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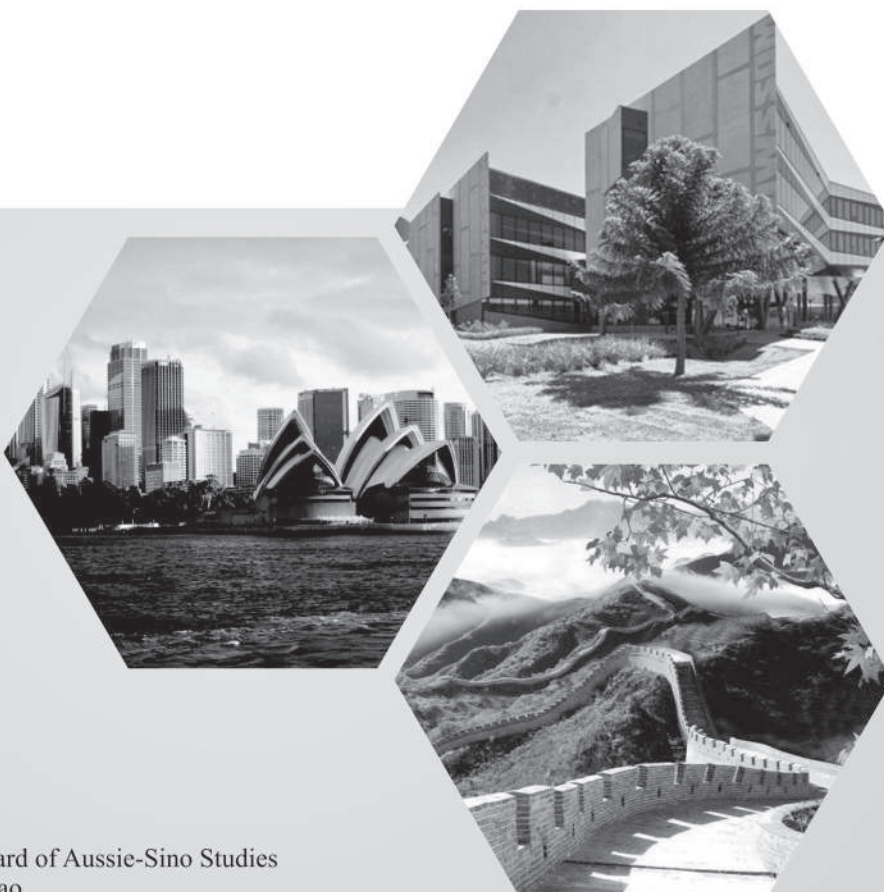
Address: 30 Casuarina CCT, Kingswood, NSW, 2747, Australia

Email: assuws@163.com; aussiesinostudies@gmail.com

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Edited by: The Journal Board of Aussie-Sino Studies
Editor-in-Chief: Dr Dacheng Zhao
E-mail: assuws@163.com; aussiesinostudies@gmail.com
Telephone: 0061410630357
Address: ① KG20 Kingswood Campus UWS (University of Western Sydney) Locked Bag
1797, Penrith NSW 2751 Australia
② 30 Casuarina CCT, Kingswood, NSW, 2747, Australia

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Actions and Reactions to the Evacuation of Guantanamo Bay Detainees to Ghana: A Content Analysis of *Daily Graphic* Online Reporting

Jacob Nyarko ^a & Eric Opoku Mensah ^b & Albert Bossman ^c

(a. University of Cape Coast, Faculty of Arts, College of Humanities & Legal Studies, Department of Communication Studies, Cape Coast, Central Region, Ghana; b. University of Cape Coast, Faculty of Arts, College of Humanities & Legal Studies, Department of Communication Studies, Cape Coast, Central Region, Ghana; c. Pentecost University College, Department of Communication Studies, Greater-Accra Region, Ghana)

Abstract: The Guantanamo Detention Camp was a facility created by the US government to house enemy-combatant captured from war fronts in Afghanistan and Pakistan. Amid controversies surrounding the legality of their detention, the Obama administration pledged to shut down the facility. Since terrorism has become a global menace, efforts to combat it have been approached from a multilateral perspective than unilateral; the US transferred some of the detainees abroad recently to close it. Ghana is one of the countries that accepted two inmates. Through content analysis, this study examines media coverage of their evacuation to Ghana as expressed by sections of the Ghanaian public. Overall, society resented their arrival on fear and panic, insecurity and illegality grounds.

Key words: Terrorism, media, public, Guantanamo Bay, security, discourse, society

Introduction

Ghana was thrown into a state of shock when the media reported that the Islamic State (ISIS) has recruited an alumnus of the Kwame Nkrumah University of Science & Technology (KNUST) in Ghana and this, among other recruitments are achieved through online and offline publicity (Bilgen, 2012). This concern appeared to intensify when the media again published that two Yemenis detained in Guantanamo Bay have been evacuated to Ghana on 7 January 2016. Guantanamo Bay is a US naval base where a detention facility was built after 9/11 to detain “enemy combatants” captured in Afghanistan and Pakistan during the counterterrorism mission (Dahlstrom, 2003; Yin, 2005). In the words of the US Defense Secretary, Donald Rumsfeld, the detainees are “among the most dangerous, best-trained, vicious killers on the face of the earth and were all involved in an effort to kill thousands of Americans” (Rose 2004 cited in Howell, 2007). According to him, the facility was built to “detain extraordinarily dangerous people, to interrogate detainees in an optimal setting, and to prosecute detainees for war crimes” (Saani, 2016). By these, the Secretary announced that the detainees would not be assigned Prisoners of War (POW) status (Dahlstrom 2003, Greenhouse 2009,

Chlopak, 2002); but face trial before military commissions established by Executive Military Order of 13 November 2001 (Greenhouse, 2009). This, coupled with the release of photos of the inmate’s accommodation conditions (Dahlstrom, 2003) triggered global criticism hence the gradual withdraw of the physical and emotional backing given to US at the beginning of the War on Terror in which alliance of countries joined them on the Kabul raid on 7 October 2001 (Jamison, 2005). To them, the questioning strategies adopted, and keeping detainees’ identities and their location of detention secret is unacceptable (Jamison, 2005; Paust, 2004). In one account, Aradau (2007) referred to Butler’s argument that in Guantanamo, national and international laws were suspended leading to NGOs and European leaders joining the critical voices of analysts to condemn it. He recounted descriptions of Tony Blair of the Bay as an ‘anomaly’ which should be shut down and the director of AI who Frames it as ‘the Gulag of our times’. Assessing the situation, the UN defines the legal regime in Guantanamo as an affront to the rule of law and several human rights declarations (Aradau, 2007) such as the Geneva Convention (Dahlstrom, 2003). For instance, army investigators employed harsh counter-resistance means in a systematic order to coerce detainees to cooperate (Bloche & Marks,

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Author: Jacob Nyarko, University of Cape Coast, Faculty of Arts, College of Humanities & Legal Studies, Department of Communication Studies, Cape Coast, Central Region, Ghana. Email addresses: jacob.nyarko@ucc.edu.gh / jacobnyarko2015@gmail.com. Phone: +233-247407264

*Corresponding author’s address:

Eric Opoku Mensah, University of Cape Coast, Faculty of Arts, College of Humanities & Legal Studies, Department of Communication Studies, Cape Coast, Central Region, Ghana. Email address: eric.opokumensah@ucc.edu.gh. Phone: +233-243604199

Albert Bossman, Pentecost University College, Department of Communication Studies, Greater-Accra Region, Ghana. Email: abossman2007@gmail.com. Tel: 0244 767 223

2005; Steyn, 2003; Marks, 2007; Lewis, 2004; Malinowski, 2008; Rubenstein & Annas, 2009; Chlopak, 2002 & Woodward, 2009) and might explain Marks (2007) position that three of the Guantanamo inmates took their own lives and some twenty-five of them were unsuccessful at multiple suicide attempts. To him, each passing day worsens their mental state of well-being and others being depressed clinically (see also: Howell, 2007 & Kennedy et al., 2009). These, inform Barack Obama's criticism of the Bush-led administration during the 2008 US elections on the handling of the terrorism war with special emphasis on the Guantanamo prison and questioned the mode of interrogations applied there (Yin, 2010) hence his determination to shut the facility on assumption of office. Malinowski (2008) reiterated: the incoming president should issue an executive order that prohibits torture and secret detention leading to the closure of Guantanamo. On May 2009, President Obama outlined a new approach to deal with detainees and its allies to encompass protecting American values (Padmanabhan, 2014) and pledged to close the center by 23 January 2010 (Rubenstein & Annas, 2009). Ghana got enlisted among the countries that accepted US proposal to house the detainees. However, news of this evacuation was received with mixed-reactions and generated widespread discourse among politicians, policy analysts, academia and civil society in Ghana questioning the legality of the evacuation, terms of agreement, the motive behind keeping Ghanaians in the dark and why Ghana, and not the US or their homeland Yemen. This seems to contradict the words of the Deputy Commander of Guantanamo who in October 2004 said: "the majority of them [the detainees] will either be released or transferred to their own countries" (Yin, 2005; Malinowski, 2008).

This study seeks to analysis the content of *Daily Graphic* reported online as expressed by sections of the public (lawmakers, politicians, security analysts and civil society) to depict the Ghanaian experience of how society reacted to the evacuation of the Guantanamo detainees to Ghana amid rumors of terrorists' attack in the country.

Literature review

The Guantanamo Bay was leased to the US by the Cuban government in 1903 and it is the oldest US foreign base in a communist nation (Dahlstrom, 2003). Aradau (2007) recorded that in the early 1990s; refugees from Haiti who applied for asylum were evacuated to Guantanamo for processing and subsequently denied. "Many were held up to three years in makeshift barbed wire camps, exposed to heat and rain in spaces infested with rats and scorpions, with inadequate water supplies and sanitary facilities" (see also: Johns, 2005). Soon after the 9/11, and subsequently the evacuation of the POW to the Bay, the popularity of Guantanamo heightened in the global media space hence becoming the focus of discourse to the extent that Marks (2007) observes:

The focus on Guantánamo Bay conveniently distracts attention from other detention centers, such as Bagram in Afghanistan and numerous unidentified "black sites" operated by the CIA across the globe where interrogation practices and the role of health professionals have come under far less public scrutiny. There is a danger that Guantánamo Bay has or will become a staged detention center, while more egregious treatment of detainees is conducted elsewhere (p. 713).

This height of concentration is as a result of the horrific nature of Al-Qaeda using aircraft to collapse the twin-towers and the US determination to retaliate to prevent future strikes by invoking the Patriot Act 18 that gave the executive ample powers that even supersede civil liberties (Jamison, 2005 & Steyn, 2003). The Bay received its first batch of detainees from Afghanistan numbering twenty on Friday, January 11, 2002 (Jamison, 2005) and another thirty followed. Within a space of 10 days, the detainees, kept at 'Camp X-Ray' had risen to 158 and tallied till it hits over 600 inmates (Dahlstrom, 2003). Upon criticism, the US Military improved the conditions at Guantanamo by erecting permanent building to house the detainees [Camp Delta] (Jamison, 2005). By this quarantine, the Bush administration intended to hold the detainees indefinitely (Malinowski, 2008) and this was echoed in a 2002 speech by the government's Deputy Assistant Attorney General John Yoo that: "Does it make sense to ever release them [the Guantanamo Detainees] if you think they are going to continue to be dangerous, even though you can't convict them [detainees] of a crime" (Yin, 2005, p.151). However, to the Red Cross, "the system of keeping detainees indefinitely without allowing them to know their fates was unacceptable and would lead to mental health problems". This, Judith Butler describes as the creation of 'black hole' in the world leading to the 'Guantanamo Limbo' (Aradau, 2007) where prisoners were held "to put them beyond the rule of law, beyond the protection of any court, and at the mercy of the victors" (Steyn, 2003, p.14). Responding to concerns over suicide at the Bay, Howell (2009) relied on Foucault's 1973 'madness and civilization' theory to study along two narratives ('terrorist madness' - Bush administration) and ('psychologically impaired'-NGOs) and concludes that an understanding of those who are 'mentally ill' and 'madmen' (dangerous or pathological) should determine those to be incarcerated and others placed on coercive prescriptions to preserve security, order and liberty. However, to Jamison (2005), amid the detainees are juveniles aged (10-13) captured as enemy-combatants whose psyche may be different from the adults. On a decision continuum to 'release' or 'detain' inmates of the Guantanamo detention, Yin (2005) identified two perplexing challenges. Firstly, "continuing to detain persons who are no longer threats to the United States is undesirable and is unlikely to persuade the rest of the world of our good intentions". Secondly, "releasing persons who in fact intend to commit mass violence against the US or to rejoin the ranks of those

fighting our military is also undesirable” (p. 150). In this instance, the US appears to be safeguarding its *international reputation* as a defender of democratic ideals as Malinowski (2008) affirms that tracing the war on terror from Guantanamo to Abu Ghraib is “filled with episodes that have diminished its [the US] reputation and influence in the world” (p. 148) on one hand, and mindful of its *own security* on the other. In as much as this ‘release-detain’ stalemate makes Howell’s study a step in the right direction, it raises similar concerns in Ghana whose president has hosted two of the inmates. The question of “why Ghana and not keep the detainees in the US or send them to Yemen” appears to be rooted on two notions. Firstly, the US somewhat received global backing to fight terrorism in the context ‘we are fighting on behalf of the world’. Secondly, due to the global outcry to shut Guantanamo, it has become imperative that countries voluntarily accept the detainees to empty the facility and shut it.

Terrorism and media

Progressively, terrorism has become a global threat (Liebes & Kampf, 2007; Elu & Price, 2015) and elevated the significance of media coverage on the subject (Liebes & Kampf, 2007). Thus, global terrorism has occupied a salient position on the public agenda of many nations over the past three decades (Keinan, Sadeh & Rosen, 2003) and Ghana is no exception. Keinan et al. (2003) further hinted, “the world has come to witness a new type of terrorism characterized by a blatant orientation towards the media and designed to attract its attention. The ultimate target of this terrorism is the media consumer rather than the victim” (p. 150). In agreement with this assertion, Wilkinson (1997) described terrorist act as one “directed at a wider target than the immediate victims” (p. 51) and further espoused that whenever terrorist violence occurs, the media will always scramble to gather news to satisfy audience especially in the current study where there is high public curiosity to be informed about the victimizers and their victims (See also Liebes & Frosh, 2006; Yarchi, et al., 2013). By this, terrorists seem to capitalize on media’s insatiable thirst for the news and indirectly engaged them as their propaganda machinery to feed the public with their information. It is in line with this that progressively, terror perpetrators themselves have legitimately become information source for the media (Liebes & Kampf, 2007) creating a win-win situation for the entities involved in this relationship. Whereas terrorists want exposure on media’s primetime to publicize and legitimize their beliefs in the lens of their affiliates, mass media coverage of terrorism provides a persistent avenue to publish compelling stories to attract and maintain high audience/listenership (Wilkinson, 1997). Though the media extensively have been blamed for terrorism propagation anxieties, Nellis and Savage (2012) maintain that “even if information coming through the media causes fear, first amendment protections of press freedom should be respected and many follow the credo that the public has a right to know regardless of the outcome” (p. 764). Thus, the media functions on

the policy of *laissez faire* and should not be constrained in its coverage of terrorism irrespective of the implications of conveying violence in the news to the public (Wilkinson, 1997). These are reminiscent of the position of Cooper (1976) when he argued that “the power of the fourth estate for good or evil is unquestionable” (p. 226). This critical role of the media informs Marks’ (2007) position that without secrets documents that leaked to the media, conditions at Guantanamo and the fight shut it would hardly be uncovered and achieved; and this interface the exact situation in the Ghanaian experience of the evacuation of the two.

Putting Africa into perspective, the continent experienced significant degrees of terror attacks in 2014 (US Department of State, 2014). Between 1974 and 2008, Africa saw 4,993 incidence of terrorist activities of which 261 groups claimed responsibility (Elu & Price, 2012). In West Africa (WA) alone, terrorist groups include the al-Qaeda in the Islamic Maghreb (AQIM), the Movement for Unity and Jihad in WA (MUJAO), Boko Haram, Seleka-anti-Balaka and Janjaweed; and their activities have drawn international concerns (Nkwi, 2015). Tracking the history of terrorism, Nkwi (2015) argued that WA is a bastion of terror activities and that the increase of terrorism after the 9/11 should not be misconstrued as the starting point of the menace as some literature appear to portray. He underscored that terrorism in the region has affected its development negatively. One of its major targets is business related so that the economic cost to governments and society become severe (Elu & Price, 2015). Clarke (2015) contends that terrorism in Africa is a bigger threat compared to Europe but receives much less coverage. He compared 17 people killed in France and the massive global condemnation it received to figures ranging from 150 to over 2000 people killed in Baga, Nigeria. This appears to defeat the multilateral approach to dealing with terrorist attacks.

Theoretical underpinnings

This study relied on the theory of moral panic (Cohen, 1972) to understand how society reacted to the evacuation of the Guantanamo detainees to Ghana based on media stories. Cohen (1972) theorized that whenever values and interests are threatened, media depict the issues, public interest awakens, officials and opinion makers respond and panic precedes social changes. Among its plethora applications, moral panic is now “used by journalists to describe a process in which politicians, commercial promoters and media habitually attempt to incite and have become the way in which daily events are brought to the attention of the public” (McRobbie & Thornton, 1995, p. 559-60). The analysis of media reports in the current study is ideal considering Cohen’s (2002) postulation that the media surfaces in all the three roles of moral panic: [i] agenda-setting [ii] transmitting the images and [iii] breaking the silence, making the claim.

Method

Design

Due to the global nature of this subject, the study focused online news of print media outlets because generally, newspapers remain the base of agenda-setting within Ghana's public sphere (Nyarko, 2016). Specifically, the *Daily Graphic* was sampled purposively for this study based on the following criteria: it is more refined and professional (Hasty, 2006), active online publication, high readership and regular review of its content by broadcast stations in Ghana. According to GeoPoll, out of the 15 top newspapers in Ghana, *Daily Graphic* has the highest readership [1.5 million], *Daily Guide* [726,000], *Ghanaian Times* [532,000]. Moreover, other titles run by *Daily Graphic* were rated: *The Mirror* [fourth-416,000], *Junior Graphic* [fifth-248,000], *Graphic Sports* [seventh-169,000] and *Graphic Showbiz* [ninth-146,000] (Zurek, 2018). Beyond these, record shows that the Ghanaian print (newspapers, magazines and journals) operating offline is estimated to be about 466 (IREX, 2012). Ghana's media ecology is dominated by state and private ownership.

January to June 2016 was the time frame for data gathering because it was the period that the detainees arrived in Ghana and the interest of both media and the public were high on the subject. Keywords as such: "Terrorism, Guantanamo Bay Detainees in Ghana" or related subjects were keyed into the search functionality on the website of *Daily Graphic* to retrieve the stories. Using inclusive criteria, all articles with a minimum content of two hundred words were selected. Consent to conduct this study was issued by the Graphic Communications Group Limited. The major limitation of this study is the use of only *Daily Graphic* for analysis. However, at the time of data gathering, a search on the websites of the other newspapers returned few or no Guantanamo story though they covered extensively offline.

Analysis of content

This study draws on the eight-step qualitative content analysis process: "prepare data, define unit of analysis, develop categories and coding scheme, test coding scheme on a sample of text, code all text, assess coding consistency, draw conclusions from the coded data, report methods and findings" by Zhang & Wildemuth (2009, p. 3-5). Content Analysis (CA) involves the process of applying an objective coding scheme to a raw data such that the information is condensed and systematically presented for analysis (Berg, 2007). Furthermore, CA is the "breaking down or fragmenting text into pertinent units of information for their subsequent coding and categorization" (Ruiz, 2009, p. 7). This approach enables text to be captured so as to deduce the subjective and inherent meaning they construct and attach to their actions (Neuman, 2006) in a scientific manner (Zhang & Wildemuth, 2009). Firstly, the articles ($N=50$) were downloaded, formatted, printed and labeled individually from 1 through to 50. The unit of analysis, categories and coding schemes were defined and

developed. Furthermore, some stories were sampled, coded to ensure consistency and shortfalls identified in the scheme were refined. Finally, all the articles were thoroughly read and relevant portions that speak to the evacuation process were coded under four units for analysis: (i) fear and panic, (ii) political dimension and (iii) legality, agreements and security issues.

Results

The president of Ghana on 7 January 2016 made a decision to accept two Guantanamo inmates voluntarily to contribute to global tranquility. The two, Mahmud Umar Bin Atef and Muhammed Salih Al-Dhuby were Yemenis captured from Afghanistan in 2001 as purported Taliban and Al-Qaeda enemy-combatant and detained at Guantanamo for 14 years according to US-Based *Fox News* (Obour, 2016). However, their evacuation to Ghana generated intense public discourse and outrage because society's values and interests appear threatened in line with Cohen's moral panic. For instance, Franklin Cudjoe, the president of IMANI Ghana assessed this development and described it as "unwise decision". Similarly, Keith Bluwey, an International Relations Analyst bemoaned: "the decision was "reckless" and "dangerous", [because] the Mahama administration was only interested in the financial benefits that it may derive from it" (*Daily Graphic Online*, January 7, 2016). These positions resonates a source from parliament that argued:

Although there is war in Yemen, some Yemeni citizens freed from Guantanamo were returned to their country. So on what bases were they brought to Ghana? [While] the issue was being openly discussed in the US, the [Ghanaian] Minister [of Foreign Affairs] had decided to discuss the matter with MPs behind closed doors (*Daily Graphic Online*, February 22, 2016).

This informed the position of the then minority leader in Parliament urging the president to "come clean" on the issue and tell Ghanaians the truth" because to him "the entire process [of evacuation] was shrouded in secrecy [and] that was unacceptable in a democracy, except where Ghana's interest would be jeopardized in a more transparent and open process" (*Daily Graphic Online*, February 16, 2016). However, to Powell, governing authorities hold private information regarding the susceptibility of targets that terrorists intend to attack. He concludes that where the marginal security return to resources allotted to protecting more susceptible targets is smaller than the marginal return to resources allotted to protecting less susceptible targets, then secrecy dominates security (Powell, 2007) and this appears to be the situation Ghana finds itself. The evacuation of the Guantanamo detainees to Ghana discourse impacted society on three major fronts.

The fear and panic front

Fear gripped many Ghanaians when the Guantanamo inmates were evacuated to the country. On social media, responses of people were a mixture of anger, disbelief and fear. This reiterates that the Internet has broadened the spectrum of terrorist propaganda and revolutionized their operations with minimal risk

and cost (Bilgen, 2012). The image Guantanamo has carved for itself 'to house hardened terrorists' as defined by Donald Rumsfeld is a negative one and it is a ground for many anxious Ghanaians who interpret the evacuation as a transfer of US problem to Ghana despite studies that all countries are susceptible to terror attacks (Jones & Fong, 1994; Owusu-Sekyere, 2016). This becomes evident in the challenge the US itself is facing in the closure of the Guantanamo especially 'how' and 'where' to release inmates without compromising its security (Yin, 2005). Society's position is rooted in the notion that terrorism is in response to external stimuli, predominantly government actions (Crenshaw, 2008) hence the agitation by society against President Mahama's decision. Moreover, Rosendorff and Sandler (2004) found that proactive counterterrorism by a country [in this case the US] tends to breed negative externalities on other states by diverting attacks to foreign targets. The media depicts Bay in the following narratives:

Some weeks ago, there was a *bombshell!* Two suspected persons, who had hitherto been detained at the *infamous* US Guantanamo Bay Detention Center in Cuba, had been granted asylum in Ghana! (*Daily Graphic Online*, March 4, 2016).

The decision to host the detainees in Ghana has provoked a *firestorm of controversy and outrage* among Ghanaians, with many expressing fear that the move would undermine Ghana's internal security and expose the country to attacks from religious extremists (*Daily Graphic Online*, January 7, 2016).

By these, the detainees arrival triggered society to wrath, fear and confusion because firstly, they see the Bay to have a questionable reputation to associate with; secondly, the security of the state is being compromised and finally, the entire evacuation process is unreasonable. Sections of the Ghanaian public could not comprehend why the president would accept them into the country. For a moment, Ghanaians saw their country as an autocratic state where the president takes fundamental decisions without consulting its subjects. Subsequently, a civil society group requested that the matter be referred to the apex court for clarification in the statements:

In their [society's] bewilderment, people asked important questions: "Is Ghana, not a democracy?" "Could the government take such key decisions, without consulting the people? ...Should the decision not be challenged in court?" (*Daily Graphic Online*, March 4, 2016).

There was fear and trembling! People could not fathom why the government would allow such persons [deemed as terrorists] into Ghana! (*Daily Graphic Online*, March 4, 2016).

As safety debates heightened, it affected the way society functions. The phenomenon of 'be your brother's keeper' and 'community goodwill and coexistence' in Ghana began to wane dramatically. For instance, the Guantanamo discourse nearly deteriorated the strong relationship between Ghanaian Christians and Muslims, which has become a global model into unrest because discussion was done through religious lens. This led to a

new phase of relationship among Ghanaians and foreigners marked by extreme suspicion especially at public places such as airports, bus stations, hotels, workplaces, cinemas, funeral grounds, malls and even churches and mosques recruited security officers to man their services. By this, terrorism generally steals society's freedom, desire to live normal lives and also breeds distrust that was hitherto unified thereby instilling fear. This reflects studies that terrorists aim at targets to cause fear and panic rather than the harm caused to the immediate victims (Krueger & Malečková, 2003; Bilgen, 2012). Thus, terrorists achieve their aim when they succeed to plant fear in society without necessarily causing grievous physical harm. The state of fear and panic further heightened with breaking news that:

Four [new] Yemeni nationals have been hauled before an Accra circuit court for allegedly entering Ghana with fake French passports and visas, thereby concealing their real identities (*Daily Graphic Online*, February 4, 2016).

In an atmosphere of fear about the spate of attacks in nearby nations like Nigeria, Ivory Coast, and Burkina Faso among others, it gave a reason for Ghanaians to be more anxious with the acceptance of the inmates. This concern suggests that a country's level of anxiety of terrorism occurrence is determined by its proximity to a victimized state. For instance, Jetter (2014) noted that media coverage of terrorist attacks is high for countries that trade with the US and are geographically closer to it. Putting the spate of terrorist attacks in West Africa under perspective, Kwesi Aning of the Kofi Annan International Peace Keeping Training Centre in Accra wrote cautioned:

We [Ghanaians] are a potential target. The president must whip his security chiefs into line. The quality of analysis they give the president must improve dramatically. Burkina Faso has been a confluence for the activities of terrorists for a very long time. We have also seen the worsening of the power struggle between the Islamic States and Al-Qaeda for the last two and half years with West Africa becoming the front line for that power struggle. Every single country in West Africa is a potential territory for the expression of this contestation of power and influence (Aning [yen.com], 2016).

By this, member states should develop consistent strategies. It is highly inadequate to organize security summits once in a blue moon. Daily and weekly intelligence gathering and strategies must be employed, monthly reviews adopted and yearly reforms injected in our way of life (Owusu-Sekyere, 2016) because terrorists have not rested and have been consistent in planning their attacks. Bueno de Mesquita (2008) had cautioned: "the dilemma is that counterterrorism tactics that increase short-run security may diminish long-run security by fanning the flames of conflict" (p. 7). Thus, inconsistent government policy rather breeds increased violence. Beyond these states of affairs that triggered anxiety among Ghanaians, fear and panic could have been better managed if major communication lapses were addressed. Firstly, the Ghanaian government machinery through its media should have

broken the evacuation news to citizens instead of by US-based *Fox News* and secondly, it lacked internal stakeholder briefing which supports the position that the entire evacuation process was handled in secret. Despite the above sentiments by the public, a section of the Ghanaian society did not share the 'fear syndrome' view. Adib Saani, a Ghanaian political and foreign policy analyst noted:

My 70 year old mother called me in a state of panic from Tamale [Northern Regional Capital]. Terrified, I enquired what the matter was. "I understand terrorists have invaded Ghana" she exclaimed. I instantly burst into laughter. As happening, I allayed her fears and tried desperately to make her understand we are safe (*Daily Graphic Online*, January 21, 2016).

Saani clarified that ex-convicts are those proven guilty by a competent court of jurisdiction, but the two Yemenis brought to Ghana after 14 years of incarceration at the detention camp cannot be described as such. The Yemenis were two of the over 500 inmates released without any crime. He reiterated:

Ghana is neither the first nor the last country to extend this humanitarian gesture. About 55 countries including European countries such as Sweden, Germany, France, Belgium, Spain, United Kingdom, have taken in these detainees. All former Gitmo detainees in Europe are living peaceful lives, without engaging in militant or other violent acts (*Daily Graphic*, January 21, 2016).

This reemphasizes that with the exponentially growth of terrorism (Jetter, 2014; Bilgen, 2012), the need to fight it from a multilateral approach rather than a unilateral one cannot be over-emphasized (Owusu-Sekyere, 2016). For instance, Albania accepted 5 of the 22 Chinese wrongly captured in Afghanistan and Pakistan by 'bounty hunters' after the US invasion and released in 2004. The rest remain stranded in Guantanamo for fear of possible torture if they return home (Saani, 2016). By this, Robert Jackson, the US Ambassador to Ghana stressed: terrorism is an international problem and that no country is immune to it. In a comment to allay society's fear and panic, a member of the clergy called for calm and cautioned that Ghanaians should react with circumspection towards the two Yemenis because any unfavorable reaction could rather draw extremist invasion:

Any negative reactions from Ghanaians can antagonize extremists who could eventually respond in negative ways we can hardly imagine, we [Ghanaians] should see the two individuals as private men and people who want to chart a course of life for themselves in our country [Ghana] and leave out any association with extremist groups (*Daily Graphic Online*, January 26, 2016).

This reinforces the study of Jones and Fong (1994) that a country with resilient media is prone to terror attack because its vociferous nature makes it ready to convey critical voices of society which may rather inflame tensions instead of calming it. However, a source disagrees saying: "it [the detainees transfer] is not in our interest, these people are not ordinary refugees who are being found

places of rest, [...] and they should have no place in Ghana" (*Daily Graphic Online*, January 7, 2016). These resistances demonstrate the extent to which society abhors terrorism.

The Political front

The evacuation of the detainees to Ghana metamorphosed into a partisan political encounter. Ghana witnessed a 'for' and 'against' discourse within its public sphere where objectivity lost its virtue, especially at a time their arrival coincided with the country's 2016 general elections. For instance, Wereko-Brobey bemoaned: "in our country, the highly partisan political atmosphere we have established does not allow any room for cross party consultation on matters of presumed national interest" (*Daily Graphic Online*, January 26, 2016). This has been branded the 'winner [of elections] takes it all phenomenon' in governance and though it has received public condemnation, it lingers on. Eugene Kwadwo Mensah, a Ghanaian Law Professor at the Chonnam National University in South Korea noted:

The political class reacted in predictable ways. For supporters of the government, the detainees were not really terrorists because they had not been convicted of any offence and the government's actions could be justified on humanitarian grounds. The government's critics condemned the decision and wondered why the authorities would put the country on the frontline of the war against terrorism (*Daily Graphic Online*, March 4, 2016).

Beyond the blame game that engulfed the public sphere to win political points, the study showed that a significant number of Ghanaians generally resented the acceptance of the two Yemenis into the country as exemplified by an appeal by a member of the clergy that Ghanaians should be patient and not over-react towards the detainees. However, to many Ghanaians, the acceptance of the detainees is tantamount to exposing the country to external aggression. A Ghanaian minority MP commented: "The people in my constituency are worried. This weekend I will meet a section of them and I will tell them that this is a government they should distrust" (*Daily Graphic Online*, February 22, 2016). This rhetoric seems to capitalize on the evacuation of the detainees to convey political messages aimed at making the sitting administration unpopular. Reflecting on Ghana-US relations, Nana Akuffo Addo, the leader of the then largest opposition party explains:

Even though we have strived and will continue to strive for strong ties of co-operation between our two countries [Ghana and US], we recognize that at the end of the day, decisions that are taken must serve the mutual interest of the two partners. Ghanaians are yet to be persuaded that this decision was in our national interest (*Daily Graphic Online*, February 25, 2016).

Abraham Amaliba, a legal practitioner and a member of the communication team of Mahama administration debunked the association of the two Yemenis to terrorism because for no offence, the US held them captives for years. Amaliba sees the president's accommodation of the detainees as a contribution to global peace and security and to help clean the mess the US has created. This is

evident in the statement below:

The government's reasons for accepting the former inmates of Guantanamo Bay was to correct the wrongs perpetuated by the United States of America. "They [the detainees] are not terrorists. They were only rounded up and made to go to a detention camp for 14 years but the US could not find any act of terrorism against them (*Daily Graphic Online*, January 26, 2016).

This resonates the position of Malinowski (2008) that the "challenge for President Bush's successor will involve not looking forward but looking backward at the abuses committed by the previous administration" (p. 157) and correcting them. However, the United States Ambassador to Ghana, Robert Jackson, finds the politicization of the transfer of the detainees to Ghana as undesirable. "I think it has become a political issue here. I regret that" (*Daily Graphic Online*, April 16, 2016). He [explained] that foreign policies should basically be non-political and that the US-African foreign policy had generally been bi-partisan. In as much as this public sphere discourse is good for a thriving democracy, over-politicization of issues has a high tendency to obscure the path to real democracy and development. To some analysts, President Mahama lost the 2016 Presidential Elections to the opposition party partly due to the acceptance of the detainees to Ghana which voters resented.

Legality, agreements and security front

At the height of the discourse surrounding the acceptance of the inmates was concerns about legality of the evacuation, agreement terms reached and how 'security-ready' is Ghana? The then minority in parliament assessed the acceptance of the detainees vis á vis the constitution and argued that: "The conduct of President Mahama in bringing the two former Guantanamo Bay detainees into the country without parliamentary approval constitutes a breach of the 1992 constitution which he [the president] has sworn to uphold" (*Daily Graphic Online*, February 16, 2016). Referring to Article 75 (1) and (2) of the Ghanaian constitution which states: "A treaty, agreement or convention executed by the president should come to the House under an Act for ratification or by a resolution" (*Daily Graphic Online*, January 30, 2016), Opoku Prempeh, then Minority Member of Parliament (MP) explained: I am not saying that "the President could not do what he had done, but the constitution which he has sworn to uphold says if he does that, he must refer it to this House" (*Daily Graphic Online*, January 30, 2016). To establish the constitutionality of the evacuation, two Ghanaians Margaret Banful and Henry Nana Boakye sued the government at the Supreme Court (SC) seeking for:

[i] a declaration that the continued stay of Mahmud Umar Bin Atef and Muhammed Salih Al-Dhuby in Ghana is unlawful, [ii] an order directed at the Interior Minister to immediately return the two detainees to the US government and [iii] an order that the government produce the diplomatic agreement between it and the United States government that gave the green light for the transfer of [the detainees] to Ghana (*Daily Graphic Online*, June 22, 2016).

Subsequently, Helen Ziwu who represented the Attorney General (AG) told the court there was no 'formal written agreement' leading the SC to order the state to: "Produce in camera the notes verbal, the subject matter of this application for a determination thereon pursuant to Article 135 clauses 1 and 3 of the constitution" (*Daily Graphic Online*, June 23, 2016). Making reference to the US legal system called "executive privilege" where the executive machinery need not consult parliament due to the nature of subject(s) like foreign policy and national security, Charles Wereko-Brobby, the Chief Policy Analyst of the Ghana Institute for Public Policy Options (GIPPO) maintained:

The Guantanamo Two came to Ghana as a result of an agreement between the US and Ghana. So, this is a *foreign policy matter*. Since there is a disputed claim that they were engaged in terrorism, this is also a *national security matter*. Obviously, it would have been difficult and inappropriate for the government to consult us [Ghanaians] on this issue. If had done so, it would in all likelihood have jeopardized our relationship with the US – [but] who knows what we got in exchange for our decision? (*Daily Graphic Online*, March 4, 2016)

To Wereko-Brobby, in as much as secrecy is paramount in issues of this nature, there seem to be a long-standing ties between the two countries which Ghana particularly would not like to lose it and may inform the acceptance of the detainees. Moreover, there are concerns that the government might have received some form of reward in this regard. As society became more concerned about this subject, the US Ambassador to Ghana, Robert Jackson explained to Nana Akufo Addo, the flagbearer of the biggest opposition party, New Patriotic Party (NPP), that the evacuation of the detainees was done on the understanding that the US pays the entire cost of their stay in Ghana for two years and noted that similar arrangements have taking place in other 55 countries. He further explained:

Beyond that, there has been absolutely no money, no payment, no bribe, [and] no agreement. We did not tie the Millennium Challenge Compact, which had already been signed, to the detainees. We have not increased or decreased US assistance to Ghana. I want to be very clear that there was no exchange of money as far as I am concerned (*Daily Graphic Online*, April 16, 2016).

Despite this understanding, the concerns of the public hovers around the tag "terrorists" and "terrorism" associated with the detainees and the fact that legal procedures were breached in the evacuation process. Finally, the SC of Ghana ruled as unconstitutional the president decision because it lacked parliamentary approval and requested that government release the agreement to parliament for ratification. Though the detainees' stay officially expired on 6 January 2018, two reasons explain their continued residence. Firstly, the evacuation agreement has no exit plan after two years of stay. Secondly, the Mahama administration granted the detainees refugee status six months after their arrival in

Ghana on 21 July 2016. Though this is in line with international protocol, it affirms that the evacuation process was hidden. Three similarities emerged in how the US and Ghanaian administrations handled the inmates. In both countries: [i] activities were shrouded in secrecy, [ii] civil society went to court to challenge it, [iii] SC ruled as unconstitutional the handling of detainees and/or their evacuation. However, this resolution process through the court demonstrates deepening democracy.

Security is critical to every nation; however, in the Ghana experience, the detainees' evacuation coincided with its 2016 elections which by itself, needs intense security. According to the Minority Leader in Ghana's parliament, some security procedures were overlooked in the evacuation process. He noted:

Article 84 (a) of the 1992 Constitution mandated the National Security Council (NSC) to safeguard the internal and external security of Ghana, while Article 83 (1) made the Foreign Affairs and the Interior ministers members of the NSC, yet clearly national security meetings were not convened on the matter (*Daily Graphic Online*, February 16, 2016).

The Minority leader appears to argue that even if the evacuation process was not made public due to its nature, at least security institutions created by the constitution should have been consulted. Hitherto, reports by the US based *Fox News* show that the US government had published earlier that Bin Atef was a high risk to the US interests while Al-Dhuby is rated medium risk. However, to Ambassador Robert Jackson, the detainees were not imposed on Ghana but her representative thoroughly interrogated them in a statement that:

Ghana did not just accept the ex-detainees when the US Government approached it, [because] the country was [even] to host three of the ex-detainees but the Ghana Ambassador to the United States, Lt. Gen Joseph Henry Smith, interviewed them and finally accepted two instead of the three (*Daily Graphic Online*, April 16, 2016).

By this, the US appears to distance itself from the detainees' status and identities making Ghana bear full responsibility because the country interrogated them prior to acceptance. On Ghana's readiness to handle terrorism situations, the US will launch the "Epic Guardian" organised in Africa to increase the effectiveness of US and African security forces to respond to international threats: trafficking and terrorism. However, Azam and Delacroix (2006) show that the level of foreign aid a country receives positively correlates to the number of terror attacks it experiences because donor assigns counterterrorism responsibility wholly to terror-targeted administrations. It appears that terrorists subsequently strike to test the efficacy of the donation be it intelligence training, physical security equipment or financial. For secrecy reasons, 'prestige foreign aid' (Morgenthau, 1962) which donors capitalize on to create positive global image for themselves should have no place in terrorism-related matters due to security tendencies.

The study showed that rumors of terrorism alone amid the transfer of the detainees impacted Ghana negatively to the extent the Police Commander of the Eastern region of Ghana cautioned:

Hotel operators [should] reject clients who refuse security checks on their premises. This has become necessary to avert robberies and terrorist attacks following the rising trends of such attacks in some parts of the West African sub-region (*Daily Graphic Online*, January 26, 2016).

Don't be afraid of losing the little monies from clients who refuse security screening. They are dangers to your lifetime investments and you must do all you can to protect your investments from such persons (*Daily Graphic Online*, January 26, 2016).

By this, the famous marketing postulation: 'customer is king' began to fade unimaginably. This crystalized into society coining a slogan hash-tagged: "Rastafoɔ wɔ krom" meaning "mad people are in town". This rhetoric created fun to cushion people's fears; but also cautioned them to be careful and watchful. Terrorism has permeated society and the fear of it, particularly, is usurping people's freedoms, stifling businesses and would-be investments. For instance, the higher a country is prone to terror attack, the lower it chances of attracting foreign direct investment (Abadie & Gardeazabal, 2005). Beyond the disturbing human consequences (Jetter, 2014), terrorism can hinder growth and influence investment decisions (Jetter, 2014; Eckstein & Tsiddon, 2004) but the effects of such attacks are temporary (Eckstein & Tsiddon, 2004) if handled well. The interplay between issues of legality, politics and security in relation to the detainees' evacuation to Ghana bred fear, panic and resistance because society perceives terror-related matters to threaten their values and interests.

Conclusion

The study has analyzed online content of *Daily Graphic* and shows that overall, the public resented the decision by the president to accept the detainees to Ghana. The public panicked to the extent that they demanded their repatriation. The degree of fear is dependent on: [i] the level of media coverage of terrorism rumors prior to incidence of terror and/or arrival of the detainees and [ii] the proximity of a country to a victimized state. In Ghana, the proximity of victimized states such as Burkina Faso, Cote D'Ivoire, Nigeria among others heightened fears with the arrival of the detainees. Ghana's readiness to handle complex security situations as a major reaction presupposes that the trust of society in its own security services and intelligence determines the level of fear. Whereas the Mahama administration buttresses their actions on the multilateral approach rhetoric to combat terrorism, the public argues that significant legal structures were overlooked during the evacuation. To the public, though decisions on foreign policy and security were handled secretly, constitutionally created security entities should be consulted. The public perceives the detainees evacuation as the importation of 'trouble' from the US to

a purportedly 'terror-free' and 'peaceful' country. From the Ghanaian experience, terrorism affects all facets of life and it is evident that news of it rumours and the acceptance of purported terrorists into society alone causes as much panic in societies that have not experienced terrorism as it pertains in victimized states. This study recommends that media moderators, panelists and audience who phone-in to programmes should be mindful of their utterances during public sphere discourse in terrorism matters because it has a high tendency to inflame extremism. Generally, the dilemma is that whereas media coverage of terrorism provides the news to inform society; it also inflicts fear and insecurity.

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“Group Pattern” and “pattern of difference sequence” from the Perspective of Interculturalism: Taking From the Soil: The Foundations of Chinese Society as an Example

Kexin Zhou

(Hunan Normal University, Changsha, Hunan, 410000, P.R. China)

Abstract: This article takes the "group pattern" and "differential pattern" mentioned in Fei Xiaotong' *From the Soil: The Foundations of Chinese Society* as the starting point to explore the differences in the national social value system under the two social patterns of China and the West, including the difference of spiritual structure, interest structure, governance structure and action model. In the context of globalization and the conflict between Western values and Chinese traditions, how can China maintains its cultural subjectivity under the condition of accepting the western modern technological rationality and transforming from the " pattern of difference sequence " to the "group pattern"? It also explores and reflects on the advantages of Chinese traditional culture, thus reconsidering the two civilizations' influence on human society, and how to rebuild Chinese culture and realize "harmony but difference".

Key words: pattern of difference sequence, group pattern, cultural subjectivity

Introduction

The " pattern of difference sequence " is a classic summary of Fei Xiaotong's traditional Chinese rural social structure in " *From the Soil: The Foundations of Chinese Society* ". He pointed out: "In the pattern of Chinese organization, our social relationships spread out gradually, from individual to individual, resulting in an accumulation of personal connections."^[1] "Like the ripples formed from the stone thrown into a lake, each circle spreading out from the center becomes more distant and at the same time more insignificant."^[1] The "differential pattern" is a vivid expression of traditional social structure in China. In the exposition, Fei combines a large number of social phenomena he observes and personal relationships in interpersonal communication. This kind of differential structure deeply embedded in the traditional rural society largely stipulates the spiritual structure, interest structure, governance structure and action model of rural society, and becomes an important foundation for the harmony and order of traditional rural society. At the same time, when he proposed this social structure model, he used the Western modern society as a frame of reference to systematically compare the traditional Chinese society with the Western society in terms of basic structure and various aspects. The modern transformation of rural China is not only the transformation of institutions and structures, but also of history and civilization. Unlike the West, China's modern transformation is forced to happen under the impact of the West rather than

internal self-evolution. This historical starting point determines that China's modern transformation inevitably clashed between the conflicts between China and the West, and intellectuals' exploration of China's modernity is also carried out under the Chinese/Western two-point framework. This two-point framework provides a huge flexibility for the practical exploration and discourse of Chinese modernity. Fei's thought was formed and developed in this space. Therefore, Sino-Western relations have become another dimension for Fei to explore China's modernity. Along this dimension, Fei Xiaotong's "difference pattern" is both a theoretical crystallization of the comparison between China and the West and an important entry point for understanding China's modern transformation.

1. Group Pattern and pattern of difference sequence

The " pattern of difference sequence " describes the interpersonal pattern of closeness and distance, and divides the distance according to the distance from oneself. This concept fits well with the nature of interpersonal relationships in Chinese society and reveals the characteristics of traditional Chinese society. These features include the following:

Egoism. In this relationship, self is always the center of this relationship, and all values are centered on "self".

The relative nature of public and private groups. In this pattern, standing in any circle, looking inward can be said to be public, it is a group; when you look outward, you can say that it

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Author: Kexin Zhou (1993-), female, Hunan, teacher of South China University, whose main research direction is translation and intercultural communication.

is private and self. There is no clear boundary between the two.

Specialist ethics. China's morality and law depend to some extent on the relationship between the object being applied and its own. All universal standards do not work.

People rule the society. The power used to maintain order is not a law, but a historical tradition of interpersonal relationships. Different from the difference pattern of Chinese rural society, Fei called the social structure of Western countries a group pattern. He believes that, like "bundling wood", the group structure is full of groups consisting of several people. "Each group has its own boundaries, which clearly define those people who are members and those who are not."^[1] In the same group, everyone has the same relationship with this group, so the status between people is equal. Among the members of the group, the interpersonal relationship is Like the firewood branches that are bundled together, they are equal and concise. If there are differences among group members or distinctions among ranks within the organization, these would have been agreed upon earlier as part of the rules of the organization..^[1] Groups or grades can be considered as "sub-groups" within the group, and within each group or level, members are still equal to each other. History shows that the group pattern is an important foundation for the formation of modern Western society. It is the modern elements of democracy, rule of law, rights, equality, and contract that are fostered in this social structure that form the basic characteristics of Western society. Liang Shuming has compared the differences in social structure between China and the West. He believes that Westerners are good at group life while Chinese people lack group life. Group life has many advantages, namely public concept, discipline, organizational ability and legal spirit. Of course, the difference between the Chinese and the West in the social structure is only relative, not absolute. Only the West is better than the group life, and China is better than the family life.

The evolution of the social structure of European countries has undergone a long process of development. After the establishment of "nation-state" through modern religious reform, the Renaissance, the industrial revolution, and especially the nationalist movement, the contemporary social system was gradually developed. Although there are differences in the details of the system among countries, on the whole, Western modern society is indeed different from traditional Chinese society in many basic aspects. "Group pattern" and "differential pattern" can be regarded as one of the main characteristics of Western society and Chinese society. It also affects our cross-cultural communication in all aspects.

2. The social structure and value system

2.1 family, nation and rule and order of the rites

In order to compare the "pattern of difference sequence" of traditional Chinese society with the "group pattern" of modern

Western society, we analyze the specific meanings of the two basic units "home" and "nation" in Chinese society and Western society.

In the "pattern of difference sequence" network, the boundaries of "family" are unclear, have scaling ability, and can even "stretch and move freely". "In Chinese, the word *jia* (family) is used in many ways. *Jialide* (the one at home) can mean one's wife. *jiamen* (kinsmen) may be directed at a big group of uncles and nephews. *Zijiamen* (my own people) may include anyone whom you want to drag into your own circle, and you use it to indicate your intimacy with them"^[1] The ability to master various types of socio-economic resources determines the closeness of the personal relationship between this person who is in the relationship net center, and others, and even determines the boundaries of his "family". Poor people often "lack of relatives", while wealthy people are "friends full of seats." If a person makes a fortune, not only will his relatives and friends necessarily benefit, but even the other creatures of this family will be benefited from the so-called "one person gets the way, the chicken and the dog rise to heaven." Therefore, the interpersonal relationship system of traditional Chinese society is "from individual to home, from home to country, from country to the world, is a one-way path." ^[1] In this order, the deepest ripples, the most intimate with everyone, and the most valued are the interests of each person's "self", followed by his "home" and then the larger group he is in, such as The layer is pushed out, and finally to the "country" and "world".

In the Western "group pattern", "family" refers to couples and underage children. Parents usually have no economic obligations and responsibilities for adult children. They may go out to eat together and may pay separately. Another group unit is the "state", Fei believes that "in Western society, the country is a distinct and unique special group boundary." "They see the country as a group that exceeds all small organizations. For this group, both the upper and lower sides can sacrifice, but they cannot sacrifice it to form a different group." Why is the country so important? Because the administrative boundary of the state is the geographical field of the implementation of the basic social system such as the political system, the legal system, the economic system, and the education system. It is these basic systems that enable a modern society to be constructed and operated to make citizens' rights, responsibilities and obligations guaranteed. So in the modern Western society, the "state" is the most important group unit.

In the traditional Chinese concept, the country is an obscure concept of "*tian xia*", the country is the home of the emperor, and the boundaries are never clear, but a circle of social forces launched from its own center. Foreigners have also noticed this. "Normally, there is no national concept in the minds of Chinese people." The two groups, "home" and "nation", which are very important in Western society, have neither clear boundaries nor

special significance in traditional Chinese society. The most important thing is the individual interests. Therefore, in the traditional Chinese society, the status and significance of the "nation" in people's minds is indeed a big problem that requires us to think.

In Western society, everyone's evaluation of self is based on the system and law recognized by the public, and there are objective standards set by the whole society. People don't care about their individual colleagues or neighbors' remarks; but in traditional China. In society, "how a person is" depends on the evaluation of people in the "circles" around him. Thus, the recognition of a person depends on whether he properly handles his relationship with the people around him, not on the basis of objective and fixed standards. Mencius said: "The father and the son have relatives, the monarch and his subjects have kindheartedness and justice, the husband and wife have difference, young and old have orders, the friends have credibility ." So the Chinese based on his relationship with others, according to the set of relationships that pass each other's obligations to clearly express his "self". This "set of relationships" is the rule of dealing with people in the pattern of difference sequence. The Chinese are recognized and survived by maintaining this pattern of difference sequence and following the "set of relationships" they require. In the development, people also have a clear expectation of each other's behavior according to this set of rules when they get along.

This pattern of difference sequence of rural China has brought about "rule and order of the rites".

This leads to the concept of "private morality", which has a certain extent of hierarchic in the pattern of difference sequence of rural society. They don't have the love of "no difference", it is difficult to find the moral elements of the individual to the group. In the conflict between public and private interests, the lack of group morality is more obvious. This is an inherent and tenacious drawback of the local society. As Fei said, "China's morality and law are all due to the degree of expansion of the relationship between the object and the relationship. In the local society, All the universal standards don't work. You must ask, who is the object, and what is the relationship with yourself before you decide what criteria to come up with."^[1] This is a feature of this local society that values human nature, nature and us. There is some conflict between the current equality and the modernization of the legal system.

2.2 Humanity and nature, individual and society

Emphasizing human relations over nature is manifested in "harmony between man and nature" is a natural starting point for the traditional Chinese cultural value system. People are a part of nature. People should adopt the natural human culture to achieve the realm of civilization. It advocates the harmonious coexistence between man and nature. It is because nature, people, society, etc. are all regarded as an extension of life and a

continuation of life. Liang Shuming calls it "continuation." Western society regards nature as the object of human conquest. It governs nature through rational activities. It does not regard nature and human beings as living beings, but as static objects to cut, analyze, and mechanically judge nature and people. He took the research method of Western medicine as an example: "Now the object of Western medicine research is the body rather than the life. The human body is observed and studied as an objective object. It does not pay attention to life. It only diagnoses and treats according to local and phenomena."^[3] Emphasizing group interest over individual are embodied in the core concept "benevolence" of Confucianism. "Benevolence" is a language that naturally emphasizes relationships and human touch. Obviously, the intention of expression is group: morality, goodness, harmony, love, and expression of a kind of "altruistic" social values.

This value of "altruism" has formed distinct values with national characteristics through thousands of years of accumulation and development. Emphasis is placed on the group and social awareness that individual interests should be subordinated to the overall interests of society. Achievements made by one person in the group are regarded as collective achievements, and the collective feels glorious. It is a virtue to advocate a noble value of selfless dedication, to take the initiative to care for others. Mao Zedong summed up the value of "altruism" in a concentrated and vivid way, using the phrase "votion to others without any thought of himself" as the moral criterion of the Communists. From the cultural language, we can also see that it advocates and publicizes the universality of "altruistic" value.

it is easy to understand that Fei others have talked about the fact that the Chinese public and private are indistinguishable and the boundaries of the group have relativity. First of all, each individual is most loyal to the social circle centered on its "self". From the core family of individual, to the "small family" of the big family, to the country and the world of the emperor, with the gradual expansion of the circle, the "self" of the circle center is constantly expanding and extending.

This is also quite different from the modern Western society. The significance of the establishment of the modern Western nation-state is that this social group is the result of individual satisfaction (at least in the value ideal), and the individual's recognition of it is also considered to be this society. The group can strictly define and protect the interests of individuals. Therefore, in essence, the Western respect for the state comes from the protection of individual's interests from the country, the maintenance of the country's constitutional government, the law and its dignity is also to maintain people's own interests.

In China, first of all, the public domain in a certain scope is actually expanded from the private sector. The social circle is derived from the extrapolation of a "self". Even the largest social

group "state" is only the home of the emperor. loyalty in the traditional dynasty countries is only to be a slave of a family. Therefore, the transformation between public and private is relative in itself. Even the state is not a public domain beyond the individual.

In this public sphere, Chinese Confucianism constructs an ideal mechanism. First, construct an ideal personality, which can suppress the individual's lust and turn it into axiom. The second is to propose "the inner and outer kings", that is, only those who possess the above personality can assume the public responsibility according to the degree of their virtues, "cultivating the body, arranging the family, governing the country, and the world" (*xiushen, Qijia, Zhiguo, pingtianxia*). But obviously, the actual situation will be far from this ideal. The cultural values advocated by Confucianism try to save the reality, especially at the national level. The bureaucratic group of Confucian intellectuals strives to limit the lusts of those emperors who may not really have the qualities of emperors to a certain extent. It is persuaded that the emperor can only link the "home world" and "the heavenly heart" to make its foundation permanent, thus guiding the emperor to diligently love the people and to "The whole world as one community." (*tianxiaweigong*) But in fact, the public nature of such communities is still inevitably declining over time. This makes Fei 's " pattern of difference sequence " of Chinese society a social picture that changes without change. The growth and decline of power also causes the differentiation, disintegration and recombination of members of society, thus making Chinese society, begin at the grassroots level, is not a society with a stable and solid structure, and its political process far exceeds the meaning of structure.

In the West, since individualism has become its ideology, individuals have also woven so-called social networks, but they are more likely to use what we now call "social capital" to fulfill the desire and enjoyment of the world. It is also in this sense that Fei 's "group pattern" based on the independence and equality between individuals can be formed. Different from the clear division of the group boundaries in the "group pattern", the group boundaries of the "pattern of difference sequence" are rich in flexibility, variability and ambiguity. In fact, the differential pattern refers not only to the social structure of China but also to the deep structure of Chinese culture. This concept is proposed to highlight the differences between the two civilizations and the two societies in the comparison between China and the West. The "pattern of difference sequence" is not only a plane network of interpersonal relationships, but also a three-dimensional structure of respect and difference. In this structure, people form a hierarchical difference order personality, and this personality provides a cultural basis for the reproduction of this pattern, from the family / community, society, nation / country, step by step, three-dimensional at the level of re-examining the pattern

of difference, we can not only see the three-dimensional social structure connotation of this concept but also find the factual confirmation of the general social level.

The expression of action and relationship construction of "self" in the pattern of difference sequence is carried out along the three dimensions of interest, emotion and ethics, but the mixed relationship between profit, emotion and righteousness determines the Chinese difference relationship. It is fundamentally different from the classification of binary relations in Western individualistic culture. The contradiction between rules and individuals implies the dynamics of social structure maintenance and change. Therefore, the pattern of difference is not a manifestation of the difference between China and the West, but also a representation of historical development.

3. The social pattern and cultural subjectivity

After entering the 1990s, intercultural communication became the focus of scholars' thoughts and inquiry activities. The cause of this was the acceleration and deepening of the globalization process. The earth is getting smaller and smaller, and the contacts between the nationalities are more and more frequent, making public relations between the state and the country, nation and nation, race and race, religion and religion, etc. become more and more complicated. While China's gradual affluence and strength play an increasingly important role in the international arena, all of these has led us to reflect and criticize Chinese culture from the perspective of intercultural communication. The fate of Chinese culture depends on whether it can self-adjust due to the situation and adapt itself to the social historical changes, and can continue its own subjectivity.

We have noticed the phenomenon of alienation of science and technology, and have noticed the consequences of the double-edged sword brought by Western culture. This situation continues in the 21st century. Since the end of the Cold War, the Western world led by the United States has invaded many small and weak countries by force. However, it is counterproductive that the more resorting to violence, the more difficult it is to obtain peace, even has caused global civilized conflicts and serious terrorism. Behind this chaos is the enlightenment culture in the West that emphasizes the opposition between heaven and man and self-interest. But we can't simply understand "cultural subjectivity" as "cultural return" or even "retrospective" (Fei Xiaotong, 2004), but should start from the fate of the entire human race and rethink the Chinese and Western civilizations to reconstruct Chinese culture from the perspective of different meanings of human society's direction, to maintain the autonomy of Chinese culture.

Fei Xiaotong's theory of social structure is of great significance to the direction of human society and the expectation of the role that Chinese culture can play in the world.

However, if we do not understand the fundamental crux of today's world civilization conflict and the key to the differences between Confucian civilization and other civilizations, it is basically impossible to achieve "harmony and difference." If a recognized and shared value cannot be achieved between different civilizations or cultural types, "harmony and difference" itself cannot be the standard for the coexistence of different civilizations. It is also necessary to find "harmony and difference" in the relationship of different civilizations. The common values of the foundation.

The "individualism" in the Western "group pattern" is more than the "self-government" in China's "differential pattern". It has undoubted superiority not only for individual personality and dignity but also for social morality, national identity and national modernization. We are concerned about the enormous energy of the technological civilization cultivated by the modern enlightenment of the West for the development of productive forces and the promotion of people's well-being, while at the same time worrying about the alienation of human beings brought about by the rationalization of tools. But even so, we should rationally realize that adapting to the Western-led modernization trend is an inevitable choice. In this tension, China must maintain its autonomy, not only to achieve the transition from "differential pattern" to "group pattern" and to accept the modern technological rationality of the West, but also to explore the advantages of traditional Chinese "technique". Overcome the limitations of instrumental rationality on a specific and micro level.

Summary

When we think about how China conducts cross-cultural communication, we should pay attention to the inherent conflict relationship between the "differential pattern" and the global game rules, reinterpreting the "differential pattern", giving it a new meaning, and based on this to imagine the human prospect

of "co-existence with difference". This cultural feature and predicament of the differential pattern requires that we must have a global vision and not be completely romantic, not sink into instrumentalism. It is necessary to recognize the independence, operational logic and purpose of culture itself. This is a perfect statement about culture but a utopian imagination. Fei finally failed to get out of this predicament. We also have difficulty surpassing it, but we have to take over his baton and seek the way to overcome difficulties.

In the context of today's globalization, economic, cultural, and artistic exchanges between countries and small multinational marriages of two people are accompanied by the process of development and change of collision-adaptation-integration. However, this is only because "the material culture of the surface layer and the functional culture of the middle layer have a tendency of 'convergence', while the deep spiritual culture does not show signs of integration between the East and the West."^[2] Therefore, the study of cross-cultural communication between China and the West still has a long way to go. It should not be limited to the historical and social level. It should stand on the position of tolerance and recognition of cultural differences, and explore the modern value of Chinese traditional culture and absorb it. An active and beneficial component of Western culture, thus truly achieving equal dialogue and exchange between Chinese and Western cultures.

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On the Road to Common Prosperity of China from the Perspective of Rawls' "Justice as Fairness"

Min Wang & Aiqing Wang

(Xi'an University of Posts and Telecommunications, Xi'an, Shannxi 710121, P. R. China)

Abstract: The road to common prosperity of China follows the law of social development of Marxist historical materialism and dialectical materialism, which not only adhere to the liberation and development of productive forces, but also adhere to the essence of socialism and the all-round and free development of all individuals. Rawls' "justice as fairness" demonstrates the reflection on social justice after the industrialization of modern western society. And it is also a design and conception of the basic structure of society based on the assumption of the original state and social contract. This echoes the theoretical and practical issues in the road to common prosperity of China and complements the latter from the perspective of social contract and ethics. Social fairness and justice are the basis for free people to unite. To achieve common prosperity and shared development is the goal and destination of socialism with Chinese characteristics.

Key words: Rawls, human union, Social justice, Common prosperity

Introduction

What is social justice and how to achieve the best union of human beings is one of the important issues that many thinkers at home and abroad pay close attention to and discuss (Zhang, 2016). The road of common prosperity in China is gradually developed in the social practice of reform and opening up. It not only develops the market economy, takes the road of industrialization, but also takes the realization of common prosperity as the internal requirement from the beginning to the end.

1. Practice and theoretical exploration of common prosperity in China

At the end of the 1970s, China's economy was backward and its productivity was low. Deng Xiaoping broke egalitarianism and put forward the strategy of "getting rich first and then getting rich along". In the early 1990s, it was further pointed out that "liberating productive forces, developing productive forces" and "common prosperity" belong to the essential characteristics of socialism.

Under the influence of "focusing on efficiency", China's economic and social development has made remarkable achievements, while the income gap has widened. Since the 16th National Congress, especially the 18th National Congress, China's social security system has entered a new period of urban-rural integration, universal coverage and all-round development. Although the level and standard need to be improved, it has also opened a new period in which all the people enjoy the fruits of reform and opening up.

The "feature" of China's road to common prosperity lies in its

two reversals. However, they conform to the law of social development of Marxist historical materialism and dialectical materialism.

First, China's thought and practice of common prosperity follow the law of interaction between Marxist historical materialism productivity and production relations.

As for what is socialism, the prevailing concept before the reform and opening-up was to eliminate class and private property and organize collective production, distribution and consumption. However, in practice, it led to inefficiency and common poverty. It is proposed that the road of "some people and some areas rich first lead the backward" conforms to the law of social development that Marxist historical materialist productive forces determine production relations and production relations react on productive forces. Orientation and policies can only be determined from the realistic level of productive forces, but not from the Communist productive forces to establish production relations and social relations in the primary stage of socialism.

Secondly, China's thought and practice of common prosperity conform to the law of social development that Marx's dialectical materialism negates and spirals upward.

Primitive communes in the early stage of human society have low but absolute average productivity. When the productivity develops further, there are surplus products and absolute egalitarianism is broken, thus human society enters an era of inequality and inequity. However, with the continuous development of social productivity, more and more sufficient material and social conditions are provided for everyone's free and comprehensive development. The requirement of free and all-round development is becoming stronger and stronger, human society will move towards

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Author: Min Wang, female, graduate student of Marxist College of Xi'an University of Posts and Telecommunications, lecturer of Shangluo Vocational and Technical College, research direction: political philosophy, localization of Marxism in China.

Aiqing Wang, female, professor of Humanities and social sciences, Xi'an University of Posts and Telecommunications, research direction: political and economic theory and reform research.

fairness and equality under the influence of this inherent need. China's road to common prosperity is a process of negation of negation. The first stage is a negation of low-level fairness, which will bring the country's overall economic strength and comprehensive national strength to a higher level. The second stage is to promote high-level fairness, which is a negation of the former negation and enhance the national life as a whole.

Thirdly, the original idea of common prosperity is to achieve the goal of rapid improvement of economic strength and comprehensive national strength. In the past 40 years of reform and opening up, the concept of national development has expanded to the overall pursuit which integrates economy, politics, culture, society and ecology. The idea of "common prosperity" has entered a new stage of "shared development", sharing of development achievements in economic, political, cultural and social aspects.

2. The Basic Thought of "Justice as Fairness" and Its Response to the Way of Common Prosperity in China

Rawls' Theory of Justice published in 1971 put forward "Justice as Fairness". It is not only a criticism and inheritance of the justice view of predecessors (Zhang & Dong, 2016), but also a reflection on social contradictions faced by the industrialized development of Western society, such as wealth differentiation, moral crisis and class Solidification Based on wealth (Ge Yu-ning, 2017), design and conceive the basic structure of society on the basis of the hypothesis of original state and social contract, try to guarantee the fair distribution of social wealth and opportunity from the procedural and institutional aspects, and ensure the function of social development to benefit all members.

Rawls uses his principles of justice to judge the justice of a basic social structure. The first principle is called the principle of equality of freedom, that is, all people share the broadest and equal system of fundamental freedoms. The second principle is called the principle of fair opportunity and the principle of difference, that is, if there are social and economic inequalities, it must conform to the following principles: (1) to the benefit of everyone; and (2) to the openness of positions and status to all. The first principle takes precedence over the second one.

In Rawls' view, justice is the fundamental virtue of a social system. If justice is violated, the social contract will no longer be legitimate. Social fairness and justice is not the means to achieve the goal, but the purpose of forming a society based on contract. In Rawls' view, this emphasis on fairness and justice stems from human reason and natural sympathy and sense of justice.

Although Rawls' "Justice as Fairness" and China's road to common prosperity are independent, their theoretical and practical problems echo each other in some respects:

First, the relationship between difference and equality.

Rawls first acknowledged "inequality", believing that people have different talents, abilities, environments and opportunities. However, the natural qualification of human beings and the

congenital conditions born in society are not so-called justice or injustice. Justice or injustice is the way of dealing with these facts by the system. His goal is to establish a system of social cooperation that benefits all. Therefore, he used the second principle to ensure equal access to opportunities and positions for all, while emphasizing that the development of society must benefit all members, especially those who are most disadvantaged in terms of origin, talent and luck.

Although some people criticize Rawls' theory of justice, it completely openly acknowledges the legitimacy of inequality, as a society, people can not develop synchronously and consistently, and so can common prosperity. Rawls adopts his second principle of justice to deal with the gap. Only when such inequality can benefit the most disadvantaged, can the design of social system be just. Marx also denounced the crude communism which denies people's individuality and pursues absolute equalitarianism everywhere in his Economic and Philosophical Manuscript of 1844: "It wants to eradicate everything that cannot be possessed by everyone as private property." (Ni Shou-peng, 2017). Deng Xiaoping, the chief architect of reform and opening-up, once pointed out: "We adhere to the socialist road, the fundamental goal is to achieve common prosperity, but the average development is impossible. In the past, equalitarianism and big-pot system were actually common backwardness and poverty. We have suffered this loss. Reform should first break down equalitarianism and big-pot system." (Deng Xiao-ping, 1995).

Second, the relationship between freedom and justice.

Rawls emphasizes that the freedom and rights of individuals are prerequisites in the design of basic social structures. But he should make amendments and supplements to the disparity between rich and poor caused by free competition. Robert Nozick fears that the redistribution of interests by the state triggered by Rawls' theory of justice may lead to the increase of state power and threaten individual freedom rights. He holds that intervening in the outcome of free competition in order to achieve equality is an artificial destruction of freedom (Robert Nozick, 2008).

In response to such doubts, it is necessary to further understand and clarify Rawls' thoughts. Rawls put forward: "It may be convenient, but not just, to reduce the ownership of some people so that others can develop. However, if the situation of other people who are not so lucky is improved, there will be no injustice in the greater benefits they earn (John Rawls, 2009)." It can be seen that his pursuit of equality does not mean that anyone, including the government, has the right to embezzle and confiscate the legitimate wealth of the former rich. This passage can be extended to several principles: (1) if some people make more profits without harming the interests of others, then some people make more profits is not unjust; (2) if some people make more profits while others' conditions are improved and advanced, then it is not unjust; (3) if the improvement and advancement is only to the disadvantaged groups but at the same time not to harm the interests of the more

beneficiaries, it's unjust. These principles have also been widely applied in the practice of reform and opening up and common prosperity in China. In the process of reform and opening-up, China has adopted the dual-track system at both macro and micro levels, making great efforts in incremental ways to seek a balance and unity among freedom and fairness.

Third, the relationship between individuals and groups.

Rawls first emphasized that individuals should enjoy the widest range of freedom, so freedom can only be restricted for the sake of freedom. And he assumes that his principle of justice is the joint way that the individual as the subject chooses independently in the original state, in which people agree to share their destiny with each other and design the system in the principle of common interests.

Although individuals in Rawls' theory value and adhere to the right of freedom, their "indifference" to others only respects their independence and autonomy, not indifference. On the contrary, they are willing to control their own enjoyment in order to help their companions lead a happy life. In the modern society with abundant material resources, more and more people want to join in the activities of public welfare and mutual assistance. In this regard, Rawls' just society is close to Marx's free association, which is conditioned by the comprehensive and free development of everyone.

Fourth, the relationship between market economy and ownership of means of production.

In Rawls' theory of justice, market economy plays a preconditional role, and has repeatedly mentioned the influence of free market on efficiency and the importance of free operation and independent career choice. However, for market economy, he believes that the connection with bourgeoisie is a historical accident, and a socialist regime can also take advantage of the virtues of this system. Deng Xiao-ping has also pointed out many times that both planning and market are economic means, and the market can also serve socialism.

Fifth, the relationship between the principle of justice and the social bottom line.

Rawls' two principles of justice are not only the manifestation of "Justice as Fairness", but also provide a appropriate bottom line of a just society. The first is that social development must guarantee the realization of everyone's freedom and rights. The second is that inequality in social development must benefit everyone. The third is that positions and opportunities are open to all. This is the core measure to prevent strata from solidifying. It is also an important aspect to ensure social equality and fairness.

3. The Practical Enlightenment of Rawls' Justice as Fairness to China's Common Prosperity

First, we should make everyone a free and equal subject, have a fair competitive market environment, and remove barriers and obstacles to the operation of the market economy. Secondly, to solve the income gap caused by the policy, the coastal areas should help the Inland areas, and industry should support agriculture. Third, we should protect legitimate income, increase the income of low-income people, expand the proportion of middle-income people, adjust excessively high income and ban illegal income. Fourth, we must strictly adhere to the social bottom line. We should improve the social security system and improve the basic living standards of the people as a whole, especially in the areas of medical treatment, education and housing. Fifth, vigorously develop social charity and public welfare undertakings and cultivate independent social forces.

In short, both Rawls under the capitalist system and socialist China with Chinese characteristics both requires the realization of social development to benefit all citizens. Insisting on common prosperity is based on adhering to the essence of socialism, and also on adhering to the all-round and free development of human beings. At the same time, Rawls' "Justice as Fairness" is a supplement from the perspective of social contract and ethics: social equity and justice are not the means to achieve the goal, but the purpose of human association itself. Without fairness and justice, a society will not have the foundation of free association.

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The Role of Organizational Culture as the Source of Unethical Behaviour in the Financial Services Sector – Based on Commonwealth Bank Case Study

Qizhen Han & Yu Li & Xing Yuetong

(The University of Melbourne)

Abstract: Banking and financial services are key requirements for economic development, and they are widely regarded as fundamental pillars for every economy entity. However, a large amount of problematic financial behaviours and scandals, including fraud, happened in Australia in recent years that severely eroded the reputation and threatened the stability of banks and the financial sector. Using case study for CBA, this paper copes with the nature of bank culture, the way that culture has effects on employees' ethical behaviours, as well as the relationship between bank culture and management. After analysis of these issues, it could be concluded that the dominance of compete-oriented culture among the financial service industry and managers' misconduct play an important role in resulting in unethical behaviours of individuals within organizations in the industry but the nature of culture (proportion) in companies within the sector can be changed by effective cooperate governance.

Key words: organizational culture, unethical behaviour, cooperate governance

1. Introduction

Banking and financial services are key requirements for economic development, and they are widely regarded as fundamental pillars for every economy entity. However, a large amount of problematic financial behaviours and scandals, including fraud, happened in Australia in recent years that severely eroded the reputation and threatened the stability of banks and the financial sector. For example, it is stated that commonwealth bank (CBA) staff manipulated Youthsaver accounts without authorization in 2013 (Feguson, 2018). After parents fill in forms to enrol in school banking, tellers use their own money or the bank's bank to activate accounts without parents' permissions (Feguson, 2018). In 2016, Australia and New Zealand Banking Group (ANZ), National Australia Bank (NAB) and Westpac were mentioned for manipulation of the bank bill swap rate (BBSW) by Australian Securities and Investments Commission (ASIC) (Ong & Lannin, 2018). The important interest rate in the economy provides a benchmark for setting personal and commercial loan rates, thus affecting business loans, mortgage, and credit cards (Letts, 2018). In 2018, AMP Limited and other organizations mentioned before were reported charging customer fees for services (financial advice) they did not provide (Neil, 2018).

In terms of influences on ethical behaviours within organizations, many studies are conducted. Falkenberg and

Herremans (1995) stated that the informal control including culture is referred as the dominant impact factor on ethical behaviours. Langevin and Mendoza (2013) addressed the influence of management control system as a whole on unethical behaviour. Brickley, Smith, and Zimmerman have argued that organizational architecture is linked to business ethics by establishing a set of incentives for individuals in the organization (Zaal & Jeurissen, 2013).

Using case study for CBA, this paper copes with the nature of bank culture, the way that culture has effects on employees' ethical behaviours, as well as the relationship between bank culture and management. In order to address these issues, the paper is organized as follows. Section 2 defines the organizational culture from a general way. In this section, what the organizational culture is and its main characteristics will be developed. Section 3 describes the competing values framework (CVF) which is widely applied by companies to define and communicate culture. In the framework, two dimensions of flexibility verse control and internal maintenance verse external positioning are developed and following this two dimensions, four types of the culture defined in four quadrants. Section 4 is the case study on commonwealth bank, using the analysis on the nature of culture in CBA, the role of culture in influencing staff behaviour, and the effectiveness of cooperate governance to discuss the influences.

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Author: Qizhen Han, The University of Melbourne.

Yu Li, The University of Melbourne .

Yuetong Xing, The University of Melbourne.

2. The Definition of Organizational Culture

Organizational culture, as many researchers agree, is a set of shared values, beliefs and norms to guide employees' work consistent with the goal of an organization (Ravasi & Schultz, 2006; Xiaoming & Junchen, 2012). Those values refer to the degree of a firm caring about employees, customer satisfaction and even the money and profit (Kotter & Heskett, 1992). Since culture is a nebulous concept, two levels are categorized to make it clearer. The first level is the core beliefs of the founder which are used as a self-sorting mechanism of workers (Bandiera, Guiso, Prat, & Sadun, 2015). In line with van den Steen (2005), this level of culture is the firm's vision. The second level is more visible, such as images or behaviour patterns of the organization. As an informal control, organizational culture not only helps align employees' goal with management goal but also provides a powerful mechanism for controlling employee's behaviour (Ojo, 2009). By encompassing structures, rules and norms into the culture, it influences how employees attach the meaning to firm and what kind of actions should be taken to improve productivity and overall performance in the company (Schein, 1985; Saffold, 1980).

3. The Competing Values Framework

Culture is ambiguous and hard to measure. However, making the culture consistent with organization behaviours is of great importance, and three points need to be considered: the organizational culture must support the implementation of the organization's strategy; the strategy must define how the resources including human resources and financial resources will be allocated to various operating activities; when assessing the leadership competence, employees' respect for and practice of the culture must be taken into consideration (Thakor, 2015). When these three conditions are met, the culture can be truly implemented in an organization's daily operating decision making activities. To make these three conditions to be met, individuals in an organization must share the same understanding of the organizational culture, therefore, identifying the culture of the organization and communicating it to the bottom line of the organization in a clear way is important.

The competing values framework (CVF) is widely applied by companies to define and communicate culture. There may be other frameworks which can also be used to help diagnose and change the culture of an organization, but in the report, CVF is the main framework used to explain the culture in an organization.

The framework, developed from organizational behaviour literature such as Quinn and Cameron (1983), Quinn and Rohrbaugh (1983), and Cameron and Quinn (2011), provides an easy and effective way to characterize organizational culture in simple terms ration (Thakor, 2015). The framework developed

two dimensions, differing the degree of flexibility verse control and internal maintenance verse external positioning. Based on these two dimensions, as figure 1 shows, four quadrants depict different types of culture.

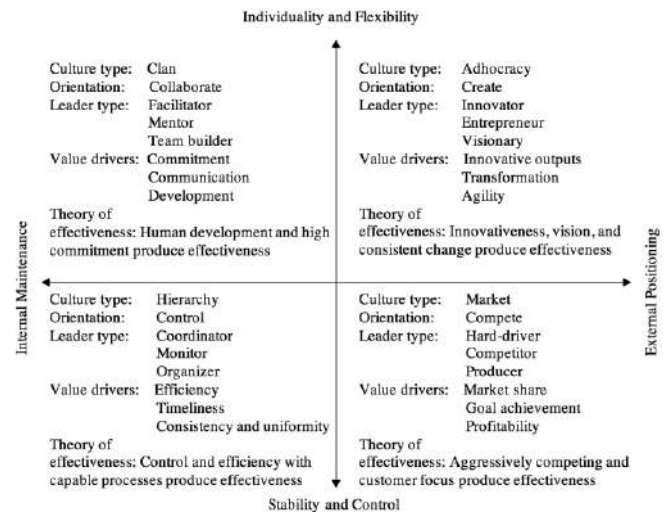


Figure 1 Cameron, Quinn, DeGraff, and Thakor (2006)

In CVF, organizational activities are categorized and put into four quadrants, including Clan (collaborate-oriented), Hierarchy (control-oriented), Adhocracy (create-oriented), and Market (compete-oriented).

To be specific, the collaboration-orientated culture, which has a high level of individuality and employee flexibility with an internal focus, puts emphasis on employee satisfaction and retention, teamwork, cross-functional groups and decentralized decision making (Thakor, 2015). The organizational effectiveness is considered as human development and a high level of commitment.

The control-oriented culture pays attention to the "process capital" inside an organization but has a high level of control among employee behaviours. The goal for the culture is making things better at lower cost and less level of risk (Thakor, 2015). Therefore, achieving high statistical prediction in cost and risk is important. The organizational effectiveness is control and capable process. To achieve that, activities such as budgeting, statistical process control, auditing and risk management should be taken (Thakor, 2015).

Compete-oriented culture focus on profit, market share and shareholder value. On the one hand, unlike control type culture which emphasizes the efficiency and outcome of an organization's process, compete culture pays more attention to external positions thus emphasising sales and revenue rather than cost and risk control. On the other hand, the individual flexibility is low, which means that the employee tightly follows the vision of senior managers. According to Cameron, Quinn, DeGraff, and Thakor (2006), the vision here might be "compete

hard, move fast, and play to win.”

The create-orientated culture focuses on external, and its flexibility of individuals is high. Since this type of culture makes innovation in an organization’s products or services extremely valuable, the freedom of thoughts and creative actions is important. Organizational effectiveness associated with strong ability to deal with discontinuity, change and risk as well as entrepreneurship, new ideas, and constant change (Thakor, 2015).

4. Case Study on Commonwealth Bank

Commonwealth Bank (CBA) is the flag carrier in the Australian banking industry, as the number one bank in Australia, the group is chosen to be the representative. Similar with the whole industry, CBA involved in series scandals over the past decade (As Figure 2).

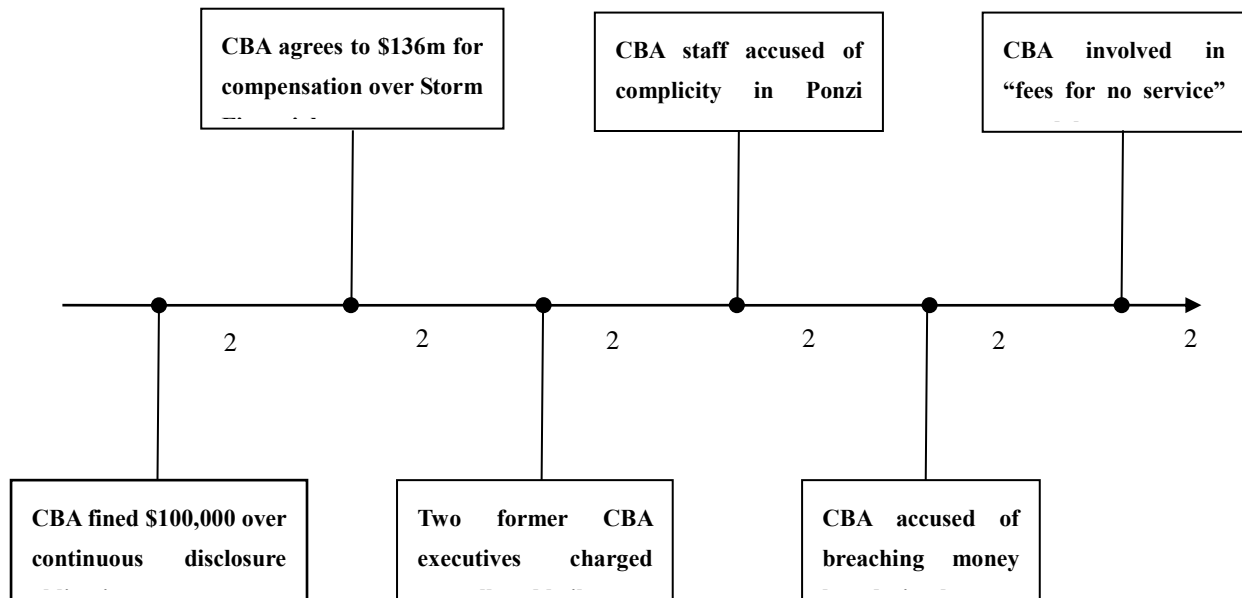


Figure. 2

As literature says, organizational culture can impact individual behaviours, it might be CBA’s culture lead to unethical behaviours. Moreover, both regulators and policymakers are attributed these to the bank culture (Snyder, 2015). Therefore, this section aims to test what the nature of CBA’s culture according to CVF framework. Then, analyze how the culture influences individuals’ ethical behaviour in the organization.

4.1 The Nature of Culture in CBA

The CVF framework which originally comes from the empirical analysis in Quinn and Rohrbaugh (1983) provides a method to measure culture. According to Fiordelisi and Ricci (2014), they used culture-specific effectiveness criteria to collect a bag of words relating four types of the culture of CVF. More precisely, they collected the synonyms describing each dimension in the first step. After that, they used those words to find other synonyms in the Harvard IV-4 Psychosocial Dictionary. Finally, they concluded a bag of words representing four types of culture respectively (As table 1). After determining words relating each dimension, they count the number of those words from the annual report to measure four dimensions of

culture. The reason why they used the annual report to collect words lie in the fact that the annual report is a more comprehensive material which can be considered as an effective tool to provide a systematic and objective measurement of words used by members of the organization. In this paper, we follow this method to measure CBA’s culture. The potential bias of using this method is the company might tend to write the annual report in order to meet the expectation of regulators. If so, different companies’ reports would look similar in terms of culture dimensions. However, Barth (2016) compared JP Morgan and Wells Fargo Company, he found the variation of these two banks. Hence, the method is valid.

Bag of words

Control

capab*, collectiv*, commitm*, competenc*, conflict*, consens*, control*, coordin*, culture*, decentr*, employ*, empower*, engag*, expectat*, facilitator*, hir*, interpers*, involv*, life*, long- term*, loyal*, mentor*, monit*, mutual*, norm*, parent*, partic*, procedur*, productiv*, retain*, reten*, skill*, social*,

ten- sion*, value*

Compete

achiev*, acqui*, aggress*, agreem*, attack*, budget*, challeng*,
 charg*, client*, compet*, customer*, deliver*, direct*, driv*,
 excellen*, expand*, fast*, goal*, growth*, hard*, invest*,
 market*, mov*, outsourc*, performanc*, position*, pressur*,
 profit*, rapid*, reputation, result*, revenue*, satisf*, scan*,
 succes*, signal*, speed*, strong, superior, target*, win*

Collaborate

boss*, burocr*, cautio*, cohes*, certain*, chief*, collab*,
 conservat*, cooperat*, detail*, document*, efficien*, error*,
 fail*, help*, human*, inform*, logic*, method*, outcom*,
 partner*, people*, predictab*, relation*, qualit*, regular*, solv*,
 share*, standard*, team*, teamwork*, train*, uniform*, work
 group*

Create

adapt*, begin*, chang*, creat*, discontin*, dream*, elabor*,
 entrepre*, envis*, experim*, fantas*, freedom*, futur*, idea*,
 init*, innovat*, intellec*, learn*, new*, origin*, pioneer*,
 predict*, radic*, risk*, start*, thought*, trend*, unafra*, ventur*,
 vision*

Table. 1

Using the above method to test CBA’ culture from 2013 to 2018, it is reasonable to draw a conclusion about the nature of culture in CBA. The result shows in figure 3. It can be seen that the graph indicates that the compete dimension dominates CBA’s culture from 2013 to 2018. In 2018, the compete dimension took up 36% while others only around 20%.

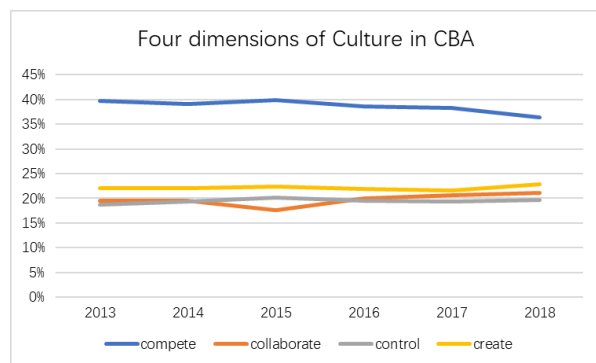


Figure. 3

To sum up, the nature of CBA’s culture is competition. According to CVF framework, compete-orientated culture is an external focus with less individual flexibility. Hence, CBA’s vision might emphasis profitability, market share and goal achievement. All of those create pressure among employees.

4.2 Culture and Behaviours

4.2.1 The Emphasis on Profitability

CBA’s emphasis on profitability, caused by compete culture, is most likely to be related to unethical behaviours of employees in both top and down levels. To be specific, there are four categories or quadrants indicated in the Competing Value Framework: Collaborate (Clan), Control (Hierarchy), Compete (Market), and Create (Adhocracy). Although companies involve a wide range of activities to improve wealth and value, the large share of these operating activities can be classified into one quadrant (Barth, 2016). It is noticeable that the compete culture, possessed by CBA, means that value-enhancing activities aim to pursue competitiveness through an aggressive and forceful way. Also, the core thinking of this culture could be summarized as “compete hard, move fast, and play to win” (Barth, 2016). Moreover, the so-called win, namely, the company’s effectiveness mainly focuses on making such preset financial outcomes as profits, market share, and shareholder value come true (Barth, 2016). Furthermore, banks are owned by shareholders and provide various financial services in order to maximize revenues from customers and generate profits (Krohn, 2017), and the focus of this culture is on delivering shareholder value (Barth, 2016). As a result, this compete culture makes banks give the highest priority to shareholders, emphasizes and judges achievement based on market share, revenues and profitability growth (Fiordelisi, Raponi, & Rau, 2015), and serves as a guide to employees’ behaviours in forms of values and beliefs (Weeks & Erasmus, 2013).

In commonwealth bank, for example, although the fixed and total target remuneration of Matt Comyn, the current CEO, is approximately 17% lower than the fixed and total target remuneration of the former CEO, the percentage of the variable remuneration in the total remuneration is also the same as before, both being 74% (CBA Annual Report, 2018). This phenomenon could reflect not only the compete corporate culture (Barth, 2016), but also the company’s and employees’ attentions to profitability (Fiordelisi, Raponi, & Rau, 2015).

In addition, executive remuneration of CBA consists of fixed remuneration, short-term variable remuneration and long-term variable remuneration. The short- and long-term variable remuneration varies remuneration up or down reflecting annual or multiyear financial performance (CBA Annual Report, 2018). Plus, the most important thing is that, in CEO’s performance measures and weightings, financial measures take up 60% of the total measures, which means that CBA puts much emphasis on financial outcomes and effectiveness. Accordingly, CEO must pay more attention to the financial targets and results in order to get more attractive bonus.

However, competition is not always good for consumers and the whole society (Williams, 2012). There exists too much focus on short-term financial outcomes, largely driven by

competition, leading to employees' willingness to be involved in unethical behaviors (Williams, 2012). Under the overemphasis on profitability and the pressure on performance targets, employees are more likely to do some unethical behaviors and misconduct.

For example, Commonwealth Bank employees manipulated Youthsaver accounts without authorization because of pressure on performance targets, and financial incentives and bonus. To be specific, after parents fill in forms to enroll in school banking, the forms are sent to banks but parents do not make deposits to activate the accounts. Tellers use their own money or the bank's loose change to activate accounts without parents' permissions. And tellers could get bonus for these so-called activated accounts. CBA has more than 1.6 million Youthsaver accounts, with approximately 120,000 new activated accounts each year. This has raised serious questions about the culture of the entire bank, because this common practice has been a serious misconduct and been described as an unethical sales practice. Equipped with competition orientation culture, employees will voluntarily compete with each other within their banks and also in other banks for struggling for better performance and financial outcomes to win more bonus. However, there would not always exist enough customers who open accounts to satisfy employees' sales targets. Therefore, influenced by the company's values and beliefs, employees would be more inclined to doing some unethical behaviours, such as this unauthorized account manipulation, to meet their targets.

4.2.2 Higher Risk Appetite

The nature of the culture in the organization may influence employees' ethical behaviour by changing their attitudes towards risk. According to Barth (2016), there is a higher level of credit risk and riskier lending practices in competition-oriented banks. In other words, organizations with a culture of competition are likely to take risks when making decisions. They may have a higher risk appetite and higher risk tolerance for fraud or unethical behaviours in the entity. Accordingly, employees within the organizations are influenced by the risk culture in the entity and may also have a higher tolerance for the unethical behaviours. As a result, it is more possible that individuals in the organization conduct unethically. In the school bank scandal in 2013, senior managers and employees underestimated the operation risk which should be detected and the reputation risk in the organization, as they had higher risk preference.

Additionally, organizational culture is a self-selection mechanism that matches workers with firms. In other words, workers would be more likely to work for the firms which share the same values or beliefs with themselves (Barth, 2016). Hence, the competition-oriented organization, by attracting competitive employees, may also have higher internal competition. The higher internal competition in the organization induces individuals to take excessive risk in order to be outstanding

among workers (Barth, 2016). Therefore, in order to perform better than others in the organization, they may make unethical behaviours for their own interests when there are conflicts between their performance and customers' interests.

4.2.3 Impact of Role Models

Management, regarded as role model, has the deepest influence on employees' values and behaviours (Falkenberg & Herremans, 1995). Recalling the school bank scandal in 2013, senior managers in CBA retail banks were complicit in the fraud (Ferguson, 2018). Senior managers rejected to punish the unethical behaviours or issue formal letters to alert the prevalent misconduct (Ferguson, 2018), showing their permission of the unethical behaviour. When employees witness senior managers' unappropriated attitude or conduct, they are more likely to be unethical. According to the study from Falkenberg and Herremans (1995), role models are the major determinant of ethical or unethical behaviours in an organization. He also argued that the visibility of managers' or supervisors' behaviour is the key to influencing employees' ethical behaviour (Falkenberg & Herremans, 1995). The influence is particularly significant in large organizations, as it is difficult for employees who are in the bottom line under the organization structure to observe CEO's behaviour (Falkenberg & Herremans, 1995). Therefore, the ethical behaviour of managers or supervisors is more important in influencing employees' behaviours.

4.3 Actions Taken to Build an Ethical Culture

According to DOMNIȘORU, OGARCĂ, and DRAGOMIR (2017), internal control can have impacts on the organizational culture, as the outcomes of management control system can transform certain elements of the organizational culture, such as the organizational regulations and the communication styles. There are the feasible actions taken by CBA to rebuild the culture in the organization.

4.3.1 Code of Conduct

Code of conduct is published on the website of CBA, as a part of cooperate governance for organizational culture, to guide individuals' decision making and behaviours in the daily operating activities so that they can do the right and proper things in every situation. The code emphasizes the importance of its customers and sets a boundary for actions so as to facilitate employees to notice and recognize what behaviours are permitted and what, namely unethical behaviours, are forbidden.

4.3.2 Non-financial Metrics

Balanced scorecard approach is applied when designing CBA's short-term and long-term incentives. Non-financial measures in relation to customers, people, and governance are emphasized in its measurement and reward system. In 2018 annual report, CBA disclosed its non-financial performance metrics from 2014 to 2018, which shows the scores of customer satisfaction, employee engagement and flexibility, as well as training hours related to code and conduct.

4.3.3 Others

In the corporate governance statement, key governance arrangements and practices relating to the governance of organizational culture, risk management, stakeholder engagement, and committee are described in details.

In terms of the governance of organizational culture, apart from the code of conduct, CBA also encourages their people and others to speak out issues or conduct that concerns them. These people are protected from retaliation or victimisation under its Whistleblower Policy.

As for risk management, policies, processes, and practices are committed to supporting a higher level of governance. A Risk Management Framework was designed to ensure both financial risks and non-financial risks are within the risk appetite of the board. It covers all systems, structures, policies, process, and people that identify, measure, evaluate, monitor, report and control groups' material risk. Three documents, including the Group's Risk Appetite Statement, the Group's Risk Management Approach, and the Group's Strategic Business Plan. In terms of managing risk culture, risk committee is responsible for reporting any matters from the perspective of risk culture that affect the operation of the group within its risk appetite.

4.3.4 The Effectiveness of Actions

Figure 3 shows a trend of decrease in the percentage of "compete" in total four types of dimensions from 2013 to 2018, which may indicate the actions taken by CBA has effectively changed the proportion of "compete" in its culture.

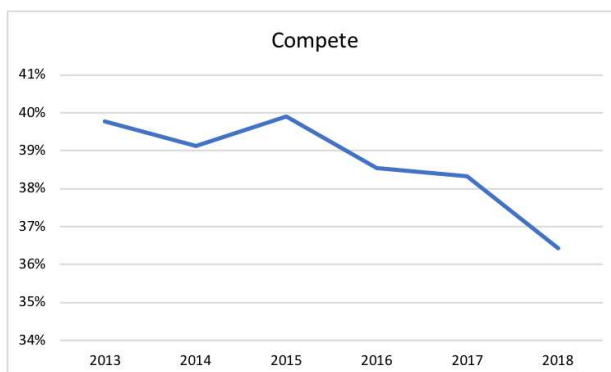


Figure. 4

5. Conclusion and Recommendations

From the analysis of the nature of commonwealth bank, the way that the culture influences individual's ethical behaviours within the organization, and actions taken by the company to build an ethical culture, it could be concluded that the dominance of compete-oriented culture among the financial service industry and managers' misconduct play an important role in resulting in unethical behaviours of individuals within organizations in the industry but the nature of culture (proportion)

in companies within the sector can be changed by effective cooperate governance.

The characteristics of overemphasizing outcomes (profits, market share, and shareholder value) with speed and higher risk preference in the compete-oriented culture are likely to be the reasons of the prevalence of unethical behaviours in the financial services sector. In addition, the article also emphasizes the importance of the influence of managers as a role model on employee behaviours. The report also shows that a wide range of actions, which have been taken by CBA, have effectively and efficiently changed the nature of the culture in the organization. The model can be referred by other groups in the industry which face some problems in controlling individuals' unethical behaviours.

Further recommendations are given according to the conclusion of this paper and analysis on other banks.

First, according to Ferrell and Weaver (1978), individuals may believe some unethical behaviours can be accepted due to lack of punishment. Therefore, an internal punishment system could be developed to prevent unethical behaviours. Employees who are involved in fraud or other misconducts should be punished. For example, the organization can terminate the contract with the person, cut or call back his or her bonus, or make an announcement among the whole organization to report and condemn the unethical behavior conducted by the person.

Second, a more comprehensive risk management system should be established and implemented. Some additional measures could be taken to help CBA improve its risk management. More precisely, the three lines activity-based defence could be created. The first line of defence refers to clarify the responsibility of risk management. Not only do senior managers have accountability for controlling risk, but all employees are also responsible for identifying and managing risk within their working scope. The second line in terms of policy and guidelines, as CBA has done in its corporate governance. The third line is the internal audit, improving the independence of CBA's internal audit team will also help to mitigate risk.

In addition, some other recommendations could also be helpful. For instance, a pledge for people who provide financial services can be developed to strengthen financial services providers' awareness of ethics, thus guiding their ethical behaviours. Moreover, an ethics committee can be established to assist the board of directors to design and implement the code of conduct, monitor the implementation of the code, and detect unethical behaviours in financial service entities.

6. Limitation

The method applied to explore the nature of the organizational culture may have biases. First, words used to define a certain type of culture may be inappropriate and cannot

fully represent the nature of the culture. Second, annual reports might be written to meet the expectations of investors so the result can be manipulated by the organization that prepares the formal document.

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How Chinese Traditional Ideologies Limit the Growth of Chinese Small and Medium-Sized Family Businesses Based on the Greiner's Growth Phase Model

Jiawei Lu^a & Youshi He^b

(a. Silicon Lake College, Suzhou, Jiangsu 215332, P.R. China; b. Jiangsu University, Zhenjiang, Jiangsu 212013, P.R. China)

Abstract: Nowadays many small and medium-sized families owned businesses in China are in prosperity. To continue growth their businesses, most of these family owned firms are trying to diversify their business portfolio or upgrading their existing business lines. However, many of them are suffering from different setbacks. Some of these firms have no idea regarding how to expand their business under their new strategy. Some are even on the verge of bankruptcy. This is the result of their unsuccessful attempts in the transitions process of upgrading or diversifying their business lines. This article uses the Greiner's Growth Phases Model to analysis and explain how Chinese traditional ideologies makes these Chinese small and medium-sized family owned firms struggling to find their new places in market.

Key words: the Greiner's Growth Phases Model, Chinese traditional ideologies, small and medium-sized family business, growth dilemma

Introduction

Nowadays, small and medium-sized Chinese family businesses take up 90% of the whole markets provide that small and medium-sized Chinese family firms have become the mainstay to support the local economy. With the reform and opening-up policy, economic globalization, marketing environment for Chinese business also changed a lot. Those small and medium-sized Chinese family firms have to compete with foreign companies rather than local companies. However, after exploring and expanding, many companies are in trouble that they have no idea about how to develop their markets and how to manage their growing companies. In China, around 70% of family businesses will be died from the first generation to the second generation. About 10% of family business will disappear from the second generation to the third generation. Around 2% of family businesses will disappear from the third generation to the fourth generation (The Family Business Model). For instance, Zhejiang province approached the study of small and micro businesses in 2017. In 2017, the sum of small and micro enterprises in Zhejiang province is 1683000. With help of the provincial government, about 88600 companies have been reorganized and up-graded from 2015 to 2017. 963 companies choose NEEQ (National Equities Exchange and Quotations). The number of listed companies increased by 194. By the end of 2017, the total number of listed enterprises in Zhejiang province is 415 (138 enterprises

in small and medium-sized enterprise board; 80 enterprises in innovation board) (the study of small and micro businesses in 2017).

Compared with other countries' family corporations, Chinese family corporations are far behind. Many people believe that Chinese family businesses' management ideas lead to these shortages: lower technologies, smaller scales and shorter histories. But they did not analyze what kinds of ideas limited their development at different phases.

This study based on the Growth Phases Model of Larry E. Greiner to analyze how Chinese traditional ideologies effect and limit the development of Chinese' family corporations at different growth phases.

1. The Greiner's Growth Phases Model

The Greiner's Growth Phases Model was proposed by Larry E. Greiner in 1972. The growth phase model of Larry E. Greiner suggests that organizations go through 5 stages of growth and need appropriate strategies and structures to cope. These five stages are: creativity, direction, delegation, coordination and monitoring, collaboration.

Phase 1 is growth trough creativity. Getting a handle on core technology of products or services can help a company to be run independently without assistance from other people or companies. In this phase, business structure is the simplest. So founders pay more attention to their products or services rather than management and internal environment of their start-ups.

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Author: Jiawei Lu, Teaching Assistant, School of Business, Silicon Lake College.
Youshi He, Professor, School of Management, Jiangsu University.

When companies enter into phase 2 (growth through direction), the sustainable growth path, functional organization structure, accounting, capital management, incentives, budgets, standardized processes also happened. Companies will become more diversified and complicated.

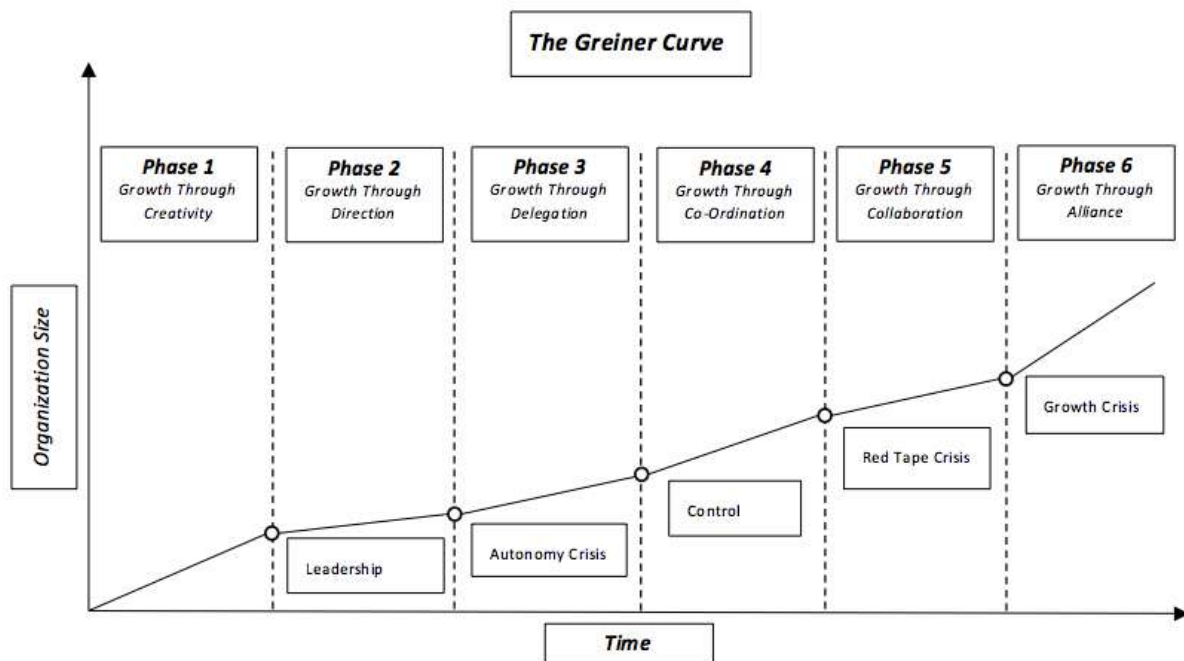
The third phase is delegation. In this phase, decentralized organizational structure, operational and market level response, profit centers, financial incentives, decision making are based on periodic reviews, top management acts by exception, formal communication.

Phase 4 is growing through coordination and monitoring. Organizations have been built up the logistics standardization system, including formation of product groups, thorough review of formal planning, centralization of support functions,

corporate staff oversees coordination, corporate capital expenditures, accountability for ROI at product group level, motivation through lower-level profit sharing. At this time, with the development of organization, red tape crisis happened.

Phase 5 is growth through collaboration. At this stage that companies begin to focus on teamwork. Its general features are new evolutionary path, team action for problem solving, cross-functional task teams, decentralized support staff, matrix organization, simplified control mechanisms, team behavior education programs, advanced information systems, team incentives. (Larry E. Greiner)

The "Greiner Curve" showed "The Greiner's Growth Phases Model" clearly.



From above analysis, we can see that in phase 1, founders who grasp the core technology of products have authority in a start-up. In this phase, founders and the leaders only need to focus on whether their products and services can meet customers' need, demand and requirements. In this phase, professional knowledge and skills are cores of companies. Management, organization structures are minor roles. In Phase 1, leaders' dictatorial manner will be helpful for start-ups to make choices effectively. Founders and leaders' authoritarian personalities dominate the development of companies.

In Phase 2, managers begin to pay attention to the efficiency of operation. Acquiring professional business knowledge is essential for all staffs and leaders. Only learning how to produce products and provide service is not enough for

leaders. They also need to understand the companies' internal environment and how to make operations more effectively and efficiently. Entrepreneurs begin to place emphasis on market strategies and business development rather than production. Comparing with the leadership in Phase 1, leaders will be more dictatorial.

After Phase 2, companies have relatively well-integrated organization structures. But because staffs are controlled by a kind of simplex management models for a very long time, companies will enter into another period of stagnation. If companies try to transit to the Phase 3, companies have to deal with two obvious challenges. The first challenge is that the simplified management models do not apply to the fast-growing productivity and scale of production. The second

challenge is that changed internal environment requires more flexible management models. Expanding markets is the main task for Phase 3. Facing to the growth of organization capacity and increasing number of staffs, leaders have to think about more people's ideas. Individual arbitrariness is not applied. It is crucial to get suggestions from different departments and different staffs.

During the process of development, companies have to utilize different ways to address various issues that happened in different stages. When organizations are operated by mechanical ways for a long term, experienced managers who have quite different management styles can inject into new vitality and make changes for companies. In Phase 3, organizations are going to seek the path that how to transfer centralized management to decentralized management. After finishing the phase 3, companies will have ability to expand other markets or find their roles in markets.

The core value of a business should be creating values for the society. But, for Chinese family corporations, the real reason and aim is still to support a family rather than create values for the society. Nowadays, these companies can keep stable in current markets, but the prospect is not much positive. Because that most Chinese family businesses engage in labor intensive industry and get benefits from demographic divided (textiles in Fujian province, shoes in Zhejiang province, etc.) With the development of technology and the rise in labor cost, their competitiveness will be declined undoubtedly. So if they want to continue to exist in markets in the future, it is necessary to take place materially change in their companies.

"A rich family cannot maintain rich for more than three generations." is a law for most Chinese family firms. Comparing with developed countries' family corporations, Chinese people and even foreign citizens of Chinese origin do not have the same number of long-time family corporations as many as developed countries' family corporations. Some family corporations survived, but they did not develop to a substantial scale, go public or expand their markets overseas. In the Growth Phases Model of Larry E. Greiner, many Chinese family corporations are hard to complete the Phase 2 (growth through direction) and transit to Phase 3 (growth through delegation). Their distinctive organizational structures, family members' ideas, blood ties are all have major impacts on management. Internal environment of companies decide their development trend. Among all management ideas of internal environments, Chinese traditional ideologies that Chinese entrepreneurs learned with grow up play the most important role when they manage their businesses. When we recognize the positive effects of Chinese ideologies, negative efforts should not be ignored. These Chinese traditional ideologies limit the development of small and medium-sized family corporations at some time.

2. Chinese traditional ideologies in small and medium-sized family companies

At present, most of Chinese small and medium-sized family companies are still controlled by their founders. Comparing with young managers, those founders are influenced by traditional ideologies more deeply. Three most obvious Chinese traditional ideologies are: the high centralization of administration authority and propriety right, management is regarded as rule, fear of reformation.

2.1 The high centralization of administration authority and propriety right

Centralized Political System enjoyed a long history in China. It was started in Qin dynasty and last more than 2000 years in order to consolidate power for the ruling class. Within 2000 years, this management idea had got into almost all Asian's managers minds and influence them deeply. Leaders want to own the absolute control over their companies. Thus, one of the most important features for family companies is that both the administration authority and propriety right are belonged to leaders. At present, in most Chinese small and medium-sized companies, founders also have all powers and duties of owners, managers, producers and sellers. In the Phase 1 (growth through creativity), all powers centralized to one people are good for running a start-up. So when founders and managers have the ownership of a company, they do not want to put administration authority into other people's hands.

2.2 Management is regarded as rule

A great amount of founders of small and medium-sized family companies in China do not accept much higher educations and lack of professional knowledge. Companies are seemed as entrepreneurs' own kingdoms and they fight for their companies. When founders and managers have both administration authority and propriety rights, these first generation entrepreneurs rank them as ruling class in business automatically and staffs are regarded as ruled class. Patriarchal leadership and ruling thoughts become the first choice for them. In this kind of enterprise environment, standards used to judge a staff are whether staffs can submit to their managers without any doubts. Anyone who does not willing to complete leaders' orders or raise an objection to their leaders will be rejected and dismissed for whatever reasons.

2.3 Fear of reformation.

The original intention for Chinese small and medium-sized family corporations usually is to support a family and change the destiny of a family rather than create values for the society or realize a lofty idea. At the beginning of start up, founders have to face to a lot of pressure and accident. So when founders achieve a reasonable result, keeping stable become the first priority. They are afraid of losing current benefits and powers. Comparing with conservation, reformation equals to unavoidable risks. Many

small and medium-sized companies are not able to afford very serious effects. Also, Chinese culture belongs to strong culture. Comparing with weak culture (developed countries), strong culture more resistant to take reform.

3. Chinese traditional ideologies limit the development of small and medium-sized family firms

These Chinese traditional ideologies mentioned above are three most obvious negative traditional ideologies that happened in Chinese small and medium-sized companies. Based on the Greiner Growth Model, many conflicts between the Greiner Growth Model and these three kinds of Chinese traditional ideologies can be found. Thus these traditional ideologies influence the development process of family corporations in China.

3.1 The limitation comes from high centralization of administration authority and propriety right

In small and medium-sized family corporations, both propriety right and administration authority centralized to a single family. In Phase 1 (growth through creativity), high centralization of propriety right and administration authority is able to create flat management organization structure. Flat organization structure is good for passing messages internally and managing more effectively for start-ups in early stages. But once companies enter into the Phase 3 and Phase 4, the internal structure becomes diversified. The scope of management is enlarged, the organizational hierarchy is identified and specialized management knowledge and management skills are in need. For many developed countries' firms, organizations usually employ consultants or professional managers to provide suggestions and assistance when they decide to take significant changes between Phase 2 and Phase 3. Consultants and professional managers come from other companies. They have pure objective views that internal staffs are lack of. But given different modes of association in families, egoism, the traditional idea that "transferring the leadership from fathers to sons" and many other particularity of Chinese family corporations, Chinese firms are not willing to transfer their administrative authority to consultants or professional managers. According to *2016 index for healthy Chinese family business* that even though the family businesses employ professional managers, only around 27.93% of founders are willing to make important strategic decisions with professional managers together (2016 index for healthy Chinese family business). If internal environment of a company has been changed, but administrative authority is changeless, this kind of lockstep management method makes their companies hard to be kept.

3.2 The limitation comes from the management is regarded as rule

When managers regard the management as rule, the internal environment is hard to apply to Phase 3 (growth through delegation) and Phase 4 (growth through co-ordination). In Phase 3 (growth through delegation) and Phase 4 (growth through co-ordination), leaders should to begin to collect ideas from different people and give up dictatorship. If the idea that "the management equals to rule" penetrates into managers' management philosophy, Leaders (the people who think they are the ruling class) will not accept staffs' (the people who are considered as ruled class) suggestions and do some change according to their suggestions. Also, in this enterprise environment, staffs' personal willingness cannot to be meet, self-consciousness and creativity will be limited. The restrainer of internal environment will make companies cannot change its quality in developmental scale. Thus companies cannot transit from the Phase 2 to the Phase 3 and Phase 4 automatically.

3.3 The limitation comes from fear of reformation

Because of historical reasons, a great amount of small and medium-sized family business entrepreneurs are lack of higher education and believe the traditional ideology "fifty know destiny". Some people want to do some change, but have no way to start. But more people are scared in to be defeated. So they choose to keep stable without many challenges. But entrepreneurship and new venture formation is essential for all companies throughout their development processes. Although functional organization structure, accounting, capital management, incentives, budgets, standardized processes are completed, these parts are still need to be reformed deeply if companies want to enter into Phase 3. Corporations need new power. Standing still and refusing to make progress are the greatest enemies for small and medium family enterprises. Many developed countries' non-family business choose to employ consultants and professional managers to carry out the reform. Those consultants and professional managers do not need to respond to adverse effects and adverse consequences (for instance, the destiny and interests of the whole family) if they failed. So they are more motivated to initiate change. But for founders or managers who manage their own family corporations, they have to be more deliberate and cautious. Because they will pay high price if they did wrong decision or reform scheme. For instance, the whole families may loss major income source and will be in debt.

4. Conclusion

Above all, the high centralization of administration authority and propriety right; the management is regarded as rule; fear of reformation are three most obvious Chinese traditional ideologies that effect and limited the growth of Chinese small and medium-sized family corporations and make them stay in Phase 1 and Phase 2 of the Greiner Growth Model for a long term. Chinese small and medium-sized family

corporations must do drastic reforms from the management aspect. The key point is to change founders and managers' traditional ideologies. It is an arduous and permanent process. It is also a conflict between weak culture and strong culture. China enjoys a long history and traditional management philosophy has been interiorized. As time goes on, this traditional management culture has become the obstacle of reformation. Managers have to realize that over time, if a certain culture becomes a handicap, a manager might be able to do little to change it, especially in the short run (Stephen P. Robbins). Nowadays, family firms try to take the transformation competitively, and inheritance of administration authority happened in many companies. During this period (between the Phase 2 and Phase 3), more and more young people who accept formal and higher education become new managers. These new managers are more ambitious, forward-looking and also more willing to accept new management model and management idea. This is a good chance for the reformation of family corporations, especially for the change of management ideas. If Chinese small and medium-sized family corporations want to survive, be able to expand their scale in both domestic and abroad markets, it is necessary for managers, no matter the original founders, the first generation managers or new managers, to change their management ideas and break away from traditional ideologies mentioned above. And also, leaders should realize that supporting a family is not the only one objective. When leaders consolidate the benefits of families, they also have to focus on the needs of society and the goal of companies' development. Creating values for society and making companies in need can

make companies last always.

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Application of Text Mining in Teachers' Quick Feedback

Feng Han

(Normal College of Beijing Union University, Beijing 100011, P.R. China)

Abstract: For many courses, papers are usually submitted in the form of homework. When classes and numbers are large, it is difficult to correct homework. Sometimes, it is time-consuming and laborious, and it often fails to give timely feedback. Modern statistical analysis tools undoubtedly provide us with effective methods and tools to overcome this dilemma. Text mining is a new research field in recent years. At present, there are few studies on the role of text mining in curriculum performance evaluation. In this paper, we apply text clustering and high-frequency word extraction methods to the feedback of course assignments with R software package Chinese. misc, and give the corresponding implementation algorithm.

Key words: text clustering, high-Frequency word extraction, text mining, fast feedback, Chinese. misc packet

Introduction

Contemporary era is the era of data explosion. All walks of life have accumulated a large amount of data. In the process of teaching, teachers have also accumulated a large amount of data. Teachers usually request students to submit papers or reading notes when correcting homework and examination papers, especially for checking class. There may be a large number of students. The evaluation results of the examination may not be in the form of scores, but in the form of a grade, such as excellent, good, qualified and so on. Or in teaching practice, teachers often summarize the papers submitted by students and ask students to report in groups. The traditional way of correcting homework is no longer suitable for the evaluation of checking class homework. It is very likely that because the order of evaluation is different, so the evaluation results are biased. Therefore, scientific and efficient methods are urgently needed to solve the problem. With the development of modern statistics, especially text mining, undoubtedly brings us a sharp weapon. The application of text mining in the evaluation of teachers' teaching checking class homework is not enough, which is also an innovation of this paper. And this paper combines with the reality, with the help of the software package of R program, combines and rewrites the program, and develops a program suitable for the evaluation of checking class homework.

The rise of text mining dates back to the late 1950s when H.P. Luhn proposed text classification based on word frequency statistics. Then Maron ^[1] published his first paper on automatic text categorization. Since then, many scholars have begun to study the field of text mining, which has been fruitful, and the

field of text mining is constantly expanding. At present, the main research fields of text mining are: Text structure analysis, text summary, text classification, text clustering, Text association analysis, distribution analysis and trend prediction ^[2].

In text mining, text clustering has a wide range of applications. Its principle is based on a clustering self-learning algorithm without supervision, which has a certain degree of flexibility and high automation processing ability. Text clustering can classify unlabeled documents into several categories according to the similarity of content. Document content categorized into the same category has a high degree of similarity, and different types of documents have great differences. Text clustering is an important branch of data mining. It can automatically classify different texts by using machine learning and other technologies. ^[3] Based on the idea and method of text clustering, this paper applies it to the evaluation of reading notes for checking class homework. It classifies 100 homework texts by text clustering, and then extracts samples from the same class for evaluation.

There are many methods of text clustering. Generally, the commonly used methods can be divided into three categories according to the clustering method based on partition: K-means-based clustering algorithm. Hierarchical clustering algorithm as well as a density-based clustering algorithm. The density-based clustering algorithm is still seldom used in text clustering so far. The main reason is that the computational complexity of the density element is large and its density judgment depends on the similarity between texts, but the similarity between texts is unstable. Even to the same cluster of texts, sometimes the similarity between texts is higher, and sometimes the similarity between texts is lower ^[4]. The other two

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Author: Feng Han (1980-), Female, Ph.D., lecturer, Normal College of Beijing Union University, research direction: causal inference. Email: hanfeng1661@163.com.

kinds of clustering algorithms are: Based on the partition method and the hierarchy-based method, the scholars Steinbach and others have studied the applicability of the two methods in text clustering, and concluded that: K-Means clustering algorithm is not only good for clustering results, but also suitable for clustering occasions with a large amount of data [5-6]. Therefore, in this paper, the K-Means algorithm is used for text clustering. Text clustering is different from another numerical data clustering. Before text clustering, Chinese text segmentation is an important process must be carried out. In Chinese text segmentation, the judgment of word character and semantics can be realized. In feature extraction, word frequency is adopted. The first step of text mining is word segmentation, which will directly affect the effect of text mining. R language has good support in word segmentation, and Chinese word segmentation package "jiebaR" [4] is better used. JiebaR is an efficient Chinese word segmentation package in R language, which uses C++ at the bottom and invokes efficiently through Rcpp. JiebaR is based on MIT protocol, which is free and open source. Thanks to the support of Chinese authors, R can handle Chinese text conveniently. But when dealing with folder text data, it is better to read folder data directly and participate it. The Chinese. misc package of R software solves this problem well. It can read folders and invoke jiebaR to participate folder data in batches. This paper applies this package to batch word segmentation and processing files in folders.

After clustering the folder text data, this paper will be further evaluated in the same category. One or more articles of the same kind are randomly selected to extract text abstracts and key words, examine the content of the articles, and give the evaluation results. Text summary and keyword extraction are mainly realized by using the TM package of R software, and word cloud is displayed by using the wordcloud package.

The following is an illustration of a stage examination of probability and statistics course. The form of the examination is to submit papers, which are sent to the teacher's designated mailbox. There are hundreds of students. We focus on clustering among different articles and extracting keywords and abstracts from the same category of articles. Chinese. misc, jiebaR, TM and so on are used as R software packages.

1. Implementation Steps of Text Clustering

Text clustering is the process of automatically categorizing document sets. The classification of text clustering is not predefined, but obtained by machine self-learning related data. Text clustering is generally divided into three steps. The following is a detailed description of each step in text clustering:

1.1 Text Representation Model

This is the first step of text clustering. The text is represented as a sample matrix which can be recognized by computer through feature extraction and dimensionality

reduction of original document set and corresponding text representation model.

Boolean model, space vector model and probability model are common text representation models, especially the vector space model (VSM, Vector space model) [7] proposed by Salton et al. in the early 1970s. It is the most commonly used text representation model and has been successfully applied in the famous SMART text retrieval system.

The principle of VSM is relatively simple, that is, the words and word frequencies after word segmentation are expressed as points in vector space, thus the processing of text content is simplified to vector operations in vector space. And it is intuitive and easy to understand. When a document is represented as a vector in the document space, it can measure the similarity between documents by calculating the similarity between vectors, and express the semantic similarity by spatial similarity. Cosine distance is the most commonly used measure of similarity in text processing.

The text representation of the space vector model (VSM) is as follows:

In statistical vector space model, a document is usually represented as a vector consisting of keywords extracted from the document and their weights, where the weights represent the importance of keywords in the document and in the whole document set.

The weight of a keyword in a document vector can be determined in many ways. A common method is to use. The weight of a keyword in this method depends on two factors: The frequency of keywords in documents and their occurrence in the entire document set. To be precise, the weight of keywords in documents is:

$$\omega_{ij} = tf_{ij} \times idf_j = tf_{ij} \times \log N / df_j$$

Among them, the total number of documents in the document set represents the inverted document frequency. This method gives keywords with high frequency and assigns high weights in a small set of documents. N / df_j

1.2 Selection of Clustering Algorithms

This is the second step of text clustering. The clustering algorithm is used to extract the knowledge pattern of text matrix, select the appropriate clustering algorithm and apply it.

Among many clustering methods, K-Means based on a partition is the most commonly used method. This paper adopts this method. K-Means is a classical partition-based clustering algorithm. It can process large text sets efficiently and effectively, and achieve local optimization. It is a typical greedy algorithm.

2.K-Means Algorithm

2.1 Principle of K-Means Clustering Algorithms

The basic idea of the K-Means algorithm is to determine the number of clusters K in advance, find K centers of mass

randomly, calculate the Euclidean distance between each point and the center of mass, find the center of mass nearest to each point, assign it to the nearest cluster, then recalculate the average value of each cluster, and repeat the process until the standard measure function begins to converge. The standard measure function usually adopts the square error criterion.

2.2 Implementation Steps of K-Means Clustering Algorithm

- (1) Creation of k points as the initial center of mass randomly;
- (2) Calculate the distance between the center of mass and the data point for each data point in the data set;
- (3) Find the nearest center of mass for each point and assign it to the cluster corresponding to the center of mass.
- (4) After distribution, the center of mass will change, and the new center of mass and the mean value will be calculated.
- (5) Repeat (2) and (3), (4) until the maximum number of iterations or the difference between the newly calculated mean and the last iteration is less than a given threshold.

The goal of text clustering is to divide the document set into several categories, and make the similarity of document content in the same category as high as possible, while the similarity of document content among different categories as low as possible. We use the K-means clustering algorithm and Euclidean distance to measure the similarity between texts, as follows.

3. Similarity Calculation

The common methods of similarity calculation are: Euclidean distance method, cosine similarity based on space vector, inner product method, Dice coefficient method, etc. [8]. This paper adopts the default Euclidean distance method of the K-Means algorithm.

Euclidean distance method:

The Euclidean distance method is used to calculate the similarity between two texts. The Euclidean distance between two texts is used to measure the similarity between two texts. The formula is as follows:

$$dis(d_i, d_j) = \sqrt{\sum_{k=1}^n (w_{ki} - w_{kj})^2}$$

In the formula, the weight of the first feature item of the text is expressed as the number of feature items of the text. The bigger the value above, the more similar the two texts are, or the greater the difference is. $w_{ki}, w_{kj}, d_i, d_j, k, n$

4. Source and access to data

The source of the data is the daily reading notes on probability theory and mathematical statistics. At present, the students have finished the first four chapters of the book. This assignment is to sort out and study the typical definitions,

theorems of the first four chapters and their application in practice, and give corresponding examples. The total number of students is 100 in three classes. We want to quickly understand the situation of students' papers and the main topics. At the same time, we randomly select five students to report.

Batch acquisition of papers:

Take 163 mailbox as an example, click on the mailbox attachment in the list on the left side of the mailbox, then click on the screen above, select the text in the document, and click download to download it in batches to the formulated folder, marked as "D:/txt".

5. Implementation and Development of Paper Evaluation Procedure

5.1 Batch Word Segmentation and Preprocessing of Files in Folders

```
install.packages('chinese.misc')
library(chinese.misc)
library(tm)
library(jiebaR)
all_file <- dir_or_file("D:/txt")
# Read all documents under the folder
all_text=unlist(lapply(all_file, scan))
# Read in the file and change it to vector uuuuuuuuuuu
y=seg_file(all_text, from='v', folder='D:/txt/txt2')
Text + participle + write out and create new folders in #
environment
```

5.2 Clustering among Papers

```
library(tm)
corpus <- Corpus(VectorSource(y))
hlzj.dtm<-(corpus,control=list(wordLengths=c(1,Inf)))
hlzj.matrix <- as.matrix(hlzj.dtm)
k <- 5
KmeansRes <- kmeans(hlzj.matrix, k) # K is the number
of clusters
hlzj.kmeansRes <- list(content=y,type=kmeansRes$cluster)
write.csv(hlzj.kmeansRes,"D:/txt/hlzj_kmeansRes.csv")
```

We intercept the clustering results of text, as shown in Figure 1 below:

id	content	type
1	概率统计在彩票	4
2	课程名称 概率论与	1
3	概率论发展史 高文	2
4	如何学好 随机事件	4
5	概率论与数理统计	4
6	切比雪夫不等式 林	4
7	概率论论文 随机环	4
8	数学期望及其应用	3
9	概率论与数理统计	4

Figure 1. Text Clustering Results

The ID is the unique identification of each paper, and the value is determined according to the download time sequence, which corresponds to the academic number of each paper. Content is the result of segmentation of each paper. Type is the final classification of each paper. For example, papers with ID number of 1,4,5,6,7,9 are classified into the same category, i.e. the fourth category.

6. Get high-frequency words in Articles

The same kind of articles are randomly selected to obtain high-frequency words. Learn about the topic and content of the article, and give quick feedback.

```
library(chinese.misc)
f<-read.csv("D:/hh/2.txt",head=TRUE)
dtm=corp_or_dtm(f,type="d",stop_word="jiebar",control="
auto2")
df=sort_tf(dtm, top=10, todf=TRUE)
According to the frequency of keywords appearing in the
articles, the top 10 keywords are selected here.
write.csv(df,"D:/hh/hljz_kmeansRes.csv")
library(wordcloud)
mydata<-read.csv("D:/hh/hljz_kmeansRes.csv",head=TRU
E)
mycolors <- brewer.pal(8,"Dark2")
wordcloud(mydata$word,mydata$freq,colors=mycolors)
# Visualize keywords using Wordcloud software package.
```

The larger the keywords in the figure, the higher the frequency of occurrence. We examined articles with ID number 1, which are classified into category 4. The results of high frequency word acquisition are as follows.



Figure 2. Article 1 Top 10 High Frequency Words

It can be seen that this article 1 studies the application of probability theory, mainly the application of expectation in the study of public stock.

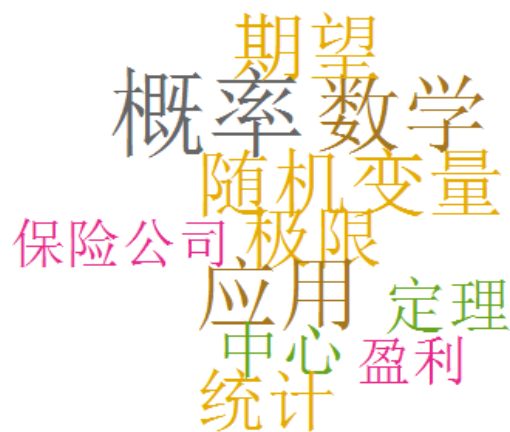


Figure 3. Article 4 Top 10 High Frequency Words

Let's take a look at this article of ID number 4, which is also classified as category 4. This paper studies the application of the central limit theorem, and an example is the practical application of the insurance company. The coverage of this paper is relatively small, only involving the central limit theorem, but the steps are relatively complete.

The article with ID number 2 is divided into the first category. The results of high frequency word acquisition are as follows.



Figure 4. Article 2 Top 10 High Frequency Words

This article is divided into different categories with Articles 1 and 4. If it is correctly classified, the keywords of this article should be different from those of the other two articles. From the results of high-frequency word mining, we can see that this article mainly starts from the actual situation, introduces the lottery winning mechanism, and calculates the winning probability by using the knowledge of probability theory and

mathematical statistics. If we want to extract 5 people from 100 people, we only need to extract one article from each category. The feedback efficiency is greatly improved. And if it involves the assessment of checking class homework, the same kind of articles can be considered as the same grade.

7. Conclusion

We apply text clustering method and high frequency words extraction method in text mining, and combine with R software package, give a mass of homework teachers timely feedback and timely understanding of students' situation methods and implementation procedures, which undoubtedly provides a reference method for teachers to evaluate homework and quickly understand students' situation, helps to modernize teaching, and contributes to timely teaching feedback. The method given in this paper is more suitable for the evaluation of pure text papers such as reading notes, and for the evaluation of checking class assignments in Humanities and social sciences. There are still some areas to be improved. The sample we apply is the document in the form of pure text. If the original papers in mathematics are original, there may be a lot of derivation of formulas, not in the form of pure text, evaluation is still to be discussed. In the following research, we will give the

identification method of massive formula papers.

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On the Cultivation Mode of Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge” : Taking Jilin International Studies University (JISU) as an Example

Xiangli Zheng

(Jilin International Studies University, Changchun, Jilin 130117, P.R China)

Abstract: Taking the Cultivation Mode of Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge” in Jilin Province as the research object, this paper analyzes the necessity of cultivating English majors to be compound talents, the main problems in the cultivation process and their causes, and provides an effective reference for exploring the talent cultivation mode of English majors in higher educational institutions in the new context.

Key words: English major, compound talent, cultivation strategy

Introduction

Over the years, a large number of outstanding talents for China's economic construction and foreign exchanges have been cultivated through English major education in higher educational institutions. With the changes in situations at home and abroad, the demand for foreign language talents in China is characterized by multiple levels, multiple industries and multiple fields. Faced with diversified demands, foreign language teaching and learning is supposed to “change with the demands” with a “multiple view” on talent training in order to cultivate high-quality talents with different characteristics and expertise for the future development of China. In this context, it is a common challenge, as well as a question in urgent need of discussion, exchanges and sharing, for all English-teaching managers and teachers to innovate teaching modes to cultivate competitive talents needed in different industries. The cultivation of high-quality, compound and application-oriented foreign language talents has become an issue that must be researched and discussed.

1. The Necessity of Cultivating Compound Foreign Language Talents

It is clearly stipulated in the *English Teaching Syllabus for English Majors in Higher Educational Institutions* that “The aim of English major education in higher educational institutions is to cultivate compound English talents with a solid English language foundation and extensive cultural knowledge, and the ability to use English proficiently as translators, teachers, managers, researchers etc. In foreign affairs, educational, economic, trade, cultural,

scientific and technological, and military sections etc.” Moreover, the Syllabus also puts forward specific requirements for compound English talents, including solid fundamental language skills, extensive range of knowledge, certain relevant professional knowledge, strong ability and high quality. The cultivation of innovative and compound foreign language professionals is a requirement for foreign language major education in the market economy, and also for the quality of talent cultivation in China in the 21st-century economic globalization.

2. Main Problems in Cultivating Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge” and Cause Analysis

2.1 Lack of Scientific Overall Planning and Reasonable Positioning in the Development of Foreign Language Majors in Higher Educational Institutions

Since mid-1990s, higher education in China has entered a new phase of fast development and accelerated reform. Especially with the enlarged scale of enrollment in recent years, higher education has been transformed from elite education to mass education. Correspondingly, with its systematic reform going smoothly, higher education has been playing an increasingly important role in promoting the economic development, social progress and scientific and technological innovation of China, as higher educational institutions chose to face and actively serve regional economy and culture, and enhance the awareness to serve the society and the market. However, the force of inertia formed in the long-term planned economy system has left behind many problems in higher educational institutions in school-running

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Author: Ms. Xiangli Zheng is an associate professor in Jilin International Studies University, Changchun, China.

concept, way of thinking, system structure and way of management, etc., resulting in the insufficient school-running strength and comprehensive competitiveness, unclear characteristics of school-running and lack of identity of the institutions.

2.2 Lack of Mechanism and Channels for Compound Talent Cultivation Resulted from the Single Mode of Foreign Language Talent Cultivation

English major education in higher educational institutions aims to cultivate compound and application-oriented English talents with a solid English language foundation and extensive cultural knowledge on the one hand, and the ability to work with English as translators, teachers, managers, marketing staff or researchers in areas including foreign affairs, education, economy and trade, culture, science and technology, military affairs, etc. on the other.

The application-oriented talent cultivation has seen drawbacks of inexperience of students and indistinctive features of the major. After the enlarged university enrollment, in particular, a series of contradictions have emerged such as lower quality of students, unreasonable discipline setting and faculty team building, insufficient school facilities, outdated textbooks and book collection in the library, etc., causing problems of incompatibility between talent cultivation mode and social development, between curricula and teaching content, between students' knowledge structure and their capability and quality, and between teaching methods, teaching management and school facilities, etc.

2.3 Featured Compound Foreign Language Curricula Have Not Established Yet

Curriculum is the core of talent cultivation mode. The scientific setting of curriculum directly affects the result of talent cultivation, which concerns not only course names, class hours and credits, but also talent cultivation view, market positioning, major construction and educational ideology, etc. In recent years, the most influential and lasting topic in the construction and reform of the English major in China have been cultivation objectives and corresponding curricula. In a word, what need to be cultivated in English major education are not only students' language skills, but, more importantly, their research and innovative abilities. Thus, it is an urgent task for English major in higher educational institutions to establish scientific, reasonable and featured curricula.

2.4 Weakness in or Lack of Professional Faculty in the Major

To cultivate talents with compound knowledge, teachers in the major are supposed to be equipped with English language and professional knowledge quality, which includes knowledge background and social practice experience. Rich working experience and practical professional knowledge are the basic quality for professional teachers. However, most teachers in English major are graduates of English language majors, indicating that they have strong ability of teaching fundamental

English but do not have a deep understanding of professional knowledge in the fields beyond English. Therefore, they would find it difficult to teach compound courses in English major. In view of the status quo, the aim of faculty team construction should be steadily optimizing the structure of faculty teams, endeavoring to improve the academic and teaching level of teachers and enhancing their teaching, research and practical abilities, eventually forming a promising faculty team with updated educational concept and strong consciousness of educational reform.

2.5 Foreign Language Practice Teaching Has Been a Mere Formality

Practice teaching is a significant part of education in higher educational institutions, an important means of cultivating students' innovative spirit and practical ability and upgrading their comprehensive quality, as well as a key link in cultivating innovative talents. However, practice teaching in most colleges and universities in Jilin Province has been a relatively weak link, with the common tendency of “more emphasis on theory than practice and more emphasis on classes than extracurricular application” and the disconnection of “learning” and “applying”. Students without practical training of “applying what is learned into practice” cannot meet the demand of international community for innovative talents; the missing link “even has become the bottleneck in cultivating innovative talents”.

3. Thoughts on the Cultivation Mode of Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge” at JISU

Jilin International Studies University (JISU) has four focuses under its English major: education, tourism, foreign-related secretary and media hosting. Following the requirements of the Syllabus, JISU has established some effective modes in cultivating compound foreign language talents as follows.

3.1 Defining Cultivation Objectives, and Directions and Features of the Major

3.1.1 English Major (Focused on Education)

English Major (Focused on Education) aims to cultivate compound English talents with a solid English language foundation, extensive range of knowledge, strong English listening and speaking ability, advanced educational concepts, familiarity with educational laws and mastery of modern English educational and teaching skills. The graduates are trained to take educational or management positions in schools or other educational institutions, enterprises or institutional organizations.

3.1.2 English Major (Focused on Tourism)

English Major (Focused on Tourism) aims to cultivate compound English talents with a solid English foundation, good intercultural communication skills, practical knowledge of tourism and tourism business, and the ability of operating and managing hotels and travel agencies or working as a tour guide. The

graduates are trained to work with proficient English as foreign-related tour guides, ceremonial receptionists, and hotel service or management staff in various kinds of enterprises or institutional organizations in the tourism industry.

3.1.3 English Major (Focused on Foreign-related Secretary)

English Major (Focused on Foreign-related Secretary) aims to cultivate compound English talents with a solid English foundation, good intercultural communication skills, practical foreign-related secretarial knowledge and foreign-related secretarial business, and the ability of foreign-related secretarial management and office work skills. The graduates are trained to work with proficient English as foreign-related English secretaries, foreign-related ceremonial receptionists, foreign-related secretarial management and service staff in various kinds of enterprises or institutional organizations in the foreign-related secretary industry.

3.1.4 English Major (Focused on Media Hosting)

English Major (Focused on Media Hosting) aims to cultivate compound English talents with a solid English foundation, profound humanistic and cultural background and thorough professional knowledge and skills, good intercultural communication skills, and practical foreign-related media hosting knowledge and foreign-related media hosting art. The graduates are trained to work with proficient bilingual (English and Chinese) ability as broadcasters or hosts/hostesses, event planners and organizers, departmental coordinators or managers in various styles of programs in multiple foreign-related media and related areas and industries.

3.2 Formulating and Implementing the Cultivation Plan for Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge” Guided by Demands

Following application-oriented talent cultivation objectives, JISU has been implementing *The Whole Set of Cultivation Standards and Plans* in an all-round manner, with a focus on the comprehensive development and improvement in knowledge, ability and personality, to provide an environment for students to develop the quality and capabilities as qualified professionals needed by the society through coordinated development and improvement of ideological, scientific and knowledge, and mental and physical qualities, as well as learning, practical and innovative abilities.

JISU aims to cultivate high-end application-oriented, compound and export-oriented English professionals with high humanistic and cultural quality, solid English language foundation, extensive range of knowledge, strong English listening and speaking abilities, and mastery of the knowledge and skills in a certain field. JISU graduates of the English major are trained to work with proficient English and the mother tongue on teaching, tourist, foreign-related, media hosting service or management positions in various kinds of enterprises and institutional organizations.

Talent cultivation of JISU takes its roots in Jilin Province, faces the development of Northeast China region and serves the entire China, characterized by its service to local economic construction and industries. Based on the accurate understanding of the changing

requirements for English talents and guided by social and job market demands, JISU has steadily improved its cultivation system by establishing the cultivation mode of “English Competence + Professional Knowledge” embodied in English Major (Focused on Education), English Major (Focused on Tourism), English Major (Focused on Foreign-related Secretary), and English Major ((Focused on Media Hosting). Talent cultivation of JISU places its focus on students’ integrated development of knowledge, ability and personality, highlighting the organic combination of class teaching, extracurricular activities and social practice. With professionalism and practicality taken into consideration in ability training, JISU has improved the comprehensive quality, practical ability and innovative ability of its students.

3.3 Constructing an Index System Covering Standards, Quality and Ability of Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge”

With the promotion of reform in the cultivation mode for talents featured with “English competence + professional knowledge”, JISU has rationalized its curricula and knowledge structure and specified the objectives of curricula with an emphasis on ability training. The compositional principle for the curricula of English major is: language skills + necessary cultural and literary knowledge + expertise and skills to serve the industry.

JISU has highlighted “English knowledge and skills + expertise and professional skills + comprehensive application” in its featured cultivation of application-oriented, compound and export-oriented talents, and presented the intersectionality and interdisciplinary nature of English major in students’ ability training. With high comprehensive quality, solid English knowledge and skills, and mastery of expertise and professional skills, JISU graduates are qualified for jobs in English education, tourism, foreign-related secretary and media hosting areas. The English major at JISU has shaped distinctive features; its Media hosting direction, in particular, has filled in the gap of major setting in higher educational institutions in Jilin Province.

3.4 Establishing a High-Quality Faculty Team of Dual-Skilled Foreign Language Talents

A qualified faculty team is a must in cultivating compound foreign language talents with innovative minds. To overcome the lack in expertise of teachers trained in the traditional educational mode, JISU has been endeavoring to enhance its faculty team construction and high-level talents introduction to upgrade its first-line faculty team. With equal emphasis on faculty cultivation and talent introduction, JISU has optimized the structure of faculty team and promoted the construction of teaching echelon and teaching groups, initially forming an efficient and capable faculty team with excellent young and middle-aged teachers and famous teachers as the main body and a group of teachers with Master’s or Ph.D. degrees as the backbone. Many JISU teachers have been abroad for short- or mid-term academic exchanges, visits or further studies in the UK, the USA, Australia, New Zealand, etc.; and

foreign teachers are employed to teach at JISU every year. Moreover, JISU encourages its teachers to take positions in enterprises or institutional organizations in accordance to their professional fields, gradually shaping a dual-skilled (teaching ability and social practice) faculty team; professional or experts in various fields are also employed to JISU to teach or participate in the professional consultation committee of the corresponding major, so that they can take part in every link of major construction, thus realizing professional knowledge sharing in the real sense.

3.5 Constructing Training Bases for the Cultivation of Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge”

Internship is an important means of cultivating students' practical ability; its effect directly testifies whether students can apply what they have learned into practice. To this end, JISU has been actively establishing training bases on and off campus.

3.5.1 By actively establishing training bases off campus and making full use of all sorts of social resources and the JISU Alumni Association, JISU has established sufficient and stable internship and social practice bases to meet the needs for application-oriented talent cultivation, based on inter-university, university-enterprise and university-institutional organization forms of cooperation. JISU continues to enhance the bonds with enterprises and institutional organizations through holding regular work meetings on cooperative education for the exchanges between different parties and constructing the channel for co-cultivating qualified application-oriented talents with enterprises. Besides, JISU has established a long-term mechanism for teachers of Comprehensive Skill-training Courses to conduct R&D work and participate in social practice or on-field practice in enterprises; relevant staff in enterprises and institutional organizations have also been invited to participate in research on the cultivation plan, teach practical courses and instruct practice teaching and training for the cultivation of qualified professionals. For example, JISU has established cooperative training bases with more than a dozen public primary schools and six middle schools in Changchun for its English Education majors, so that students can go to the real classrooms to apply relevant knowledge and skills; JISU has also established cooperative training bases with six large and medium-sized travel agencies in Changchun to provide internships for English Tourism majors and offered internships at TV stations to English Media Hosting majors.

3.5.2 JISU has been strengthening the construction of internship bases and training bases. The specific measures include: giving full play to the function of the Global Village, Simultaneous Interpreting Hall, Campus TV Station, and all simulated laboratories for the cultivation of application-oriented talents; inviting relevant staff from cooperative units to the internship or training bases to instruct

training together with JISU teachers; moving “job place” into campus through making full use of the role of internship and training bases in providing students a cultural environment, language application ability training and comprehensive quality improvement, etc. JISU has established many platforms for internships on campus. For instance, some students in the English Secretary Major have internships at the Archives Center of JISU to get familiar with secretary work and some English Education majors have internships as teaching assistants. Through internships on and off campus, students have well grasped professional knowledge of their major.

3.6 Shaping a Quality Assurance System for the Cultivation of Compound Foreign Language Talents Featured with “English Competence + Professional Knowledge” with Unique JISU Characteristics

To realize the objective of cultivating compound English talents with Featured with “English Competence + Professional Knowledge”, JISU has been taking teaching quality as the lifeline of school-running and “strengthening awareness and upgrading standards, while constructing systems and mechanisms” as guidance, carrying out strict implementation and effective operation of its well-designed regulations based on the construction of a comprehensive teaching quality management system and stipulation of quality standard for each link. Adhering to the principle of “administering school-running and operational management and regulating teaching, learning and examinations in a strict manner”, JISU strives to standardize teaching, learning and teaching management behaviors, to ensure there are rules for everything and the rules are followed.

Conclusion

In summary, the diversified era and society call for compound foreign language talents with strong adaptability and practical ability. The cultivation of such talents is a systematic project. Only by constructing a professional system compatible with regional economic development and establishing a mode for training compound English professionals can higher educational institutions deliver excellent compound talents of higher quality in greater number for China's modernization cause.

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The Development and Tendency of English Literature Studies in China

Tianyuan Zhu

(English Language and Literature Department, Yonsei University, South Korea)

Abstract: This paper introduces the contemporary English literature studies in China from 1980s to the present, and forecasts its trend in the future decades. English literature studies are featured over time in China because of the influences of literature development by its social culture. In recent years, classical English literature studies are steady in China, whereas modern English literature studies increase greatly. The theories can be proved by the number of related works in different time period. From the year 1980 to the following decade, the types of English literature studies in China were mostly literary criticism about classical English novels. Representative works included Zhu Hong's *Treaties on English Literature (1984)* and Shi Xianrong's *West Wind and Rank Grass: English Literature Studies (1986)*. Since China opens up more gates to western culture in the beginning of the 21st century, people pay more attention to the contemporary western literatures; moreover, scholars notice that the growing number of overseas students in western countries bring more fresh blood to the researches. Therefore, the studies among these fields increased since then. However, studies on western classical works are still steady; the representative works included Cheng Aimin's *Studies on British and American Literature in 20th century (2002)*. In addition, modern and multicultural representative works include Ding Yun's *New Vision of English Literature Studies (2005)*, and Lin Jing's *The Death Philosopher of English literary Masters*. Based on what have been studied so far, the research direction of English literature studies in China would be multicultural in the future, and the modern English literature studies would lead scholars to deeper discussions.

Key words: English literature studies in China, classical literature, modern literature, literary criticism, multicultural

Introduction

English literature study has a long history and a profound tradition, and it always occupies a special position among literary studies. The American literature rises among the literary world in the 20th Century and becomes an independent and powerful national power separated from one branch of the past British literature, which makes English literature an important part of the world literature. Therefore, learning and analyzing the history and development of English literature can help people to understand the western culture better. Moreover, it is a good way to absorb the essence of English literature, and possibly promote cultural exchanges worldwide. Chinese scholars have always paid great attention to study the British and American literature; therefore, they came up with numerous of new discoveries while doing researches. At present, domestic researches on English literature have initial results, and the main research directions usually are the new concepts and new viewpoints of it. However, the present studies have been lack of unified management, which brings the researches of English literature in China into a difficult situation; in other words, it is hard to break through the bottleneck at the moment. Thus, it is fundamental for people to search for the new theoretical methods to support English literature researches in China, so that scholars can get out of the

dilemma they are going through. In recent years, as our values and ways of life diversified gradually, both the academic spirit and literary studies are facing serious challenges in the effects of different cultural awareness. Since China is under the transition period of a rapid development, which makes its concept of values and interests can easily conflict with each other. That is why most of the studies of English literature among Chinese scholars can only influence a certain degree of facts. Specifically, as it shows on the main works of various stages of researches, there are few studies on the education of English literature and translation. Overall, the situation nowadays of English literature study can be concluded as that the classical literature researches are developed in a relatively stable way, whereas the researches on modern English literature are fluctuant, with particular emphasis on the multicultural development of literature and modernism.

1. Literary Criticism

It was first in the early 1980s when China began to carry out a systematic, comprehensive and in-depth study of English literature. Because of the closed social environment, unfortunately, many scholars who have high academic attainments do not have the opportunities to create their own academic systems. In both the 1980s and 1990s, the studies on

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Author: Tianyuan Zhu, English Language and Literature Department, Yonsei University, South Korea.

English literature in China were mainly based on literary criticism. As an important part of the whole literary system, literary criticism plays an irreplaceable role. It is not only defined as a thorough analysis and exploration of a literary phenomenon, but also took literary appreciation as the basic starting point to analyze a certain author's works. In a word, literary criticism plays a key role in the history of the development of researches on English literature in China. And different from the ideological criticism, literary criticism can be demonstrated by the various aspects of materials, as long as it is closely linked to the point of view that you wanted to clarify. Moreover, it is different from the general analysis of works. Literary criticism must have a general evaluation of the work, and there is a certain process of argumentation for evaluation. During this period of time, there are three main representative works: *Treaties on English Literature* (Zhu, 1984), *West Wind and Rank Grass: English Literature Studies* (Shi, 1986) and *Literary Criticism in Modern and Contemporary English Literature* (Zhao, 1991).

The author of *Treaties on English Literature* Zhu Hong (1984) grasped the key point of it, and it is remarkable that with anxious and resentful feelings, there was still a calm analysis of the deep roots buried in the phenomenon. Zhu touched by the principles and methods of literary criticism, therefore, her analysis helped people to see that clearing up some theoretical confusion is not only difficult but also urgent and necessary. It was not simply adjusting the political attitude, so if people wanted to establish healthy and normal literary criticism, they had to try to find the best ways. The first problem we were facing was the standard problem. Zhu used metaphor to say that the English literature research was a rock named "realism"; therefore, regarding to this, her sharp insights became a more eye-catching content among her work. The second problem was the method problem. Zhu indicated that judging the quality of the works and grasping the writers' creative thoughts were usually depend on the conclusion. By seizing the individual stories in an easy way, the background tests of social lives were not usually produced by certain works, also, people couldn't fully understood the overall tendency of the writers' creative thoughts. Standards and methods are not necessarily complicated problems, but the deviations are existed. Because of the deviation from the foundation, the building under construction cannot be built firmly, so does literature studies. Zhu pointed out that the dangerous basic deviations that have not yet been paid enough attention to, so it was the primary mission for people to realize its significance. Similarly, Shi Xianrong (1986) in the *West Wind and Rank Grass: English Literature Studies* and Zhao Qiguang (1991) in the *Literary Criticism in Modern and Contemporary English Literature* also emphasized the personalities which showed people the importance of literary criticism. They put forward higher requests to the reviewer

rather than themselves, which forbid them to repeat the literature word by word or use the simple way to label the works. After constantly adjust them, they can create their own understanding of social lives and the profound and mature ideas about development. So that to prevent the laziness of thought in human nature and make contributions for the human spirit of truth.

Literature criticism works in this period put forward more precise and appropriate criteria which can be applied to literary works of different genres, styles and methods of creation. These standards are not only the new breakthrough in the field of literary criticism, but also the reminder of the readers, as well as the emancipation of the critics. It is not hard to find that critics of this period liked to use rhetorical questions, in which way they can avoid the comments being too superficial, and can arouse people's attention to think deeply, so as to achieve the ideological resonance. In order to achieve this goal, the scholars brought up three opinions in general. First of all, the scholars usually suggested that the in-depth researches on the objects should be reviewed. They do not only focus on plot, but also pay more attention to their ideological contents and special meanings. Secondly, the scholars do not always use the realistic standard to judge the unrealistic works, thus they can avoid the one-side results of the commentaries. Finally, the scholars often make in-depth researches and textual researches on their experiences and creative backgrounds, so that they could be more accurate in interpreting their thoughts and emotions, and ensure the objectivities and literariness of the evaluation later on. As far as I am concerned, the works of this period of time have relatively distinct characteristics toward its society.

2. Multicultural Literature

In the past three decades, the studies of English literature mainly focused on works, writers, schools and historical studies, which made the studies of English literature more specialized, mature and standardized. When it came to the 21st Century, the deeper communication between Chinese and Europeans on culture led to the fusion of contemporary British and American literature in China. During this period of time, the studies of English literature, especially the studies in classical and modern literature under multicultural environment were distinct. Representative classical works were *Studies on British and American Literature in 20th century* (Chen, 2002), *Milton's Satan and the tradition of English Literature* and *Research on Fielding* (Shen, 2010). And modern representative works were *A New Vision of English Literature Studies* (Ding, 2005), *English Literature in the Vision of Culture Study* (Xu, 2008), and *the Death Philosopher of English literary Masters* (Ling, 2014). The authors of these works have long been engaged to the studies of British and American literature. With a solid foundation, a good theoretical accomplishment and a strong academic achievement, they have preponderances to understand the originals better.

From a long time ago, the researches on Milton's poems always focused on his masterpiece *Paradise Lost*, a piece of long poem. And the drastic debates between critics on *Paradise Lost* were always focused on the view of the character Satan. Therefore, the key to appreciate the epic of Milton is that how to understand the character Satan correctly. In the book *Milton's Satan and the tradition of English Literature and Research on Fielding*, Shen Hong (2010) attempted to reveal the elusive English literary tradition that Milton has been directly benefited and inspired under his creation of poetry, especially the creation of the figure of Satan, in order to propose a new interpretation of the epic *Paradise Lost*. By exploring the different aspects of Satan's character, it is convinced that the British literary tradition has a great influence on the creation of *paradise lost*. In shaping the image of the complex figure Satan, Milton benefited from early two branches in English Literature: one is the religious and ethical poetry from the Old English *Genesis* and Spencer's *the fairy queen*; the other is the British drama works from medieval time to renaissance. The connotations of the epic of *Paradise Lost* are largely determined by a British literary tradition which is constituted with the two branches together. Therefore, if people want to objectively evaluate Satan's character, it is essential to always use the British native literature tradition as references, so that they can effectively avoid "the fallacy of intentions" mentioned by Shen. *Milton's Satan and the tradition of English Literature* is the starting point for analyzing Milton's masterpieces – Satan's image in *Paradise Lost* was mainly came from the perspective of literature tradition, which emphasized British literary tradition made a great influence on the creation of it, and also, it endowed the profound connotation of this epic.

As for another work *Research on Fielding*, written by Han Jiaming (2010), was widely dabbled in the latest researches and achievements abroad at that time. Han not only used the in-depth analysis of Fielding's novels by using a criticism method of combination, historical and cultural researches and textual interpretation phases, but also incorporated the drama, news and politics previously unstressed into the scope of the studies. It showed Fielding's rich personal life and outstanding achievements as a playwright, novelist, political writer and magistrate at the same time. In addition, it is so far the most comprehensive exploration and discussion of the writer in China. The book's comment on Fielding's works is neither divorced from the 18th Century British cultural context, nor reflected the special attention of Chinese scholars in 21st Century. It is very helpful for readers to understand Fielding, so that to understand 18th Century's English literature better, as well as the early development of commodity society, politics and culture.

While the studies of classical English literature have been developed steadily, many scholars paid their attentions to the studies of modern literature. *New Vision of English Literature Studies* written by Ding Yun (2005) mainly discussed 16 famous

masters who had global impact and a large number of readers and their famous masterpieces in English literature, characterized by "appeal to both refined and popular taste". According to Ding, the most distinctive feature of *New Vision of English Literature Studies* is that in the context of globalization linguistic environment, the book tried to interpret, examine and rethink the English literature studies by using contemporary colorful new vision, new thinking, new ideas and new methods. Firstly, the structures and methods of choosing the topic are new. Secondly, Ding tries to use new thinking and new ideas which are popular in modern literature, so to examine the same work in multiple levels and multiple prism patterns, therefore, many fields of studies can be refracted from it. In addition, this book is the opening and the development of the methodology of literary criticism.

Furthermore, Xu Yingguo (2008) created *English Literature in the Vision of Culture Study*, the monograph about the researches of English Literature in the perspective of cultural studies. It basically can be divided into two categories including the research of text and the research of culture, which can be further subdivided into the following parts: women's culture and literature works, modern and post-modern American literature, British literature from the perspective of Chinese culture, Chinese English literature, Chinese American literature, American Chinese culture and Chinese culture, and comparative literature from Chinese cultural perspective. One part of English feminine literature focused on women's literature from the perspective of feminine culture in the view of new historicism; modern and post-modern literature focuses on the development characteristics and trends of American Literature in the multicultural context. The other part is mainly to study British and American literature, especially the American Chinese literature from the perspective of culture.

As we all know that Emily Bronte, Thomas Hardy, Joseph Conrad and Virginia Woolf are the greatest literary giants in the British and American literary history. They left many masterpieces for later generations with their superb and skilled literary skills. It is not difficult to find that they also have different styles of writing about death when reading carefully. *The Death Philosopher of English literary Masters* wrote by Lin Jing (2014) chose the famous people in the British and American literature history to illustrate the death philosophy writing as the writing proposition. The book was in a high value for readers to understand the English literature and the writing of the proposition of death under the meaning of culture and the significance behind it.

Besides, one of the characteristics of contemporary American literary world is the prosperity of minorities-related literature. Chinese scholars paid special attention to minorities-related literature such as African American literature, Chinese American literature and local literature. The Nankai

University Press released more than ten “Chinese American Literature Studies Series”, which has brought together important achievements in the study of Chinese American Literature (including Taiwan). Not only the cultural characteristics and historical contribution of Chinese novels were discussed, but also the aesthetic value of Chinese novels was explored further.

3. Conclusion

Although the Chinese English literature researches started late, and the contemporary literature development was relatively short and slow, which caused side effects on the researches of the whole field of Chinese literature. Fortunately, by facing the difficulties, Chinese scholars stick to go against the current affairs. The studies of foreign literature, especially English literature, have filled the gap between the academic fields under a certain extent. At present, the studies of Chinese English literature mainly involve four fields – literature history, genre, subject matter and literary theory. Based on the research foundations of these four fields, other aspects are continuously developing, and the scope of researches become wider and wider. This is an important symbol of the maturity of the research systems of British and American literature in China.

In short, at first, the researches of English literature in China is become more and more common and professional, and show stronger levels time after time; second, the abilities and feelings to accept the advanced levels of knowledge become more and more keen, which helps the development of literature studies; third, studies of Chinese English literature is biased towards the appreciation of works of famous contemporary authors; fourth, the span and range of British and American Literature in China at present are very large, which is beneficial to cultivate comprehensive talents. It is indicated from all these aspects that the current research trend of British and American literature in our country is good and has a very broad prospect. Of course, our research team and personnel need to improve their qualities and status as soon as possible, so as to integrate into the current atmosphere of British and American literature researches. In addition, the overall atmosphere of the studies of British and American literature also needs to be strengthened to purify it.

To sum up, it is estimated that modern or minorities-related English literature studies will be an important theme in China for the next decades rather than the studies of classical English literature. The research directions of British and American literature in China will introduce more in-depth discussion of modern literature works under the selection of literary works,

and more topics will be created for the British and American literary characteristics under the multicultural environment. For instance, it is necessary to break the misunderstanding of Eurocentrism, and study the American Indian literature of ethnic literature further in a multicultural perspective, in order to find the real origin of American literature. In addition, in the theoretical study, the specialization will be further strengthened. However, the rapid development of science and technology and the informational era nowadays have a certain impact on the current researches atmosphere of English and American literature, especially show a great temptation for those who are devoted to literary researches. The persistence of dedication of the heart in the complex social environment determines the research the future of China in the British and American literature studies. There is a keen need for talented people with concentration and ambition to devote them to the studies of British and American literature. Therefore, in order to develop English literature research vigorously in China in the future, it is necessary to stick to hold the firm belief of learning and practical to do research works, and be ready to face all kinds of difficulties and challenges, thus make a contribution to English literature researches in China under globalization.

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Study on the Construction Path of Pastoral Complex under the Background of Rural Tourism Upgrading: Based on the Elements Analysis of Porter Diamond Model

Zhanqi Li & Lingyun Huang & Weijun Liao

(Zhenjiang College of Humanities and Tourism, Zhenjiang, Jiangsu 212028, P.R. China)

Abstract: Under the new situation, traditional rural tourism can no longer meet the diversified and quality consumption needs of modern tourists, and upgrading has become the primary task of current rural tourism. Depending on Porter's "Diamond Model", the main factors of forming industrial competitiveness are analyzed. Around the integration of rural agricultural resources, rural landscape areas, health resorts, agricultural education & experience areas, folk culture experience areas and residential areas are established to construct the pastoral complex. With this platform as the engine of rural industrial development, and drove by the core competitiveness of the upgraded version of rural tourism, we can expand other industrial chains of rural economy and achieve the goal of revitalizing rural economy and culture.

Key words: rural tourism, pastoral complex, path, diamond mode

Introduction

In recent years, under the background of coordinated development of urban and rural areas and vigorously promoting the construction of new countryside, the ordinary traditional agriculture and rural tourism can no longer meet the psychological needs of urban tourists. "Living in farmhouse, doing farm work, eating farm food, viewing farm scenery and enjoying farm pleasure" has evolved into an in-depth cultural experience.^[1]

In China, Zhang Cheng, president of Oriental Garden Industry Group Co., Ltd., first put forward the concept of pastoral complex in a report entitled "Study on the model of pastoral complex" in March 2012, which aroused heated discussions among experts, scholars and tourism builders. From the view of market structure, its greatest advantage lies in encouraging the supply-side reform of agriculture, which not only improves the rural economy, but also has a positive effect on the rural cultural construction, and is a bran-new mode to promote the revitalization of rural economy. In document No. 1 of 2017, the Central Committee pointed out that supporting conditional rural construction should take farmers' cooperatives as the main carrier, let farmers fully participate in and benefit from the pastoral complex that circular agriculture, creative agriculture and agricultural experience are integrated, and carry out pilot demonstrations through comprehensive agricultural

development and transfer payments, etc.

1. Origin and Concept Recognition of Pastoral Complex

1.1 Origin of pastoral complex

"Pastoral", as explained in the Xinhua Dictionary:(1) Literally, fields and gardens;(2) Generally speaking, refers to the countryside.(3) Describing or expressing the life of villagers, especially by pastoral means. In the cognitive consensus of rural tourism, the pastoral conception is "pastoral conception". The emergence of complex originated from the construction of urban complex. When the population gathers and the land is scarce to a certain extent, a comprehensive form of the urban complex will appear in the core part of urban agglomeration.^[2]

In the 1950s and 1960s, with the general development of the economy, some capitalist countries in the West began to change from traditional agriculture to modern agriculture, and the rural economic situation had a new growth point. In order to ensure the harmonious development of rural areas, early Western countries, represented by Germany and the Netherlands, made innovations and reflections on the unity and planning of rural economic development. Some places also formulated relevant laws to ensure the smooth progress of the reform.

In early Italy, the countryside was upgraded to an agricultural tourist area, forming a comprehensive living space with functions of cultural education, rural entertainment and knowledge inheritance, making full use of the rich natural

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Author: Zhanqi Li (1981-), male, Han nationality, Xuchang, Henan, Zhenjiang City College of Humanities and Tourism, master's degree, lecturer, main research direction: tourism management. Lingyun Huang (1984-), female, Han nationality, Jiang Danyang, Zhenjiang City College of Humanities and Tourism, master's degree, lecturer, main research direction: tourism management. Weijun Liao (1970-), male, Han nationality, Zhenjiang, Jiangsu, Zhenjiang City College of Humanities and Tourism, master's degree, professor, main research direction: global tourism.

resources in the countryside. People can not only experience the original agricultural farming methods, but also gain happiness in participating in modern fitness activities. In recent years, this comprehensive mode of ecological agriculture has developed rapidly. Agricultural tourism managers in Germany provide citizens with opportunities to experience rural life and open up three leisure agricultural tourism modes: vacation farm, rural museum and citizen farm for urban residents to enjoy rural life. Korean rural tourism attaches great importance on the excavation of rural traditional culture and customs, and develops innovative rural projects on the basis of agriculture itself, and applies them to commercialization. The principal forms of leisure agricultural tourism in Korea are "sightseeing farm" and "weekend farm". Rural fruits, snacks, streams, landscapes and farm customs have become the theme of rural tourism.

As a pastoral complex is still a new thing in China, many scholars still have different understanding. In recent years, with the progress of beautiful countryside construction, the pastoral complex has begun to rise from the theoretical stage to the practical stage. The "Wuxi Peach" project, the "Oriental Pastoral Complex", is the first "Pastoral Complex" project in Yangshan Town, Huishan District, Wuxi City. It started construction in early April 2013 with an investment of 5 billion yuan and a planned total area of 6246 mu. It took five years to complete the overall planning.^[3] The Oriental Pastoral Complex consists of four parts: agriculture, cultural tourism and residence, as well as the intrinsic complex format, which embodies the organic integration of urban and rural areas and achieves the driving role of the complex for other rural related industries.

1.2 The concept of pastoral complex

There are many different views on the concept of pastoral complex, basically three kinds: Firstly, the integration of agricultural industry transformation mode in rural areas mainly highlights the basic position and role of agriculture, which is called agricultural integration. Secondly, the characteristic town is based on agriculture + cultural tourism + real estate, which is composed of municipal suburbs and modern urban agriculture. It is called suburban agricultural town. Thirdly, it should be regarded as beautiful rural construction, highlighting circular agriculture, creative agriculture, agricultural experience plus new community or pastoral community, to become beautiful rural community. As shown in Figure 1, the intersection relationship between agricultural complex, suburban agricultural town and rural community is shown.

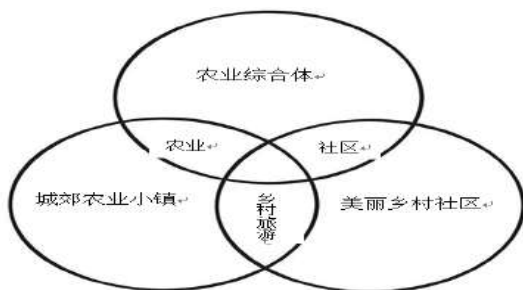


图 1 农业综合体-城郊农业小镇-田园社区交集关系

Through the analysis of the aggregate relationship in Fig. 1, it can be concluded that the rural complex is based on the traditional rural agriculture, with rural tourism as the medium, with rural communities or small towns as the carrier, forming an integrated urban-rural development model of modern agriculture, creative leisure agricultural tourism and the combination of human and natural harmonious ecological pastoral experience community. It is the trend of the future development of modern agriculture. The integration of experience and production is leading the new model of rural tourism in the new era. It is also the advanced stage of development of the combination of agriculture and tourism, tourism and rural culture, residence and the experience, vacation and life.

The structure of Rural Tourism Upgrading pastoral complex is shown in Figure 2.

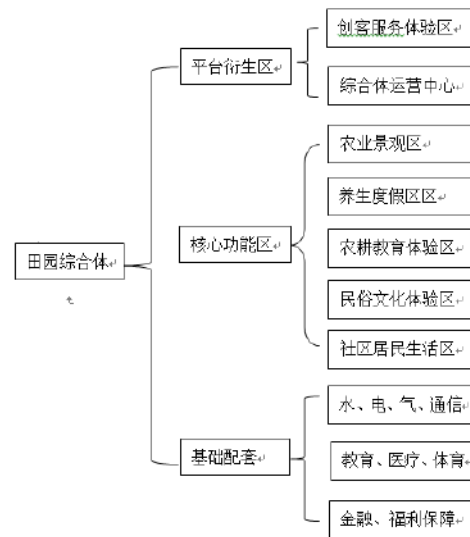


图 2 乡村旅游升级版田园综合体结构图

After the upgrading of rural tourism, the pastoral complex takes traditional agriculture as the main line of development, and rural tourism as the core of the complex development. Through the role of the engine of rural tourism, it promotes the development of other related rural industries, forms a new point of rural economic growth, and makes up for the singularity of the traditional rural tourism development. The pastoral complex consists of three main parts: Infrastructure is the guarantee of the complex development, improving the allocation of rural resources and narrowing the gap between urban and rural areas. The core function area contains five functions. The biggest difference between the traditional rural tourism and the core function area is to build a community residential area, which plays the role of attracting and retaining talents. The platform derivative area not only provides guidance and projects for local villagers' entrepreneurship, but also serves as a wisdom center for complex operation, which ensures the integrity of project innovation and scientific management.

1.3 Theoretical support of pastoral complex

The pastoral complex can also be supported in theory. For

example, in urban-rural dualism, to eliminate the difference between urban and rural areas, many scholars believe that "urban and rural must be married". They believe that the relationship between urban and rural areas should change from the initial tension and opposition to harmonious unity. Only by integrating urban and rural can burst out new hope, new life and new civilization. The emergence of pastoral complex caters to and resolves the contradiction between urban and rural dual structure, and puts forward practical solutions.

Agenda 21, passed by the United Nations Conference on Environment and Development in 1992, formally adopted the concept of multi-functional agriculture. One point of agricultural multifunction theory is that agriculture not only has the function of food production and economic value, but also can realize the additional functions of traditional culture display, leisure sightseeing and ecological education through rural tourism. The basic function of the pastoral complex is to realize the integration of rural industries, cultivate new rural industries and optimize the allocation of rural resources. Another point of view is the theory of rural value. Rural areas should reflect the value that cities do not have, such as production, life, society, culture, environment, etc. The dislocation of rural and urban development will complement each other in resource utilization and talent cultivation. It is the pastoral complex that integrates the differences between urban and rural areas into a whole and unifies their unique resources to form a joint development force.

2. The Necessity of Upgrading Rural Tourism into a Pastoral Complex

2.1 Under the integration of pastoral and rural tourism, the value of each complex will need to be further enhanced, and the rural cultural landscape will be renewed

The main value of traditional rural pastoral lies in the production of agricultural products. The mission of industrial value of rural pastoral ends when the crops produced in the land are processed roughly or sent directly to the market without processing. In modern agriculture, the value of pastoral will be reflected in all aspects of rural tourism. The real home of mankind is the countryside, which breeds the development of modern cities. The most grounded life is rural life. The life close to nature makes people worship nature more and respect nature more. Rural culture is different from modern urban culture. It embodies more natural factors and makes the sense of natural life and belonging stronger.

Pastoral complex is a kind of tourism that caters to modern people's desire to return to nature. It is a type of tourism that can purify the soul, achieve the unity between man and nature, and reflect the harmonious coexistence between man and nature. Pastoral value can be reflected in all aspects of rural tourism. In addition to a single agricultural product, there are also farming experience, farming operation, thrifty education and so on. Once

again from that piece of heavy land to find their spiritual sustenance. Rural folk culture, farming culture and sacrifice will be embodied and applied in the pastoral complex according to the new rural tourism mode, showing new vitality.

2.2 The pastoral complex has become an advanced stage of rural tourism development

Agricultural products are the traditional thinking of agricultural production, while tourism constructs thinking from the perspective of tourists. In rural tourism, first of all, to meet the basic conditions of food, housing and transportation, there is a need for certain infrastructure allocation. At the same time, rural tourism not only needs complete facilities, but also needs to improve the local service level to retain the hearts of tourists, so that tourists can feel the cultural charm of rural areas with local characteristics. It is tourism thinking to provide tourism services according to people's needs. In a word, it is a people-oriented thinking to satisfy people's various needs. Therefore, rural tourism as the main line will affect the development of pastoral complex from the way of thinking, so that the living environment and social and economic development will be greatly improved.

2.3 The pastoral complex will bring many benefits to traditional rural tourism

The pastoral complex can make the farmer's pastoral go directly to the market without intermediate links in production, processing and circulation, and leave more pastoral value directly in the countryside, so as to promote the development of rural economy. From the perspective of tourists' experience of local characteristics of rural culture, rich forms of rural culture have a great attraction for tourists, and also allow more rural culture to be protected, inherited and promoted, and the quality of rural tourism is further improved. The development of rural tourism can not be separated from the participation of a large number of local rural residents. The value of "increase in agricultural efficiency, farmers' income and rural greening" will be realized in the pastoral complex. Local residents can also participate in the construction of the pastoral complex according to their own reality. The pastoral complex achieves premium effect in rural tourism and makes full use of rural human resources. The construction of rural complex mainly centers on the beauty of rural nature and simplicity excavated by rural tourism, and also upgrades and protects the rural ecological environment.

3. Porter Model and Elements Analysis of Competitiveness of Pastoral Complex

3.1 Porter diamond model

Professor Michael Porter of the United States, after studying various countries and industries in-depth, believes that the formation of industrial competitiveness mainly consists of four basic elements and two variables. Four basic factors,

namely, production factors, market demand, related and supporting industries, enterprise strategy, enterprise structure and competition, constitute the core elements of the "diamond model". These core elements form a complete organic whole, and interact with each other and influence each other, together determine the competitiveness level of an industry. In addition, Porter also pointed out that there are two variables due to the change of external environment: opportunity and government. Opportunities for an enterprise are constantly changing, and government policies will change because of the ruling party and the social situation. They also play a very important role in the formation of industrial competitiveness.^[4] The diamond model is mainly derived from these four core elements and two variable elements, which together form a diamond relationship, as shown in Figure 3:

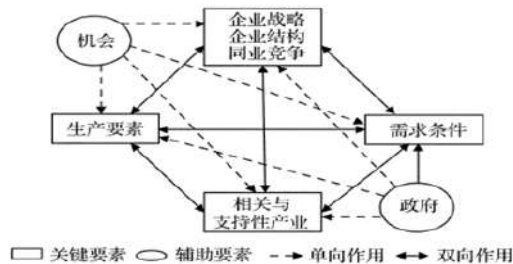


图3 波特钻石模型

3.2 Elements analysis of the pastoral complex competitiveness from the perspective of porter's diamond model

Porter's diamond model is a tool to analyze the international competitive advantage of the industry from a macro point of view, and has a thorough analysis of the competitiveness of the industry. The application of Porter's diamond model for the construction of pastoral complex at the micro level is conducive to the analysis of the main elements of the pastoral complex core competitiveness. As an upgraded version of rural tourism, pastoral complex should clarify the core elements of its industrial competitiveness. In the process of factor analysis, we should avoid harm and seek benefits in the construction of rural complex, develop its weak areas, highlight the existing advantages, maximize interests, and form a joint force to promote rural economic development.

3.2.1 status of production factors

The production factors in Porter's diamond model mainly include capital, nature, manpower, knowledge, infrastructure and so on. As the most precious resource in the construction of pastoral complex, human resources are mainly participated by the local residents of rural tourism, and there are a large number of employment and entrepreneurs in rural areas. Natural resources are mainly local unique natural geographical environment and human customs, which are inherent advantages

for rural areas. In terms of knowledge resources, capital resources and infrastructure, it is a weak link in the construction of rural tourism complex. Compared with developed cities, knowledge resources are not rich and concentrated, capital resources are relatively scarce, financing has difficulties, infrastructure is not perfect, and some rural areas are still relatively backward.

3.2.2 Demand situation

Demand situation mainly refers to the market demand of the country. With the increase of residents' income and the steady growth of the domestic economy, the consumption of tourism industry continues to grow. At present, rural tourism is the main way of leisure and entertainment for urban residents on holidays, and rural tourism is welcomed by consumers due to its unique characteristics. With the progress of society, the demand of tourism consumers for tourism products is also developing and changing. Traditional farmhouse entertainment, country parks and resort hotels seem single. Therefore, rural tourism needs to be upgraded rapidly in order to lay a foundation for the birth of comprehensive rural tourism products.

3.2.3 Relevant and supporting industries

Mutual support of related industries can promote the development of rural tourism, and the construction of pastoral complex can not be separated from the close support of related industries. In addition to traditional tourist hotels, tourist transportation and travel agencies, it also needs agriculture as the basic support of rural tourism pastoral complex to carry out various forms of agricultural-related tourism activities. It also needs the development of industry to improve the national economic income and the hardware needed for tourism, and to improve the quality of characteristic accommodation of rural tourism through the construction industry. E-commerce based on the Internet will enhance the popularity of pastoral complex.

3.2.4 Enterprise strategy, structure and competition

The pastoral complex of rural tourism is mainly the integration of rural communities in the interaction between urban and rural areas. It not only has aborigines, but also absorbs new villagers from other places to start business, work, live and provide for the aged. It is also essential to attract stable tourists through creating agricultural sightseeing, farming experience and vacation leisure. Through the combination of circular agriculture, creative agriculture, farming experience and pastoral community, the pastoral complex mainly highlights the low-carbon environmental life, creative ecological resident place, and ultimately forms the most attractive living mode of living and travelling community.

3.2.5 Government

Promoting the upgrading of rural tourism in China can not be separated from the support and encouragement of the government. The government plays a role of overall planning, guidance and promotion in the construction of pastoral complex.

Only under the correct guidance of the government, planning, policy guarantee, financial, infrastructure and other means of support, can we successfully complete the construction of the pastoral complex. Without the support and encouragement of government departments, the scale of rural tourism development will be significantly reduced.

In order to achieve the high-quality development of rural leisure tourism, the Ministry of Agriculture and Rural Affairs recently issued a circular to deploy the upgrading action of leisure agriculture and rural tourism. By 2020, the scale of the industry will be further expanded and the business income will continue to grow, striving to exceed trillion yuan. ^[5]

3.2.6 Opportunity

With the development of social economy, the demand of modern tourists has begun to develop towards diversification and quality. The traditional rural tourism is extensive and can not meet the requirements of the new era of rural tourism. There are many traditional rural tours, beginning to make tourists feel dull and monotonous, unable to meet the quality of rural tourism life need, rural tourism upgrading is imperative. As a rural resident, the desire for economic improvement has become increasingly strong, hoping to get rich through local resources and improve living standards. The integration of the needs of tourists and local residents promotes the upgrading of rural tourism in terms of format, facilities, services, culture and management, and the pastoral complex emerges as a result.

4. Construction Path of Pastoral Complex Based on Element Analysis of Porter Diamond Model

4.1 Proposals should be sought for the construction of pastoral complex

In order to ensure the scientifically and adaptability of the construction of the pastoral complex, it can not only meet the characteristics of modern agriculture, but also carry out leisure tourism, or make the tourists and residents satisfied with the pastoral community. Therefore, the construction of pastoral complex should be considered from both horizontal and vertical perspectives. Horizontal considerations refer to continuous communication and learning with other tourism and agricultural complexes in the same region in the early stage, avoiding homogeneous competition, and going out to learn advanced construction and management concepts of rural complexes. Vertical consideration refers to not only obtaining the unified planning of local government construction and seeking the support of the government, but also forming a consensus with the investors of the complex and the planning, design and construction parties in the whole process of planning preparation to ensure the realization of their respective interests. In addition, it should meet the requirements of relevant government departments in environmental protection, planning, tourism and construction, and ensure the legitimacy and rationality of the

construction of pastoral complex.

4.2 Based on the local characteristic resources, form the overall tourism effect

No tourism planning can exist independently without resources. As a pastoral complex involving local interests, the construction must be based on local resources. On the basis of deep excavation of local agricultural resources and tourism resources, through the integration and optimization of resources, further expansion of rural tourism industry chain can be formed to maximize the value of resources and form the 1+1>2 agglomeration effect of the combination of tourism resources and agricultural resources. The pastoral complex belongs to the resource-dependent complex, which relies on both agricultural resources and various local customs in the countryside. It also depends on the participation of the tourism industry. Therefore, on the basis of conforming to the government's rural resource plans, the pastoral complex excavates the rural local resources in depth, making the local flavor and nostalgia become the business card of the pastoral complex.

4.3 Theme culture is the core of the pastoral complex

Culture makes tourism more attractive, and tourism makes culture display and inheritance. A pastoral complex lacking cultural themes has no lasting vitality. At present, the sorting and excavation of local rural culture in countless rural tourism planning is particularly superficial, which also leads to the uniformity of many rural tourism projects and serious homogenization competition. Most tourists travel in the countryside is to get off - climb the mountain - enjoy the flowers - pick the fruit - eat - get on the bus - go home. This kind of travel is difficult to impress people, and even more difficult to slow down the pace of the guests' travel and lack of stable attraction. With the unique cultural image of rural tourism pastoral complex, tourists will experience more deeply, leave a more lasting tourism experience, which can bring greater tourism benefits.

4.4 Innovation is indispensable in the complex

The innovation of rural tourism pastoral complex is not only tourism project and tourists' experience innovation, but also internalized in the pastoral complex. It should not only have tourism products with local characteristics and innovative experience projects, but also be able to innovate business management ideas and bring forth new ideas. The name of rural tourism and pastoral complex project with its own characteristics will make the tourists remember it ever-lasting. The product image positioning with local characteristics will make tourists linger and forget to return. Reasonable functional structure zoning of complex will save time and worry for local residents and tourists. The logo with distinct personality will make the brand popular. Scattered agricultural landscape sketches will make tourists more pleasant physically and mentally. So product design and enterprise management need to be advanced and

innovative.

In order to meet the increasingly diversified needs of tourists, rural tourism pastoral complex projects should be designed. The services and contents should be updated and changed periodically. Take the agricultural seasonal link as the main line to form a complete rural tourism industry chain, combine the characteristic agricultural products with festivals and arts, form unique agricultural products with cultural connotation, and increase the added value of agricultural products. Agricultural experience and agricultural production, farming culture and farm life are upgraded to the sale of rural tourism commodities, which not only meets the psychological needs of novelty seeking, but also achieves the purpose of pleasing the body and mind, and forms a new form of rural tourism. The innovation of rural tourism and pastoral complex project does not necessarily adhere to traditional rural culture. High-tech can be introduced into farming experience and education. Through diversified project forms, it can create a kind of rural life that teaching goes together with pleasure, which tourists can enjoy life in a relaxed and comfortable atmosphere.

4.5 The pastoral complex should embody unity and pluralism

Pastoral complex should embody unity in planning, design and management, and form brand effect, so that tourists can get quality assurance of tourism experience. Diversification mainly includes product form and agricultural innovation. We should design different rural tourism products according to different tourist market demands. Rural tourism and pastoral complex should embody a highly comprehensive industrial complex in agriculture, tourism and community. It is necessary to break through the single rural tourism industry and form convalescent health care, in-depth vacation, vivid recall, livable and travelable communities, so as to form rural tourism industry clusters and give full play to the effect of industrial agglomeration. Rural tourism should be the main line in the planning of pastoral complex, coordinating the development of local related industries, realizing the overall industrial effect of the region, driving the local farmers to become rich, and promoting the economic and social development of the region.

4.6 Relying on the pastoral complex, it will become a new engine of rural economic and social development

The fundamental task of the return of pastoral complex is to solve the problem of rural regional tourism development. It is a new situation of tourism development, but its function and role in the countryside does not stop there. The most notable feature of the pastoral complex is the word "complex". This is quite different from traditional farmhouse entertainment and rural sightseeing agriculture. It shares the same concept with the urban commercial complex, but it relies on the development of rural agriculture and other rural resources.

The pastoral complex can be built according to the requirements of rural tourism development in the aspects of landscape building, product design, tourists' moving line arrangement, brand promotion, etc., but it can not be abandoned at the expense of agriculture and ecology. It is another important development platform for rural entrepreneurship and knowledge gathering. Through talent gathering, it forms a rural intelligence center, which provides guidance for local farmers or foreign entrepreneurs in land, capital and entrepreneurial technology. At the same time, the relevant departments of the government encourage, absorb, cultivate agricultural production and processing, nursery plants, flowers, catering accommodation, literary creation and other companies and teams to enter the countryside. The construction of the complex is coming.

5. Conclusion

On the basis of Porter's model, this paper analyses various competitiveness factors of pastoral complex after the rural tourism upgrading, and realigns and optimizes them to promote the coordinated development of other rural industries. With agriculture+ cultural tourism+ industry as the main structure and rural tourism as the main line, the pastoral complex innovatively establishes agricultural landscape area, health-preserving resort area, farming education experience area, folk culture experience area and residential community living area in three aspects of pastoral production, pastoral life and pastoral landscape. It is not only an engine of rural tourism, but also a comprehensive platform of cross-industry and cross-function. It fully demonstrates the charm of tourism+ industry, and provides a useful reference for the upgrading of local rural tourism and the revitalization of the rural economy and culture.

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Effect of Exercise Prescription on Bone Mineral Density in Perimenopausal Women in a University Community

Chunna Yang^a & Guimin Weng^a & Hui Liu^a & Li Wang^a & Li Li^b

(a. Out-patient Department of Guangdong University of Foreign Studies; b. Department of Cardiac Intensive Care Unit of Guangdong Provincial People's Hospital)

Abstract: Purpose: to explore the effect of exercise prescription (resistance exercise plus aerobic exercise) intervention on bone mineral density (BMD) in perimenopausal women in a university community. Method: A total of 22 Osteoporosis cases of perimenopausal women in a university community and 26 controls were selected for anti-resistance exercise plus aerobic exercise prescription intervention for 12 months. The subjects were monitored their changes in BMD before exercise and after 3, 6, 9 and 12 months with exercise. Results: Anti-resistance exercise plus aerobic exercise prescription intervention can reduce bone mass loss in perimenopausal women.

Key words: Exercise therapy, Bone mineral density, Perimenopausal women

Introduction

Osteoporosis (OP) is a common chronic disease in perimenopausal women. Many studies have shown that the occurrence of OP is closely related to lifestyle, especially exercise methods; and effective exercise is of great significance in preventing and delaying the occurrence and development of OP complications. Although many studies have mentioned the importance of exercise for the prevention of osteoporosis, there is not much research on which way, the intensity and frequency of exercise can effectively improve bone density, and the resistance exercise is also newly proposed as a method of exercise that improves bone density. Therefore, this study conducted a one-year anti-resistance exercise plus aerobic exercise prescription intervention for peri-menopausal women, and monitored changes in bone mineral density, and explored the anti-resistance exercise plus aerobic exercise prescription intervention for peri-menopausal women's bone mineral density. Impact, with a view to providing a convenient, safe, effective and economical exercise prescription to prevent osteoporosis.

1. Objects and methods

1.1 Research object

Using convenient sampling, 52 people from 40-55 years old menopausal women who lived in the neighborhood of a university in Guangzhou from December 2017 to December 2018 were selected as the object of study. 4 people withdrew

halfway and 48 left to complete the intervention.

1.1.1 Case group selection

According to the diagnostic criteria recommended by the OP Committee of the Chinese Society of Gerontology, 26 patients were diagnosed as OP and were willing to participate in the research. Inclusion criteria: (1) women aged 40-55; (2) no tumors were found or received relevant treatment; (3) no drugs affecting bone density were used. Exclusion criteria: hyperthyroidism, malignant tumors. Among them, one subject was withdrawn from the knee joint pain, one was withdrawn due to Meniere's syndrome, and two were unable to complete the 50% intervention time and exited. The remaining 22 OP subjects completed the intervention.

1.1.2 Control group selection

26 patients who were diagnosed as normal according to the aforementioned OP diagnostic criteria and who were willing to participate in the study, the age between the control group and the intervention group were no more than 5 years old.

1.2 Methods

1.2.1 Intervention method

Exercise interventions include: 1. Issuing a health education manual for exercise intervention with main content including the benefits of exercise for OP, the principles of exercise, precautions (anti-fall, etc.), and combination of exercise programs, etc.; distributing sports recording books; helping to select sports combinations; guiding sports and records; checking the movements from time to time and adding corrections. 2. At the beginning of the intervention, one concentration theory

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Author: Chunna Yang, female, associate chief nurse, undergraduate, deputy director of the outpatient department of Guangdong University of Foreign Studies, Email: 3181324151@qq.com

Corresponding author: Li Li, female, associate chief nurse, undergraduate, No.1 Intensive Care Unit of Department of Cardiac Surgery at Guangdong Provincial People's Hospital, Email: lili1974@163.com

lecture was given, and the content of the lecture was consistent with the contents of the instruction manual. 3 Formulating a sports program, combining the daily life of the subject, and selecting a combination of exercise (resistance exercise, aerobic exercise) according to their physical fitness and exercise habits; Among them, aerobic exercise includes: brisk walking, jogging, square dance, mountain climbing; and resistance sports include: squat, jumping, skipping.

Exercise time: continuous intervention for 12 months, 3-5 times a week, and the interval between two exercise intervals <2 days, each exercise about 30-45 minutes; exercise intensity is medium intensity; teaching subjects to test heart rate by themselves, and when they exercise the heart rate reaches 60% to 70% of the maximum heart rate (maximum heart rate =

220-age).

1.2.2 Evaluation of exercise intervention effect

Bone mineral ultrasonography was performed before and after the intervention to assess bone mineral density (BMD) changes.

1.2.3 Statistical method

Statistical analysis was performed by using statistical software SPSS 16.0 to compare the differences in bone mineral density before and after intervention.

2. Results

2.1 The baseline data of the two groups of subjects before intervention are shown in Table 1.

Table 1. Comparison of baseline data consistency before target intervention

Group	Number	Age	Height(cm)	Weight (kg)	BMD g/cm ²
Control	26	45.46±4.59	156.73±5.06	52.08±8.33	1506.96±58.33
Cases	22	50.00±3.95	156.28±3.70	53.09±10.26	1341.68±43.61
<i>t</i>		-4.436	0.422	-0.378	10.945
<i>P</i>		0.001	0.675	0.707	0.001

2.2 Comparison of bone mineral density after intervention in two groups of subjects

BMD after intervention and BMD before intervention were not significantly different between the two groups at 3 months, 6 months, 9 months, and 12 months after intervention. The

difference was not statistically significant. The extent of BMD reduction was lower in the group than in the control group, and the difference was statistically significant (*P* < 0.001), as shown in Table 2.

Table 2. Comparison of BMD after intervention in two groups of subjects (± s, g/cm²)

Number	After Intervention				
	3months	6months	9months	12months	
Control	26	1499.08±51.27	1501.62±54.31	1511.58±54.73	1511.08±55.26
Case	22	1336.32±54.72	1340.50±47.05	1338.59±37.39	1336.18±41.70
<i>t</i>		10.626	10.879	12.939	12.608
<i>P</i>		0.001	0.001	0.001	0.001

3. Discussion

When women enter the perimenopausal period, not only will bone loss occur due to age, but it will obviously accelerate after menopause. The bone mineral density of the lumbar vertebrae of 286 women aged 44-55 has been studied, and it is found that: healthy women have about 2.9-9.8% bone loss in the premenopausal period; and the second and third years after menopause, salt lost 6.4-13.8%; the first four or five years of women's menopause is the time of accelerated bone loss; and exercise is the main positive factor affecting bone mass, and

exercise mode, type of exercise, exercise time, etc. will have different effects on bone mass ^[1].

Studies found that postmenopausal women who use a combination of aerobic exercise, jumping and resistance training are better at preventing osteoporosis than women use a single exercise^[2,3].

The results of this study show that one-year resistance exercise plus aerobic exercise intervention can effectively reduce bone loss in perimenopausal women, similar to the findings of other studies ^[4]. Among the intervention subjects selected in this study, the average age of patients with osteoporosis was

50.00±3.95, which is at the age of accelerated bone loss. Although exercise intervention can delay bone loss, it does not keep bone mass to restore to the previous level. Modern studies have shown that the potential impact of mechanical load on bone mass in the growing season is greater than that of mature bone. For adults, exercise can prevent age-related loss of bone mass, causing improved mechanical properties, but not significantly increasing bone mass^[5]. Exercise intervention should cause a significant increase in bone mass, and it must be more than 1 year^[4]; and exercise intervention time can be longer if the individual differences are fully considered. But it is certain that proper exercise is important for the maintenance of bone density. In addition, for perimenopausal women, exercise can also slow bone loss due to reduced activity, which is beneficial to neuromuscular function, coordination and balance, and can reduce the risk of falls^[5].

For the future research it is recommended that to make up for the shortcomings of the current sample size and the self-reporting of the exercise situation, there is a need to use

large sample size and use of more accurate measurement methods, and verify the long-term effects of the intervention model.

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Treatment of Complex Stanford Type-B Aortic Dissection with Supra-aortic Arch Shunts and TEVAR

Hua Liu^a & Jun Zhang^a & Bin Liu^b & Ling Luo^a & Qunxian Zhang^a & Ye Yuan^a & Jing Wang^a

(a. Taihe Hospital of Shiyan City, Shiyan, Hubei 442000, P.R. China; b. Tongji Hospital at Huazhong Institute, Shiyan, Hubei 442000, P.R. China)

Abstract: Purpose: To investigate the clinical effect of combined Supra-aortic arch shunt combined with TEVAR in the treatment of complex Stanford B aortic dissection. **Method:** Retrospectively analysis the clinical data of 109 patients with complex Stanford type-B aortic dissection in thoracic and cardiovascular surgery of Taihe hospital in Aug. 2010 to Dec. 2016. Treating with aortic arch bypass combines with TEVAR method and traditional open chest aortic arch replacement plus stent elephant trunk, that is to make a comparative study of surgery done to analyze the efficacy of surgery and postoperative complications in patients. **Result:** 4 cases die of superior shunt (3.67%). One case has a type-A dissection of proximal end. Angle sign is in 2 cases (2%). Internal hemorrhage due to trauma is in 5 cases. Type I b is found in 1 case (5.1%), distal descending aorta again TEVAR. In 1 case of type II s, the internal leakage of the left subclavian artery disappears; 2 cases of II o, one year after operation, the internal leakage of CTA disappears. 1 case in Type III with small internal leakage is followed up continuously. Neurological complications occurred is in 10 cases (9.2%). Vascular restenosis (VR) is found in 2 cases (2%). Postoperative pulmonary infection occurs in 2 cases (1.83%). 5 Cases die after stent-assisted elephant trunk operation, and 1 case of Proximal inverse avulsion, 1 case of internal leakage, 13 cases of neurological complications, 3 cases of Vascular restenosis of bridging vessels and 14 cases of pulmonary infection. **Conclusion:** As Superior aortic arch shunt combines with TEVAR in the treatment of complex type B aortic dissection, the mortality rate, proximal avulsion after TEVAR, angle sign, internal leakage and pulmonary infection are low, long-TEVAR vascular patency is high, but there are still some neurological complications. This technique is worthy of clinical application and further study.

Key words: Complex Stanford type-B aortic dissection, arcus aortae, endovascular repair (EVR) of aortic dissection, Hybrid procedures

Introduction

Aortic dissection (AD), which is currently treated surgically, and has two types of surgical procedures: traditional open surgery and thoracic endovascular repair TEVAR. Because aortic dissection often involves the opening of the superior branch artery of the aortic arch, the traditional open surgery for the treatment of aortic arch lesions requires deep hypothermic circulatory arrest (DHCA) to put aortic arch replacement. Although cardiosurgical procedures and extracorporeal circulation techniques have been fully captured, the management of critical care in anesthesiology is mature and stable, and auxiliary equipment and drugs are being developed. However, the mature application of this technology can not be mastered or popularized by most hospitals, which has the characteristics of unbalanced development in the field of cardiac surgery in China. The current situation is one of complex and long-term surgery with many major trauma complications. The death rate of open

aortic arch surgery is reported to be as high as 7% to 17%. The incidence of complications of open surgery is closely related to the advanced age [1-4].

Non-complicated thoracic aorta covered with TEVAR has a small trauma and good results in the short and medium treatment [5]. However, for the dissections involving arcuate lesions, because of the complexity of anatomy, the morphology of the superior branch artery and lumen of the arch is varied, angled, bent and the anchorage area is too short, etc. The authors call those as difficult anchorage zone and the high-speed, high-pressure pulse flow in the aortic arch are the main causes of early or late failure in endovascular stenting. The anchorage area is located near the left subclavian artery and near type-Ia, type-II s, type-II o internal leakage, which is in a high risk [6-8]. At present, there is a lack of in-depth study on biomaterial properties of different parts, of the aortic arch, different curvature and different lesions of the vessel wall. After the stent is released, it could not be coated consistently with the aortic

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Author: The First Author Institute: Taihe Hospital of Shiyan City, Hubei Province (Affiliated Hospital of Hubei Medical College). The Corresponding Author: Zhang Jun (Taihe Hospital of Shiyan City, Hubei Province), E-mail: louvar@126.com.

wall in the lesion state, which can lead to the formation of the beak, internal fold, displacement and even rupture of the stents [9-12].

TEVAR is added to the chimney to extend the anchorage area while ensuring branch blood supply. There is a lower mortality rate compared with open surgery and hybrid surgery. However, the stroke rate remains noteworthy; "gutter" from a chimney graft resulting in a Type I proximal inner leakage, The Achilles heel of the technique [13,14], with acceptable short-term results and lack of effective long-term follow-up, has also become the Achilles heel of the technique [15]. In-situ fenestration does not require a pre-operative custom stent, which can be provided in case of emergency when branch vessels are opened. However, this technique requires frequent manipulation of the aortic arch, which can lead to adverse events such as neurological complications. After opening the window, we need to implant the branch stent again, which is difficult in technology and high in material cost [16]. There is a bright future and more complex operation technology in the clinical trial period for stents with branching and laminating [17]. Criado et al. 2002 [21] This paper reported the treatment of aortic arch lesions

by dissection and endovascular techniques. First reported by Haulon in 2014, 38 Cases of Multicenter Experience in Using TEVAR with Superior Bow Branch, Although the results of the technique were acceptable, the mortality rate was 13 per cent in high-risk populations and 16 per cent in stroke rates [18].

The superior aortic arch shunt was used to reconstruct the blood supply of the aortic arch branch after TEVAR. Through the combination of traditional and intracavitary surgical techniques, it can overcome the shortcomings of traditional open surgery, such as the large complications of trauma, and the difficulties faced by TEVAR alone. To expand and attach the scaffold to the relatively ideal anchoring area to reduce the incidence of beak, internal leakage and avulsion [19]. The clinical data of 109 cases of aortic dissection treated with supraarch shunt combined with TEVAR from August 2010 to December 2016 were analyzed retrospectively.

Information and Methodology

Clinical data of Complex Stanford Type-B Aortic Dissection

Category	Cases	Sex		Age (years, ±s)	Hypertension(mmHg±s)		Medical history					Interlayer staging		
		Male	Female		SP	DP	Hypertension	MCI	COPD	CD	Diabetes	RI	acute	chronic
superior aortic arch shunt	109	87	22	54.2±11.1	151±26	94±13	89	8	6	3	5	4	90	19
traditional open surgery	98	91	7	53 ±13	148±27	91±12	68	6	3	2	2	2	91	7
Chimney combined with TEAVR	36	30	6	52±9	156±28	89±17	30	3	1	2	1	1	31	5
TEVAR	48	40	8	58 ±13	145±27	93±18	33	5	2	1	2	1	40	8
Testing values		7.304 ^a		2.38 ^a	1.376 ^a	1.485 ^a	6.6 ^a	0.852 ^a	0.992 ^a	1.1 ^a	1.18 ^a	0.6 ^a	5.72 ^a	
P		0.068		0.069	0.25	0.218	0.086	0.837	0.8	0.77	0.75	0.89	0.12	

PS: SP: Systolic pressure

DP: Diastolic pressure

MCI: Multiple cerebral infarction

CD: Coronary disease

RI: Renal inadequacy

109 cases, 77 males and 32 females, aged 31 to 78 years (mean 54.2 years). All patients underwent CT angiography before operation to determine the location of aortic dissection, the involvement of aortic arch branches, the size of aneurysm and the condition of arterial approach. According to Mitchell's method, the aortic arch can be divided into four regions: z0 z1z2 and z3, according to the location of aortic dissection and the location of aneurysm. Zone Z0 includes ascending aorta to distal opening of the unnamed artery, zone Z1 including distal opening of the innominate artery to the distal end of the left common

carotid artery, z2 region including the distal opening of the left common carotid artery to the distal opening of the left subclavian artery, including the left clavicle. The Z4 region of descending aorta located 2 cm at the distal end of the inferior artery included 2 cases of descending aorta located below 2 cm distal to the left subclavian artery. 5 cases were located in Z0 area and 5 cases were located in Z1 area. 51 cases were located in Z2 area and 51 cases were located in Z3 area. 35 cases were located in Z4 area. See table 1.

Table 1. Basic Data of 109 Patients with Aortic Arch Superior Branch Bypass and TEVAR

	Number of cases		Number of cases
Age	56.4±7.3	Multiple cerebral infarction	34
Male	77	Chronic obstructive pulmonary disease and pneumoconiosis	18
Female	32	Coronary disease	21
Acute Stage	90	Aortic insufficiency	8
Chronic Phase	19	Diabetes	18
Z0 Area	2	Hypertension	87
Z1 Area	5	Renal inadequacy	9
Z2 Area	16	Abdominal aortic aneurysm and iliac artery aneurysm	3
Z3 Area	51	ASO	13
Z4 Area	35	Total number of cases	109

PS: ASO: atherosclerosis obliterans

The Z0 and Z1 regions choose de-branching technology, namely Debranch technology. The patients were anesthetized by intravenous inhalation, median sternum incision, partial branches of aortic arch were fully dissociated, the brachial vein, recurrent laryngeal nerve and thoracic catheter were protected, and heparinization of the whole body was observed. Lateral aortic forceps clamp partial ascending aorta, anesthetized to stabilize blood pressure and heart rate. The anterior wall of ascending aorta was opened longitudinally, the proximal end of ascending aorta and the posterior wall of ascending aorta were examined during the operation, and the dissection and hematoma formation were judged (if dissection was involved, ascending aorta replacement or total arch replacement was performed under cardiopulmonary bypass). Using TerUMO or MAQUET three-forked artificial vessels to bypass, the proximal end of the artificial blood vessel was first constructed into a hoodie-shaped shape. The anterior wall of the ascending aorta was sutured continuously with 4-0 prelene tapetum, and the distal end of the artificial vessel was clamped by pliers, and the lateral wall forceps of the aorta were slowly released. The three branches were anastomosed with the trunk of the head and the left

common carotid artery and the left subclavian artery respectively. Open the turret after full exhaust. Metal wire was used to locate the posterior edge of ascending aorta anastomosis in order to facilitate the complete isolation of dissection confirmed by TEVAR precise Anchorage.

The superior arch shunt was selected in Z _ 2 and Z _ 4 regions. Surgical incisions were made according to the target vessels of shunt. The left and right common carotid arteries (LCCA, RCCA) were exposed by oblique neck incision or neck thyroid incision, and the left and right subclavian artery (LSA, RSA) were exposed by left and right oblique subclavian incision or right oblique neck incision. Blood vessels were repaired with Gore-tex6~ 10 mm artificial blood vessels. End-to-end anastomosis and end-to-side anastomosis were performed. The occlusion time of carotid artery was less than 10 min. There were 3 cases of AA-BCT-LCCA, 4 cases of AA-BCT-LCCA-LSA, 4 cases of RCCA-LCCA, 11 cases of RCCA-LCCA-LSA, 1 case of RCCA-LCCAA-LAXA, 75 cases of LCCA-LSA, 4 cases of LCCA-LAXA, 7 cases of RAXA-LAXA. See table 2.

Table 2. Operation Mode of Supra Arching Shunt

Areas	Diversion Mode	Number of Surgeries (cases)	Percentage (%)
Z0 Area	AA-BCT-LCCA	1	
	AA-BCT-LCCA-LSA	1	

	Total	2	1.83%
Z1 Area	AA-BCT-LCCA	2	
	AA-BCT-LCCA-LSA	3	
	Total	5	4.59%
Z2 Area	RCCA-LCCA	4	
	RCCA-LCCA-LSA	11	
	RCCA-LCCAA-LAXA	1	
	Total	16	13.80%
Z3 Area	LCCA-LSA	44	
	LCCA-LAXA	3	
	RAXA-LAXA	4	
	Total	51	46.80%
Z4 Area	LCCA-LSA	31	
	LCCA-LAXA	1	
	RAXA-LAXA	3	
	Total	35	32.10%

PS: AA: Ascend Aorta

BCT: Brachiocephalic trunk

LCCA: Left Common Carotid Artery

RCCA: Right Common Carotid Artery

LSA: Left Subclavian Artery

LVA: Left Vertebral Artery

LAXA: Left Axillary Artery

RAXA: Right Axillary Artery

TEVAR method: right or left common femoral artery incision, The left radial artery was punctured and 6F radial artery sheath was inserted into the 5F pigtail catheter for ascending aorta angiography, and the dissection of the aortic dissection and superior arch branches were developed. The 6F sheath was inserted into the femoral artery, and the transposed guide wire was super-selected into the dissection cavity. The abdominal main routine radiography was performed, and the left anterior oblique position was 45-65° after the superhard guide wire was

exchanged. The aortic arch was fully expanded, no subtraction, and based on the bone images or in vitro labeling, fluoroscopically fed into a covered stenting delivery system, conventional sodium nitroprusside-controlled hypotension to 90/60mmHg, Rapid release of the covered stent, re-contrast angiography, clear stent position, the shunt blood vessels are unobstructed and there is no internal leakage, such as type I internal leakage, the spring is placed in the left subclavian artery opening. See Table 3.

Table 3. Data of 109 Cases of TEVAR Stent Implantation

Manufacturer	Tape of stent	Number of Inserting Pieces (pieces)	Percentage (%)
	(mm)		
Gore	28X150	3	
	31X100	3	

	31X150	5	
	34X100	4	
	34X150	4	
	34X200	30	
	37X200	4	
	40X200	5	
	Total	58	44%
Relay	32X28X180	9	
	34X28X180	7	
	34X30X145	10	
	Total	26	19.70%
Lifotech	28X24X160	2	
	29X16X160	2	
	30X26X160	4	
	32X28X160	7	
	34X28X180	20	
	28X28X80	10	
	24X24X80	3	
	Total	48	36.40%

Result

109 patients were treated with superior aortic arch shunt combined with TEVAR. The success rate was 100%, and 2 cases with moderate stenosis of the grafts were treated with axillary bypass graft (1 case) and left neck bypass graft (1 case). The patients were followed up for 9 months and 12 months, respectively, and followed up for the treatment of antiplatelet drugs. There were 4 deaths (3.67%, 4/109) and 1 case died of sudden cardiac arrest 3 hours after operation. One case had left massive hemothorax and 1 case had pericardial tamponade and died on the 8th day after operation. The reverse avulsion of aortic dissection was considered. One case developed acute myocardial infarction 1 week after operation. The cause of death was not related to the operative procedure, and the patient was complicated with coronary heart disease before operation. Neurological complications occurred in 3 cases (3%). One patient developed left temporal infarction 24 hours after operation. The symptoms were relieved after medication and

rehabilitation treatment. One case had severe follow - up 2 days after operation. the re - examination revealed moderate stenosis of right vertebral artery, unobstructed by bypass, and the symptoms disappeared after implantation of intra - vertebral stent. there was no recurrence of the disease .One patient developed dizziness and blackness in the right eye on 5th postoperative day. Angiographic findings suggested that bypass vessels were unobstructed and cured by vasodilator. Pulmonary infection occurred(PIO) in 2 cases (1.83%). All patients were treated with mechanical ventilation, delayed extubation, tracheotomy in 1 case. Anti-infection therapy was discharged 11 and 21 days after operation. One case (0.9%) received hemodialysis after operation with renal insufficiency. He recovered and left hospital after 11 days. One case (0.9%) of cervical hematoma was treated by debridement, and there was no bleeding in the anastomotic stoma. Hoarseness was found in 1 case (0.9%) and returned to normal after 6 months. 105 cases recovered and discharged. The patient was hospitalized for an average of 11 days.

Among 105 discharged patients, 7 cases lost their visits, and the remaining 98 cases were followed up regularly,

including general living conditions, symptoms and CT angiography data. The patients were followed up for 3 months to 2 years. CTA after TEVAR 7 days after TEVAR with proximal avulsion type A dissection(PATA), The ascending aorta replacement was performed in emergency cardiac surgery. After 3 months to 1 year, the CTA examination indicated that the artificial blood vessel and the covered stent were well applied without stenosis and internal leakage. Two cases (2%) had short and small beak sign(SSBS), and there were no serious adverse complications such as internal leakage(IL) and reverse avulsion after 2 years of follow-up. Internal fistula occurred in 5 cases (5.1%). One case suggested type Ib. The distal descending aorta was again cured by TEVAR. Case II type, endoperative leakage disappeared after embolization of left subclavian artery. In 2 cases (II0), the internal leakage of CTA was disappeared 1 year after operation. One case of type III, untreated. Seven patients with neurological symptoms(NS) were followed up for 2 years.

One patient with right frontal lobe infarction and motor dysfunction was discharged from hospital after rehabilitation. There were 5 cases of multiple lacunar infarction, including 3 months postoperation, 6 months, 9 months, 11 months and 14 months. There were 3 asymptomatic cases and 2 cases of blood theft from left subclavian artery. The patients presented with intermittent dizziness and were given relief by vasodilator therapy. One case developed TIA 16 months after operation. Angiographic findings suggested that bypass vessels were unobstructed and cured by vasodilator therapy. One patient developed severe left renal artery stenosis 12 months after operation and was cured by stent placement. One patient developed abdominal aortic aneurysm 2 years after surgery and was again treated with endovascular stent implantation. None of the patients had terminal death and could live normally after follow-up.

Category	Cases	Mortality rate	PATA	SSBS	IL	PIO	NS	VR
Superior aortic arch shunt	109	4	1	2	5	2	10	2
Traditional open surgery	98	12	0	0	0	9	5	2
Chimney combined with TEAVR	36	1	3	1	5	1	2	0
TEVAR	48	2	4	14	8	1	5	0
Testing values		7.502 ^a	7.034 ^b	24.2 ^b	6.818 ^b	7.286 ^b	1.795 ^b	0
P		0.047	0.03	0	0.033	0.05	0.616	1

PS, PATA: proximal avulsion type A dissection

SSBS: short and small beak sign

IL: internal leakage

PIO: Pulmonary infection occurred

NS: neurological symptoms

VR: Vascular restenosis

Discussion

For the complicated B-shaped interlayer in the difficult anchoring area, the chimney technology is adopted, and the "gutter" produced by the chimney shifting plant causes the proximal internal leakage of type I; and the incidence of stroke [13-15]. The technique of window opening is technically difficult, the incidence of nervous system complications and the cost of materials are high. There is a wide prospect and complicated operation technology for the stents with branching and lamination, which is still in clinical trial period [16-17]. Superior bow shunt combined with TEVAR to avoid DHCA, reduce thoracotomy, reduce paraplegia, surgical approach changed from trauma to minimally invasive. The superior arch shunt was used to reconstruct the blood supply of the aortic arch branches and to enlarge the anchorage area, i.e. to avoid the shortage of chimney and fenestrated technique, and to improve the success rate of endovascular repair [20]. According to the location of the aorta at the proximal end of the aortic dissection, the superior arc shunt

surgery was used to expand the anchorage area in different ways.

When the ascending aorta was involved in the Z0 region, the ascending aorta was replaced by open aortic arch to the distal end of the dissection, and the endovascular repair was performed by using an endovascular graft in the Z0 region. The aortic arch lesions involved all three branches of the arch. The standard procedure is to reconstruct the three superior branches of the arch with four-forked artificial blood vessels [20]. Debranch technique can be used for the Z0 dissection which involves the distal part of the ascending aorta and is healthy at the proximal end. In this paper, two cases were successfully operated without the use of the supraarch branch bypass under cardiopulmonary bypass (CPB). 1 cases in this center were applied to the simple type A aortic dissection using hybridization technique. The center of the ascending aorta was gradually reported for the treatment of dissection of Z0 area, which was more minimally invasive, but it was characterized by small samples and case reports. The long-term effect and follow-up were still not challenging for the treatment of Z0 area.

The Z1 area needs reconstruction of the left common carotid artery. The right common carotid artery bypass can be achieved. The vascular prosthesis can be placed under the skin or in front of the cervical vertebra. The 5-year patency rate of carotid artery bypass was 90%. There are also reports that the transposition of the left common carotid artery to the brachiocephalic artery has the advantage of improving the patency rate and reducing the risk of graft infection, but the disadvantage is that sternotomy is required^[16].

Most type B dissections and thoracic aortic aneurysms require the anchorage region to be selected for Z2. This area is primarily required to reconstruct the left subclavian artery. Early studies have shown that the left subclavian artery can be overlaid, but Riesenman et al^[17] In 112 patients, the probability of cerebral events occurring in patients with partial or complete coverage of the left subclavian artery was found (10. The overall incidence was significantly higher in this group of cases (4.5%). The European Valiant trial also reported a 9% incidence of post-subclavian infarction, compared to 0.8% after the reconstruction of the left subclavian artery.^[18] When the rupture or the proximal end of the aneurysm is located in the z2 area, the blood supply of LCCA needs to be reconstructed in order to obtain enough anchorage area. Common bypass methods are RCCA-LCCA and RCCA-LCCA-LSA bypass, RSA-LCCA and RSA-LCCA-LSA bypass.

When the proximal AD breach is in the z3 area. Reconstruction of LSA with left vertebral artery, incomplete Willis circle, left internal mammary artery supply after CABG and ipsilateral internal carotid artery occlusion by posterior circulation compensation, The common way is LCCA-LSA bypass. In order to increase the anchorage area as much as possible, the risk of Type I internal leakage can be avoided because the anchorage area is not enough for the re-bow shunt operation, or the use of chimney technology. The blood supply of LCCA and LSA was reconstructed in 51 patients with z3 area aortic lesions. LSA proximal reflux may result in Type I internal leakage, which can be eliminated by ligating LSA or coil embolization at the proximal end. We routinely block the proximal end of the LSA and the vascular anastomoses with double 10-wire in order to prevent competitive blood flow after superior bow shunt surgery. There was no II-type internal leakage at 1 year follow-up in 1 month, 3 months and 6 months after operation.

In this group, 35 cases of aortic dissection were located in Z4 area, 13 cases were dissecting left subclavian artery opening, 4 cases were hematoma involved left common carotid artery opening, 7 cases were aortic perforative change around left subclavian artery orifice. The above 24 cases were covered with traditional TEVAR stent on the unhealthy aortic intima. There were 8 cases of severe angulation of arch. Traditional TEVAR was at risk of stent displacement, beak sign and type I internal

leakage. We routinely performed supraarch shunt and revascularization for difficult Anchorage area, and the patients were followed up well after operation. The right subclavian artery originated from descending aorta in 3 cases. The dissecting break was close to the opening of right subclavian artery, and the right subclavian blood supply should be reconstructed by RCCA-RSA bypass.

Using the right subclavian artery as a blood supply can also avoid the complications of right common carotid artery anastomosis. In this group, RSA-LCCA-LSA was used in 24 patients with RCCA-LCCA-LSA accessory pathway. RCCA-LCCA-LSA was used in 5 patients with RCCA-LCCA.

The key to the success of TEVAR is to make sure the bypass vessel is unobstructed. Superior arc shunt technique is not difficult, and anastomotic bleeding may occur in the early stage, bypass blood vessels are not free and so on. One case appeared one week later local hematoma, mostly anastomotic bleeding, was treated by debridement. No serious blockage of bypass vessels was found during follow-up. Moderate stenosis of bridging vessels was found in 2 cases, and the bypass vessels were unobstructed in the other 103 cases. The authors emphasize the technique of anastomosis, choose the diameter match artificial blood vessel anastomosis, the length is appropriate, avoid the blood vessel too short to pull the anastomosis. To ensure the patency of long-term bypass vessels, anti-platelet aggregation drugs should be used as early as possible to prevent restenosis. Cerebral infarction occurred in 1 cases (6 months after operation). CT examination showed that the bypass vessels were unobstructed.

The incidence of neurologic complications was 9.2 and the incidence of type I internal leakage was 4.8%, similar to 4% reported by Ren et al.^[22-23] The proximal Anchorage area was selected on the relatively straight and healthy aortic wall through the supraarch shunt. The incidence of the central beak sign was found to be 2%, the beak was short, small and untreated, and no internal leakage or inverse avulsion was caused after 2 years of follow-up. The incidence of proximal avulsion dissection after TEVAR was 1%. Of course, this was related to the form of aortic wall, the severity of the lesion, the choice of operation time, the type of stents and the operative skills of the surgical patients. The technique of superior aortic arch shunt combined with TEVAR has safety and practicability, and still needs to be studied in a large sample.

Conclusion

Supra-aortic arch shunts provide a relatively healthy proximal anchorage area, making TEVAR less likely to have mortality, post-operative proximal avulsion, angle sign, and internal leakage in the treatment of complex B aortic dissections. The patency rate of vascular patency is high in the recent and middle term, but there are still some neurological complications.

This technique is worthy of clinical application and further study.

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Diagnostic Value of CT Angiography and MR Angiography for Intracranial Aneurysms

Yunli Yan^a & Tingting Wang^b & Yongjun Tao^a

(a. Department of Radiology, Wenzhou Hospital of Chinese Medicine, Wenzhou, Zhejiang 325000, P.R. China; b. Department of Dermatology, Wenzhou Yongjia County Hospital of Chinese Medicine, Wenzhou, Zhejiang 325401, P.R. China)

Abstract: *Objective:* To explore the application value of CT angiography and MR angiography in the diagnosis of intracranial aneurysms. *Methods:* 96 patients with suspected intracranial aneurysms who were admitted to our hospital from May 2015 to May 2018 were enrolled. All patients underwent CT angiography and MR angiography, and compared with DSA results. *Result:* ①In the DSA examination, there were 31 cases of arterial malformation and 65 cases of aneurysm; ②DSA examination of the largest diameter of the tumor (6.53 ± 4.28) mm, tumor neck width contrast (9.92 ± 3.46) mm and CT angiography (6.42 ± 4.05) mm, (9.37 ± 3.24) mm no significant difference ($P > 0.05$), and There were significant differences in MR angiography (5.13 ± 3.03) mm and (8.25 ± 1.97) mm ($P < 0.05$); ③The accuracy of CT angiography was 89.83%, sensitivity was 94.87%, and specificity was 80.00%, which was significantly higher than MR angiography 72.03%, 85.90%, and 45.00% ($P < 0.05$). *Conclusion:* In the diagnosis of intracranial aneurysms, CT angiography and MR angiography are effective examination methods. The former is more accurate and has higher application value, which is worthy of clinical application.

Key words: intracranial aneurysm, CT angiography, MR angiography

Introduction

The abnormal localization of the cerebral artery lumen causes an aneurysm-like protrusion, which is called an intracranial aneurysm [1]. An intracranial aneurysm occurs mostly at the bifurcation or main branch of the cerebral artery, according to the statistics, the proportion of the aneurysm in the anterior segment of the cerebral artery is about 80% [2]. Patients with intracranial aneurysms generally have no typical symptoms. Before the aneurysm is about to rupture, 40%-60% of patients will have aura symptoms such as increased intracranial pressure and oculomotor nerve paralysis; After the aneurysm rupture, it will cause subarachnoid hemorrhage, resulting in systemic symptoms such as elevated body temperature, elevated blood pressure, and gastrointestinal bleeding. If the aneurysm bleeds into the frontal lobe of the cerebral hemisphere, it may lead to hemiplegia, dementia, and aphasia. Equal neurological symptoms, if the aneurysm involves the trigeminal nerve and the oculomotor nerve, the patient will have localized localization of the cranial nerve [3-5]. Therefore, early diagnosis of intracranial aneurysms and the development of targeted treatment programs are very important. CT angiography and MR angiography are common methods for diagnosing intracranial aneurysms. In order to compare the diagnostic effects of the two methods, 96 patients with suspected intracranial aneurysms were retrospectively reviewed.

1. Materials and methods

1.1 General Information

96 patients with suspected intracranial aneurysms admitted to our hospital were selected as subjects. Inclusion criteria: ① Symptoms such as headache, vomiting, blurred vision, disturbance of consciousness, and hemiplegia; ② The onset time is no more than 7 days; ③ Family informed consent; ④ Approved by the Ethics Committee. Exclusion criteria: ① Combined with severe liver and kidney disease; ② Combined with severe heart disease; ③ Combined with systemic infectious diseases; ④ A history of iodine allergy exists. Among them, there were 52 males and 44 females, aged 23-72 years, with an average of (48.2 ± 22.6) years old.

1.2 Methods

1.2.1 CT angiography

An angiographic examination was performed using a GE Optima 680 1.5T multi-slice CT machine, the operation is as follows: routine plain scan, pre-test calculation of contrast agent, with a high-pressure syringe through the right elbow vein 4-5ml / s bolus 50-100ml iohexol 350 mgI / ml, delayed 8-12s, after intensive scanning, The scanned image is transmitted to the workstation, the image is processed by the subtraction software, the skull image is subtracted, the three-dimensional image is created by using the VR, MIP, and SDD methods, and the original image is combined to analyze and diagnose the patient's condition.

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Author: Yunli Yan, Department of Radiology, Wenzhou Hospital of Chinese Medicine.
Tingting Wang, Department of Dermatology, Wenzhou Yongjia County Hospital of Chinese Medicine.
Yongjun Tao, Department of Radiology, Wenzhou Hospital of Chinese Medicine.

1.2.2 MR angiography

An angiographic examination was performed using the GE Signa HDxt 1.5T MR machine. The procedure was as follows: After routine sequence scanning, 20 ml of contrast agent Gd-DTPA was injected through the cubital vein at an injection rate of 3 ml/s, and a 3D TOF sequence scan was performed to transmit the acquired images. To the workstation, the VR and SSD methods were used to reconstruct the intracranial blood vessels, and the images were analyzed in multiple planes and at multiple angles.

1.2.3 DSA inspection

Inspection with Siemens C-arm illuminator, The operation is as follows: The Seldinger method was used to puncture the right femoral artery. 2D-DSA was used to perform bilateral and lateral scanning of the bilateral internal carotid arteries. According to the actual situation, the oblique position scan was performed to inject the femoral artery at a speed of 3-4 ml/s. 90ml contrast agent iohexol 350 mgI / ml, using 3D-DSA rotary angiography technology to collect data, the first rotation speed is 40° / s, obtain the positioning piece, after reset, infusion of 3ml / s vertebral artery or internal carotid artery 18ml The contrast agent was maintained at a rotation speed of 40°/s for a second rotation with a delay of 0.5 s. The cerebral angiography was performed, and the acquired image was reconstructed three times by the workstation to analyze the image.

1.3 date statistical analysis

The data collected by statistical software SPSS19.0 was used for analysis. The maximum diameter of the aneurysm and the width of the neck were normal measurement data. The test method was t test, and $\pm s$ was used. The diagnostic accuracy, sensitivity and specificity were Counting data, the test method is chi-square test, the application rate is expressed, $P < 0.05$ indicates that the data difference between groups is statistically significant.

2. Results

2.1 DSA inspection results analysis

DSA examination showed that there were 31 cases of arterial

Table 3. Comparison of the maximum diameter and neck width of the tumor in two methods [$\pm s$, mm]

methods	number of tumors	maximum diameter of the tumor	neck width contrast of the tumor
DSA inspection	78	6.53 \pm 4.28	9.92 \pm 3.46
CT angiography	82	6.42 \pm 4.05	9.37 \pm 3.24
MR angiography	89	5.13 \pm 3.03*	8.25 \pm 1.97*

Note: * $P < 0.05$ compared with DSA examination

2.4 CT and MR angiography application value analysis

The accuracy, sensitivity and specificity of CT angiography

malformation, including 40 cases of right occipital artery malformation, 2 left temporal lobe artery malformations, 11 left occipital parietal artery malformations, and right iliac occipital lobe. There were 10 arterial malformations, 7 left occipital lobe artery malformations, 5 right frontal parietal artery malformations, and 4 left frontal parietal artery malformations.

2.2 CT angiography, MR angiography results analysis

In CT angiography, 29 patients had arterial malformations, a total of 36, 67 patients were aneurysms, a total of 82, compared with DSA results, see Table 1; MR angiography, 24 patients were There were 29 arterial malformations, and 72 patients were aneurysms, a total of 89. The results were compared with those of DSA. See Table 2.

Table 1. CT angiography and DSA results comparison [n (%)]

CT angiography	DSA inspection		total
	positive	negative	
positive	74	8	82
negative	4	32	36
total	78	40	118

Table 2. MR angiography and DSA results comparison [n (%)]

MR angiography	DSA inspection		total
	positive	negative	
positive	67	22	89
negative	11	18	29
total	78	40	118

2.3 CT and MR angiography for aneurysm examination analysis

Regarding the maximum diameter of the tumor and the width of the neck, the difference between CT angiography and DSA was small, and it was not statistically significant ($P > 0.05$); MR angiography was significantly smaller than DSA, and the difference was statistically significant ($P < 0.05$), as shown in Table 3.

were significantly different from those of MR angiography ($P < 0.05$). See Table 4.

Table 4. Comparison of diagnostic accuracy, sensitivity, and specificity of the two methods [%]

methods	number of cases	accuracy	sensitivity	specificity
CT angiography	78	89.83 ([74+32]/118)	94.87 (74/78)	80.00 (32/40)
MR angiography	78	72.03 ([67+18]/118)	85.90 (67/78)	45.00 (18/40)
χ^2	-	10.265	4.629	26.133
P	-	<0.05	<0.05	<0.05

3. Discussion

The specific pathogenesis of intracranial aneurysms is still unclear. The majority of scholars believe that the reasons for the formation of aneurysms include: (1) Congenital factors: residual embryonic blood vessels, defects in congenital arterial development, and fissures in the middle of the wall. Under hemodynamics, it will impact the wall of the cerebral artery and induce aneurysm^[6]. (2) acquired factors: the proportion of infectious aneurysms is small. According to the survey, the prevalence rate is only 4%. Systemic infections will form small embolisms, which are retained in the cerebral artery weekend branch or arterial bifurcation. Finally, aneurysms are formed; intracranial infections such as meningitis and intracranial abscess can damage the arterial wall and induce aneurysms^[7]. Atherosclerosis of the arterial wall is the main cause of aneurysm, which not only occludes the arterial vascular occlusion, but also causes the vessel wall to deform, and it will reduce the elastic fiber of the arterial wall and weaken its tolerance. 40-60 years old is the high incidence of arteriosclerosis. Therefore, the probability of developing an intracranial aneurysm in elderly patients is extremely high^[8-9]. Surgery and external stimuli cause the brain to be injured, and directly involve the arterial wall, which in turn causes an aneurysm.

Although the intracranial aneurysm is not a true tumor, its harm can not be underestimated. Once the aneurysm ruptures, it will cause a variety of symptoms. In severe cases, coma, paralysis, and even some patients will die. DSA is known as the gold standard for diagnosis of cerebrovascular disease^[10], but it is invasive operation, and has strong radiation, high cost of examination, difficult to promote in the clinic. CT and MRI are two common imaging techniques in clinical practice. Both techniques have higher resolution, do not use contrast agents, solve radiation hazards, and are inexpensive, and are suitable for disease screening^[11]. However, there is some controversy in the medical field regarding the diagnostic value of the two techniques in intracranial aneurysms. The results of this study show that CT angiography is superior to MR angiography, mainly because: ① CT angiography has high sensitivity, and the application reconstruction software can clearly display the vascular anatomy and surrounding anatomical details; ②MR angiography has a small excitation angle, which is susceptible to turbulence in vascular turn and bifurcation, resulting in local signal loss^[12] In addition, there is a missed diagnosis, and its background tissue inhibition is poor, and the imaging quality is uneven. The diagnosis effect in small aneurysms or hemangiomas with complicated blood flow is not satisfactory.

In summary, compared with MR angiography, CT angiography has advantages in the diagnosis of intracranial aneurysms, which is worth learning.

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The Study of the Value of Gastric Enhanced CT and Ultrasonography in the Diagnosis of Gastric Stromal Tumor Patients

Sunxi Pan & Lifang Yang & Xuhui Li

(a. Wenzhou Hospital of Traditional Chinese Medicine, Wenzhou, Zhejiang 325000, P.R. China ; b. Wenzhou Hospital of Integrated Traditional Chinese and Western Medicine, Wenzhou, Zhejiang 325000, P.R. China)

Abstract: *Objective:* to evaluate the diagnostic value of gastric enhanced CT and contrast-enhanced ultrasonography in gastric stromal tumors (GIST). *Methods:* the clinical data of 93 patients with gastric stromal tumors admitted in our hospital from April 2017 to May 2018 were retrospectively analyzed. All the patients were confirmed by operation and pathology. The patients were examined by enhanced gastric CT and dual contrast echocardiography (Double contrast-enhanced ultrasonography, DCUS). To compare the diagnostic value of two diagnostic methods. *Results:* the total detectable rate of gastric enhanced CT (96.77%) and DCUS (97.7%). The positive rate of 0.05.DCUS localization was significantly higher than that of gastric enhanced CT (98.92%, 87.10%, $P < 0.05$). There was no significant difference between the two methods in the qualitative diagnosis rate of low risk type (89.29% vs 89.29%) and high risk type (86.49% of gastric enhancement CT 94.59%) ($P > 0.05$). *Conclusion:* the diagnostic ability of the two imaging methods in the diagnosis of gastric stromal tumors is similar, but the localization ability of DCUS in gastric stromal tumors is better than that of gastric stromal tumors. Strong CT, may be the first choice for diagnosis of gastric stromal tumors.

Key words: gastric stromal tumor, gastric enhanced CT, ultrasound double contrast, diagnostic value

Introduction

Gastric stromal tumors are the tumors that occur in the gastric mesenchymal tissue, which account for about 65% of mesenchymal tumors in the digestive tract^[1], the biological behavior and clinical manifestations of which have the characteristics of benign and malignant tumors. However, that patients usually do not have any specific symptoms in the early growth of tumor tissue or just be focused on abdominal pain is easy to be ignored by them, which can lead to missed diagnosis. When diagnosed, the gastric stromal tumors often reach the middle and late stages and missed the best treatment period. Therefore, choosing the appropriate diagnostic method to improve the early detection rate is of great significance to improve the prognosis quality of patients' life. Conventional ultrasound, MR and other imaging exploration techniques were used before, but the early diagnosis accuracy was low, and it was difficult to distinguish it from gastric malignant tumors^[2]. With the development of imaging technology, new imaging techniques such as gastric enhancement CT and DCUS are gradually applied to the early diagnosis of gastric tumors. That this study analyzed the results of the two diagnostic methods for gastric stromal tumors and compared with the results of surgical

pathology diagnosis based on the above discussion which was designed to provide new insights into the clinical diagnosis of gastric stromal tumors. We selected patients admitted to our hospital for gastric stromal tumors from April 2017 to May 2018, and retrospectively analyzed the cases. See below for details.

1. Materials and methods

1.1 General Information

We retrospectively analyzed 93 cases of gastric stromal tumor patients which were admitted to our hospital and Wenzhou City Hospital of Integrated Traditional Chinese and Western Medicine and the First Affiliated Hospital of Wenzhou Medical University from April 2017 to May 2018, which included 55 males and 38 females, aged 39-78 years, with a median age of 58.50 years.

Inclusion and exclusion criteria: ① All patients were confirmed by surgical pathology as gastric stromal tumor, and they all underwent gastric enhancement CT and DCUS examination before surgery. Clinical symptoms at admission of them include abdominal pain, upper abdominal discomfort, vomiting, obstruction, gastrointestinal bleeding. And the physical examination found gastric space occupying lesion; ② Patients with other serious illnesses and mental illnesses were

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Author: Sunxi Pan, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.

Xuhui Li, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.

Lifang Yang, Department of Radiology, Wenzhou Hospital of Integrated Traditional Chinese and Western Medicine.

excluded. All patients signed an informed consent form with the hospital before the diagnosis.

1.2 Methods

Stomach enhanced CT: The instrument is GE Optima CT680, LightSpeed VCT and SIEMENS Definition AS 64-slice spiral CT machine. Allow the patient to fast for 6 hours and to drink 1000 mL of water 30 minutes before the test, and keep the supine position after holding the breath. Intramuscular injection of 10 mg anisodamine (Shanxi Jinxin Shuanghe Pharmaceutical Co., Ltd., National Medicine Zhunzi H14022414) 10 min before scanning, and allow the patient drink 500 mL water again. First, a 256-slice non-contrast CT scan was performed, followed by rapid injection of 50-100 mL Uween in the elbow vein (Bayer Pharmaceuticals Co., Ltd. Guangzhou Branch, National Drug Standard J20100027).CT scans were performed 30s, 60s, and 180s after injection. It is then reconstructed with a layer thickness of 3 mm and a matrix of 512×512.The scan range is from the right phrenic top to be suppressed downwards to the level of the iliac crest. Then observe possible lymph node metastasis and peritoneal disseminated lesions to observe possible lymph node metastasis and peritoneal disseminated lesions.

DCUS: The instrument is HITACHI EZU-MT28-S1 and PHILIPS iu22 Doppler color ultrasound diagnostic instrument. The probe frequency of which is 4.0~5.5MHz.First let the patient keep the fasting for more than 8h, and then we examd the 0.5mg atropine (Hubei Kelun Pharmaceutical Co., Ltd., Guoji Zhunzi H42021159) injected30 minutes ago to inhibit the situation of gastrointestinal motility. First, routined two-dimensional ultrasound examination of liver, gallbladder, stomach, spleen, pancreas, bilateral kidneys, pelvic cavity, and abdominal lymph nodes. Then let the patient take orally gastric contrast agent, we dynamically observed the contrast agent through the lower esophagus, cardia in real time. After oral administration, the patient was replaced with a sitting position, a supine position, and a right anterior position. Then we checked the fundus, corpus, stomach angle, antrum, pylorus, duodenal bulb.

After determining the location of the gastric stromal tumor, 50 mL of Sonovi (Swiss Bracco International B.V, registration number: H20110350) was quickly injected into the patient's

elbow vein, and the image dynamics were recorded and stored in real time. After observing the tumor information, the abdominal organs such as liver, gallbladder and pancreas were scanned.

The imaging features of the tumor site, volume, morphology, border, internal echo, distant location and lymph node metastasis were analyzed after gastric enhancement CT and DCUS scanning.

Two high-grade imaging doctors in our hospital read the film together without knowing it, then negotiated and unified when they had different opinions.

Surgical pathology confirmed: Cut the patient's lesion tissue for microscopy. Immunohistochemical examination revealed that positive expression of KIT protein indicates the presence of gastric stromal tumors. Then we classified of gastric stromal tumor grades based on tumor volume and microscopic images: ① tumor diameter ≥ 5cm, mitotic number ≥ 2 /10 high power microscope field is high-risk type; ② tumor diameter <5cm, mitotic number < 2 /10 high power field vision is low-risk type.

1.3 Observation indicators

Observe the diagnostic accuracy of the two methods.

1.4 date statistical analysis

Use SPSS 20.0 for statistical analysis of data. Measurement data is represented by ().The count data is expressed in n (%),Chi-square test. P ≤ 0.05 indicates that there is a significant difference in statistical results.

2. Results

2.1 pathological examination results

Surgical pathology revealed that 38 lesions were located in the corpus, 25 in the bottom of the stomach, 17 in the Tuen Mun, and 13 in the pylorus. Immunohistochemical examination revealed 37 patients with high-risk gastric stromal tumors and 56 patients with low-risk type.

2.2 Comparison of gastric enhancement CT and DCUS detection rates

Gastric enhanced CT and DCUS were able to clearly show the lesions. The total detection rate of gastric-enhanced CT was not statistically significant compared with DCUS, P>0.05. See Table 1.

Table 1. Comparison of the detection rates of gastric-enhanced CT and DCUS on gastric stromal tumors [n(%); n=93]

Methods	The detection rate	Missed diagnosis rate
Stomach enhanced CT	90 (96.77)	3 (3.23)
DCUS	91 (97.85)	2 (2.15)
χ^2	0.206	0.206

P

0.650

0.650

Note: There were 3 missed diagnosed cases of gastric-enhanced CT. The reason was that the patient's gastric wall tension was small and the gastric cavity filling was poor, resulting in the small volume of lesions not detected. DCUS had 2 cases of missed diagnosis due to obesity and thick accumulation of subcutaneous fat layer, causing significant attenuation behind the ultrasound signal, and the lesion diameter <1cm, which is difficult to display.

2.3 Comparison of positioning, qualitative diagnosis rate of gastric enhanced CT and DCUS

The diagnosis rate of DCUS was higher than that of

gastric-enhanced CT, $P < 0.05$. There was no statistically significant difference between the two methods in the diagnosis of low-risk and high-risk types, $P > 0.05$. See Table 2.

Table 2. Comparison of the positioning, qualitative diagnosis rate of gastric-enhanced

Methods	Positioning diagnosis rate				Qualitative diagnosis rate		
	Gastric body	Bottom of the stomach	cardia	pylorus	Total diagnosis rate	Low risk type	High risk type
Stomach enhanced CT	31 (81.58)	24 (96.00)	15 (88.24)	11 (84.62)	81 (87.10)	50 (89.29)	32 (86.49)
DCUS	37 (97.37)	25 (100.00)	17 (100.00)	13 (100.00)	92 (98.92)	44 (78.57)	35 (94.59)
χ^2	/	/	/	/	10.007	0.774	0.210
P	/	/	/	/	0.002	0.379	0.647

Note: Stomach-enhanced CT showed that 12 cases of extra-thickness gastric stromal tumors were not positioned correctly, 9 cases were misdiagnosed as liver-stomach masses, the source could not be determined, and 3 cases were misdiagnosed as exogenous masses of left hepatic lobe; DCUS showed a case of an extraluminal gastric stromal tumor misdiagnosed as an extragastric mass.

3. Discussion

Gastric stromal tumor is a submucosal tumor that is very common in the gastrointestinal tract. It originates from gastric stromal cells and has malignant potential, and non-directional differentiation accounts for about 2% of all gastrointestinal tumors [3]. Clinical studies suggest that [4], the biological behavior of gastric stromal tumors is very complicated, it is very difficult to clearly distinguish between benign and malignant. Therefore, some scholars have proposed [5] to identify the risk of gastric stromal tumor recurrence or metastasis by replacing the benign and malignant assessment of gastric stromal tumor with low-risk and high-risk qualitative diagnosis. However, regardless of the size of gastric stromal tumors, there is a risk of distant metastasis, so early diagnosis is the main means to improve the quality of patients' life. In the past, when gastric stromal tumors were diagnosed, traditional gastroscopes and gastro-intestinal angiography were usually used. Because gastric stromal tumors are mostly located in the muscle wall of the stomach, it is often impossible to find small-volume lesions by gastroscopy. Even if a tumor is detected, it may be impossible to confirm the diagnosis due to the limited depth of the biopsy. However, barium meal imaging has limitations in showing internal liquefaction, necrosis, and extraluminal growth, and it is impossible to accurately determine the surrounding tissue and organ infiltration, distant metastasis of the lesions, etc. Therefore, it is necessary to explore a more clear and accurate method to

improve the diagnostic accuracy of gastric stromal tumors.

The results of this study show that: The total detection rate of gastric-enhanced CT (96.77%) had not statistical significance compared with DCUS (97.85%), $P > 0.05$. The diagnosis rate of DCUS (98.92%) was higher than that of gastric-enhanced CT (87.10%), $P < 0.05$. There were no statistically significant differences between the two methods in the low-risk type (89.29% for gastric-enhanced CT, 78.57% for DCUS) and high-risk type (86.49% for gastric-enhanced CT and 94.59% for DCUS), $P > 0.05$. The cause analysis is: ① CT scan range is wide, and the imaging time is short, the image quality is high. The gastric stromal tumors show uniform density or slightly lower density under CT plain scan. The large volume or malignant tumors show uneven density. Some lesions showed marginal eggshell-like calcification or coarse granular calcification, and there were necrosis, hemorrhage, and cystic changes [6]. An enhanced scan after injection of the contrast agent revealed a moderately uniform or uneven enhancement of the mass, and no enhancement of the necrotic liquefaction site. Multi-planar reconstruction can clearly observe the positional relationship between the lesion and the stomach wall. The observation of different angles can evaluate the tumor growth characteristics, internal structure, size, and surrounding tissue and organ infiltration, thus improving the accuracy of qualitative diagnosis. However, the disadvantage of enhanced CT is that it is poorly located for large-volume mass and extra-thickness gastric

stromal tumors, and it is difficult to detect small-volume lesions; ②DCUS is a method of combined ultrasound angiography under the premise of oral UCA, which can effectively reduce the interference of gas in the gastrointestinal cavity, so that the gastric cavity is in a state of filling, through the analysis of blood perfusion, Combined with the characteristics of "negative development" of the venous phase of gastric stromal tumors and "positive development" of the arterial phase [7], the position of the lesion can be accurately displayed, and the biological behavior of the lesion can be judged. Therefore, the correct diagnosis rate of DCUS is higher than that of gastric enhancement CT. In qualitative diagnosis, because the blood supply of tumors growing in the stomach wall is much richer than normal tissue, especially high-risk gastric stromal tumors, the blood supply is higher than the surrounding normal stomach wall tissue. Therefore, DCUS still has certain value in qualitative diagnosis.

In summary, the two imaging methods have similar diagnostic abilities in the detection rate of gastric stromal tumors and the progression of disease progression, but DCUS has better localization ability for gastric stromal tumors than gastric enhanced CT, which can be used as the first choice for diagnosis of gastric stromal tumor.

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Applied Value of MR Diagnosis in Traumatic Bone Contusion of Knee Joint

Hailong Ye & Yongjun Tao

(Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine, Wenzhou, Zhejiang 325000, P.R. China)

Abstract: Objective: To explore the diagnostic value of MR in traumatic bone contusion of knee joint. **Methods:** The clinical data of 104 patients with traumatic bone contusion of knee joint treated in our hospital from August 2017 to July 2018 were retrospectively analyzed. All patients were diagnosed by CT and MR, and the accuracy and imaging manifestations of the two diagnostic methods were compared. **Results:** CT diagnosis showed 3 extensional injuries, 8 dashboard injuries, 19 axial rotational injuries and 45 pinch injuries. MR reexamination which happened 5 days after injury found that 104 knee joint traumatic bone contusion patients had 8 extensional injuries, 12 dashboard injuries, 20 axial rotational injuries and 53 pinch injuries. The diagnostic accuracy of MR was higher than that of CT and $P < 0.05$. CT showed that there was no positive fracture change in all patients with traumatic bone contusion of knee joint. MR showed that T1WI was localized long abnormal low signal, T2WI was abnormal high signal and short-time reversal recovery sequence was obvious high signal change in acute stage of traumatic bone contusion of knee joint. In patients with occult bone injuries, T1WI is a linear low-signal band with blurred boundary and surrounded by low-signal edema band. In T2WI, low-signal fine fracture line can be seen, and the surrounding edema band is high signal, or slightly low, slightly high signal and high-low mixed signal with blurred boundary. Short-time reversal recovery sequence is wide-range high signal with blurred fracture line. **Conclusion:** MR diagnosis can improve the accuracy of judging the condition of traumatic bone contusion of knee joint, and the examination range is comprehensive. It has important significance for early diagnosis and targeted treatment, and has clinical application value.

Key words: knee joint traumatic bone contusion, MR diagnosis, application value

Introduction

Knee joint is the most complex and leveraged joint in human skeletal structure. Its load can reach 2-3 times the weight^[1], so it is also the most vulnerable part of the whole body joints. Traumatic bone contusion of knee joint is a common occult bone injury in clinic. The cortex and cartilage tissue of the patients are normal, but it can induce complications such as bone marrow hemorrhage, trabecular micro-fracture and knee edema, which have adverse effects on the daily life of the patients. The first step of rehabilitation treatment is to adopt effective diagnostic methods to confirm the condition of the patients. But X-ray and CT examinations taken in clinical practice have limitations^[2]; In recent years, X-ray and MR have been widely used in the diagnosis of occult bone injury in orthopaedics because of its advantages of clear imaging and high resolution^[3]. Based on the above discussion, this study discussed the diagnostic value of MR in traumatic bone contusion of knee joint. A retrospective analysis method was adopted. 104 patients with traumatic bone contusion of knee joint admitted to our hospital from August 2017 to July 2018 were selected as research samples. CT and MR were used to diagnose the patients, and the accuracy and image of the two methods were compared. For details, see below.

1. Data and methods

1.1 general information

The clinical data of 104 patients with traumatic bone contusion of knee joint admitted to our hospital from August 2017 to July 2018 were retrospectively analyzed. There were 65 males and 39 females, aged 18-64 years, with a median age of 40.91 years. The causes of injury were as follows: 15 cases of heavy injury, 24 cases of sport injury, 29 cases of trample injury, 36 cases of car accident. The average time from injury to treatment was 6-72 hours (37.95 ± 3.05) h, the knee injury level was 27 cases of grade I, 35 cases of grade II, 42 cases of grade III.

Inclusion and exclusion criteria: 1. All patients had a history of knee joint trauma, and the fracture of knee joint was excluded by X-ray examination. With the consent of the patients, the diagnosis of knee joint traumatic bone contusion was confirmed by arthroscopy. The clinical manifestations were knee joint dysfunction, local pain, edema, unable to bear weight and difficulty in walking; 2. Elimination of pregnancy and walking. Female breast-feeding patients, with malignant tumors, mental illness, heart disease, liver and kidney organic lesions, poor tolerance. Informed consent was obtained from all patients before the diagnosis.

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Author: Hailong Ye, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.
Yongjun Tao, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.

1.2 Methods

CT plain scan: The patient maintains supine position. The knee joint of the patient is scanned with GE Optima 680 64-slice spiral CT machine. The parameters are set as follows: slice thickness is 0.6-8.0 mm, matrix is 512 x 512. After scanning, the image is transmitted to the workstation for processing.

MR diagnosis was performed 5 days after injury. The instrument was GE Signa HDxt 1.5T MR imager with 4.0mm slice thickness, 1.0mm interval, 398*512 matrix and 18cm scanning field. The cross-sectional, sagittal, coronal, fat suppression and proton density weighted imaging scans of the knee joint were performed. The cross-sectional scanning sequence was T1WI and T2WI, with parameters of repetition time of 0.55 s, echo time of 19 ms, repetition time of 3.5 s and echo time of 99 MS respectively. The sequence of fat suppression plus proton density weighted imaging was PDWI, repetition time of 3 s and echo time of 24 ms. Diagonal sagittal T1WI and PDWI fat suppression scans were found in patients with suspected cruciate ligament injury symptoms.

1.3 Observation indicators

The accuracy and imaging findings of the two diagnostic methods were compared. Two radiologists with more than 10 years' seniority in our hospital read the films by double-blind method and gave diagnostic opinions. The opinions were not agreed at the same

time.

1.4 Statistical analysis of data

The data were analyzed by SPSS 20.0 and the enumeration data were expressed by n (%) and Chi-squared test. $P \leq 0.05$ indicates significant differences in statistical results.

2. Results

2.1 Accuracy comparison between two methods

The results of arthroscopy in 104 patients were 10 extensional injuries, 13 instrument panel injuries, 24 axial rotational injuries and 57 pinch injuries.

There were no obvious meniscus injury, knee joint bone contusion, ligament injury and cartilage injury in CT diagnosis, but the clinical symptoms of 51 patients were consistent with knee joint traumatic bone contusion. The final diagnosis was 3 extensional injury, 8 instrument panel injury, 19 axial rotation injury and 45 pinch injury. MR was performed 5 days after injury. In 104 cases of knee joint traumatic bone contusion, 8 cases were extensional injury, 12 cases were instrument panel injury, 20 cases were axial rotation injury, 53 cases were pinch injury. The diagnostic accuracy of MR was higher than that of CT and $P < 0.05$. See Table 1.

Table 1. Comparison of two methods in the diagnosis of traumatic bone contusion of knee joint (n;%; n=104)

Method	Extensional injury	Instrument panel injury	Axial rotational injury	Pinch injury	Missed diagnosis rate	Misdiagnosis rate	Accuracy rate
CT	3	8	19	45	17 (16.35)	12 (11.54)	75 (72.12)
MR	8	13	21	53	9 (8.65)	0 (0.00)	95 (91.35)
χ^2	/	/	/	/	/	/	10.029
<i>P</i>	/	/	/	/	/	/	0.002

2.2 Imaging findings

CT showed that all patients with traumatic bone contusion of the knee have no positive fracture, MR showed that the T1WI of patients with traumatic bone contusion in knee joint was a localized long-term abnormal low signal, and the T2WI was a long corresponding abnormal high signal, and the short-time reversal recovery sequence was significantly high signal change. The patients with occult bone injury were T1WI with low signal band and blurred boundary, and there was low signal edema band around it; T2WI visible low signal fine fracture line, peripheral edema with high signal, or for slightly lower, slightly higher signal, mixed signal, boundary blur; short time reversal recovery sequence is a wide range high signal and the fracture line is blurred.

3. Discussion

Knee joint bears more external force, so it is the part with higher probability of injury. Bone contusion refers to bleeding caused by external force of knee joint accompanied by minor bone trabecular fracture and bone marrow edema, but the cortex and cartilage tissue can still be completely preserved. Clinical

investigation and research show that falls, heavy objects and traffic accidents are the high-risk factors leading to traumatic bone contusion of the knee joint, and the incidence is increasing in recent years^[4]. Early diagnosis of clinical symptoms of patients is of guiding value in choosing appropriate treatment and avoiding adverse consequences caused by improper treatment. Therefore, it is of great significance to adopt appropriate methods to detect bone contusion. In the past, X-ray and CT scan were often used in clinical diagnosis, but they could not show the specific symptoms of bone contusion, and the limitations were obvious. In recent years, the progress of magnetic resonance technology has made it a widely used chemical imaging method in clinical applications. It can generate signals by radio frequency pulses using the characteristics of spin motion of nuclei and obtain clear images on computers. In addition, MR is highly sensitive to the changes of water molecules, with accurate location, high resolution and accuracy. It is valuable for early diagnosis of bone contusion to show the injury of knee joint and its adjacent structures.

The results of this study showed that CT diagnosis of 3 cases of extensional injury, 8 cases of dashboard injury, 19 cases of axial

rotation injury and 45 cases of pinch injury. MR reexamination 5 days after injury found that 104 cases of knee joint traumatic bone contusion patients had 8 cases of extensional injury, 12 cases of dashboard injury, 20 cases of axial rotation injury, 53 cases of pinch injury. The diagnostic accuracy of MR was higher than that of CT and $P < 0.05$. CT showed no positive fracture changes in all patients with knee joint traumatic bone contusion. MR showed that T1WI in acute stage of knee joint traumatic bone contusion was localized long abnormal low signal; T2WI was abnormal high signal of long corresponding shape; short reversal recovery sequence was obvious high signal change. In patients with occult bone injuries, T1WI is a linear low-signal band with blurred boundary and surrounded by low-signal edema band. In T2WI, low-signal fine fracture line can be seen, and the surrounding edema band is high signal, or slightly low, slightly high signal and high-low mixed signal with blurred boundary. Short-time reversal recovery sequence is wide-range high signal with blurred fracture line. The causes were as follows: (1) Wang Xiaojuan^[5] believed that knee joint trauma bone contusion had unique imaging manifestations in MR scan. The internal medicine of epiphysis or metaphyseal cancellous bone showed abnormal maps, reticular and patchy signals, while T1WI showed low signal, low mixed signal, slightly high or high signal, and short time. The inversion recovery sequence and PDWI show high signal and blurred boundary. (2) MR is a non-invasive imaging technology that can display cartilage structure, ligament and tendon in vivo, and has the function of multi-level and arbitrary orientation imaging. When scanning knee joint, it can display fine structure along the direction of ligament or tendon more accurately, so as to improve the diagnosis. Accuracy; (3) Traumatic bone contusion of knee joint usually has a close relationship with the accessory structure of knee joint. Dong Yanjiang^[6] and others believe that bone contusion often does not occur alone, but often combined with other joint accessory structures, cartilage and bone injuries, such as tendon, meniscus, ligament, etc., which is also the cause of pain felt by patients after knee joint injury. The patients with bone contusion often indicate other structural injuries of the knee joint, which requires more careful observation in terms of medial and lateral collateral ligaments, anterior and posterior cruciate ligaments and meniscus. In addition, the MR imaging manifestations of traumatic bone contusion of knee joint are very typical and easy to detect, but we still need to pay attention to differentiate it from the following pathological changes: (1) Bone marrow edema: Yu Conglin^[7] and others classify bone marrow edema into ischemic, reactive and mechanical according to the etiology. Traumatic bone contusion of knee joint belongs to mechanical disease. As a result of bone marrow edema, pain in patients is caused by increased intraosseous pressure caused by high fluid volume in bone marrow, which should be distinguished from other two types. (2) Occult fracture: This kind of fracture is different from bone contusion. Most of the MR

manifestations are linear low signal shadows which are separated from bone cortex in large bone contusion^[8]. However, MR is difficult to distinguish between bone contusion and displacement and occult fracture without separation. It is often misdiagnosed as occult bone injury. Clinical diagnosis can be made through trabecular bone or cortical integrity; Identification of integrity and continuity. (3) Remaining red bone marrow: Most of the marrow of normal adults is yellow bone marrow, but because of some pathological changes, when the bone marrow needs to increase hematopoietic function, the yellow bone marrow will be reversed to red one. This reversal form is mainly diffuse uniform or isolated, island fusion. It is easy to be misdiagnosed as bone contusion by MR. In order to improve the accuracy of MR diagnosis. Detailed investigation is needed in clinical diagnosis.

In conclusion, MR diagnosis can improve the accuracy of judging the condition of knee joint traumatic bone contusion, and the examination scope is comprehensive. It has important significance for early diagnosis and targeted treatment, and has clinical application value.

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Sensitivity and Specificity Analysis on MR and CT in the Diagnosis of Craniocerebral Trauma

Kaitai He & Yongjun Tao

(Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine, Wenzhou, Zhejiang 325000, P.R. China)

Abstract: To compare the results of CT and MR in the diagnosis of craniocerebral trauma. **Methods:** 197 patients with craniocerebral trauma admitted from September 2016 to June 2018 were retrospectively analyzed. The sensitivity and specificity of the two methods were compared by CT and MR. **Results:** There was no significant difference in the total detection rate of brain injury between CT (92.39%) and MR (90.36%) ($P > 0.05$). The sensitivity of MR to epidural and subdural hematoma (100.00%), axonal injury (100.00%), brain contusion (100.00%) and subarachnoid hemorrhage (100.00%) was slightly higher than that of CT (95.24%, 94.74%, 95.00%, 92.31%), $P < 0.05$. The specificity of the two methods for epidural or subdural hematoma, axonal injury and cerebral contusion was 100.00%. The specificity of MR for subarachnoid hemorrhage (100.00%) was slightly higher than that for CT (98.06%), with no statistical significance ($P > 0.05$). The sensitivity of CT to skull fracture (84.21%) was higher than that of MR (50.00%) ($P < 0.05$). The specificity (100.00%) was not statistically significant between two methods ($P > 0.05$). **Conclusion:** Both methods have high specificity in the diagnosis of craniocerebral trauma, but MR can be used in the diagnosis of epidural and subdural hematoma, axonal injury and cerebral contusion in craniocerebral trauma. The diagnostic sensitivity of subarachnoid hemorrhage is higher than that of CT, and the sensitivity of CT in the diagnosis of skull fracture is higher than that of MR. Therefore, the combination of CT and MR can be used in clinical diagnosis to improve the diagnostic accuracy.

Key words: CT, MR, diagnosis of craniocerebral trauma, sensitivity, specificity

Introduction

Craniocerebral trauma is a common clinical traumatic disease. The injury site varies from person to person, and the clinical manifestations and severity of the disease varies among patients. If the result of craniocerebral trauma is light, it may left behind many kinds of sequelae, severe cases may endanger the patients lives^[1]. Due to the frequent traffic accidents in China and the high proportion of deaths caused by acute craniocerebral trauma, the rapid and effective diagnosis in the early stage of injury and the targeted treatment within the limited time window of treatment are the essential measures to improve the survival rate of patients and the quality of prognosis. With the application of imaging technology such as CT and magnetic resonance (MR), it has brought great help to the qualitative diagnosis of craniocerebral trauma. However, there are differences between the two diagnostic techniques in judging the specific symptoms of craniocerebral trauma. Therefore, the comparison of CT and MR results in the diagnosis of craniocerebral trauma can provide more accurate guidance for clinical diagnosis and treatment^[2]. On the basis of the above statements, this study retrospectively analyzed 197

patients with craniocerebral trauma admitted from September 2016 to June 2018 in our hospital. CT and MR were respectively adopted to compare the sensitivity and specificity of the two methods (see below).

1. Materials and methods

1.1 Subjects and Criteria

A total of 197 patients, 108 males and 89 females with craniocerebral trauma admitted from September 2016 to June 2018 were retrospectively analyzed. The age of patients ranged from 19 to 76 years (median age, 46.50 years). The causes of injuries included 51 accidental injuries, 57 falling injuries and 89 traffic accident injuries. The specific injury types were confirmed by surgical pathology, including 42 cases of epidural or subdural hematoma, 38 cases of axonal injury, 40 cases of cerebral contusion, 39 cases of subarachnoid hemorrhage, and 38 cases of skull fracture. Glasgow coma scale was performed on admission to assess patients' eye, verbal and motor responses. According to this, craniocerebral injury was graded, including 42 cases of severe injury (13~15 points), 86 cases of moderate injury (9~12 points), and 69 cases of mild injury (2~8 points).

Inclusion and Exclusion Criteria: (1) All the selected

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Author: Kaitai He, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.
Yongjun Tao, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.

patients showed clinical symptoms such as dizziness, headache, nausea and vomiting, and unclear consciousness. CT was taken within 3 hours of admission and MR diagnosis was performed within 24 hours. And all patients were treated by surgery, and the results were compared with the results of surgery. (2) All patients received basic treatments such as dehydration, maintenance of water-electrolyte and acid-base balance, reduction of intracranial pressure, brain protective agent, vitamin C and so on [3]. (3) Patients with brain tumor hemorrhage, congenital coagulopathy and a history of mental illness are unqualified. Before the diagnosis, all patients' family members signed the informed consent with the hospital.

1.2 Methods

CT: GE Optima 680 64-slice spiral CT was used for cranial top to bottom scanning. The parameters were set as follows: tube voltage was 120kV, tube current was 150mA, scanning field was 250mm x 180mm, the thickness of the skull base section and the intersection gap are both 5 mm and the thickness of the skull top section and the intersection gap are both 10 mm. Iohexol contrast agent (General Electric Pharmaceutical Shanghai Co., Ltd., NMPN H20000596) was used for routine scanning. The obtained image was then uploaded to the workstation for reconstruction, including multiplanar recombination, maximum density projection and volume rendering.

MR: Magnetic resonance examinations were performed using GE Signa HDxt 1.5T scanner. The MR imaging protocol consisted of a T1 - weighted Fluid-Attenuated Inversion Recovery sequence (repetition/echo time/number of excitations, 2261 ms/9.7 ms/1; field of view, 24×19.2 mm; matrix, 320×256 mm; band width, 25 kHz); T2 - weighted fat-suppression sequence (repetition time/echo

time/number of excitations, 3500ms/111ms/1; field of view, 24×24 mm; band width, 25 kHz; section thickness, 4.0 mm; intersection gap, 0.5 mm); T2 - weighted Fluid-Attenuated Inversion Recovery sequence (repetition/echo time/ time interval (TI) /number of excitations, 8600 ms/126 ms/2100 ms/1; field of view, 24×24 mm; matrix, 288×192 mm; band width, 31.2 kHz); T2 - weighted gradient echo sequence (repetition/echo time/number of excitations, 500 ms/15 ms/1; field of view, 24×24 mm; matrix, 256×192 mm; band width, 15.61 kHz; section thickness, 6.0 mm; intersection gap, 1.0 mm; flip angle, 20°) and echo planar imaging sequences of diffusion weighted imaging (repetition/echo time/number of excitations, 600 ms/100 ms/2; field of view, 24×24 mm; matrix, 128×128 mm; band width, 250 kHz). The patient was in a supine position.

1.3 Outcome Measures

The images were screened and analyzed by two experienced imaging physicians in our hospital, and the consensus was made when there were different opinions. Then the sensitivity and specificity of CT and MR diagnosis of craniocerebral trauma were calculated and compared.

1.4 Statistical analysis

Statistical analysis was performed using SPSS 20.0. Enumeration data are represented by n (%). All data were statistically analyzed using chi-square test. $p < 0.05$ was considered statistically significant.

2. Results

2.1 The detection rate of the two methods was compared with the results of surgical verification

The total detection rate of CT and MR for craniocerebral trauma was not statistically significant ($P > 0.05$). See Table 1.

Table 1. comparison of the total detection rate between CT and MR for craniocerebral trauma (n; %; N = 197)

Methods	epidural and subdural hematoma (n=42)	axonal injury (n=38)	cerebral contusion (n=40)	arachnoid parenchyma (39)	skull fracture (n=38)	Total detection rate
CT	40	36	38	36	32	182 (92.39)
MR	42	38	40	39	19	178 (90.36)
χ^2	/	/	/	/	/	0.261
P	/	/	/	/	/	0.609

2.2 Comparison of the sensitivity and specificity of the two methods to specific syndromes of craniocerebral trauma

Compared with CT, MR was more sensitive to epidural and subdural hematoma, axonal injury, cerebral contusion and subarachnoid hemorrhage ($P < 0.05$). The specificity of

both methods for epidural or subdural hematoma, axonal injury and cerebral contusion was 100.00%. The specificity of MR for subarachnoid hemorrhage was slightly higher than that of CT, and the comparison was not statistically significant ($P > 0.05$). The sensitivity of CT to skull fracture

was higher than that of MR ($P < 0.05$), and the specificity of CT and MR to skull fracture was not statistically significant ($P > 0.05$). See Table 2.

Table 2. Comparison of sensitivity and specificity between CT and MR for specific symptoms of craniocerebral trauma (n; %)

Methods	epidural and subdural hematoma (n=42)		axonal injury (n=38)		cerebral contusion (n=40)		arachnoid parenchyma (39)		skull fracture (n=38)	
	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity
CT	95.24	100.00	94.74	100.00	95.00	100.00	92.31	98.06	84.21	100.00
MR	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	50.00	100.00
χ^2	4.876	/	5.402	/	5.128	/	7.998	1.959	26.509	/
P	0.027	/	0.020	/	0.024	/	0.005	0.162	0.000	/

3. Discussion

At present, CT is still the preferred method of examination for the diagnosis of acute craniocerebral trauma [4]. However, with the continuous upgrading of MR technology, the scanning speed is getting faster and faster, and it has the advantages of multi-parameter and multi-directional imaging. Therefore, the diagnostic value of MR for craniocerebral trauma has been clinically confirmed and recognized [5]. The results of this study showed that the total detection rate of CT and MR for craniocerebral trauma (CT 92.39%, MR 90.36%) was not statistically significant ($P > 0.05$). The sensitivity of MR to epidural and subdural hematoma (100.00%), axonal injury (100.00%), cerebral contusion (100.00%) and subarachnoid hemorrhage (100.00%) was slightly higher than that of CT (95.24%, 94.74%, 95.00%, 92.31%), $P < 0.05$. But the sensitivity of CT to skull fracture (84.21%) was higher than that of MR (50.00%), $P < 0.05$. For epidural or subdural hematoma, axonal injury, skull fracture and cerebral contusion, the specificity of the two methods was 100.00%. And the specificity of MR for subarachnoid hemorrhage (100.00%) was slightly higher than that of CT (98.06%). The reasons may be as follows: (1) Examining epidural hematoma by CT is mostly based on morphological indicators. In some patients, CT images of convex lens or spindle-shaped intracranial hematoma, epidural and subdural mixed hematoma are easily misdiagnosed as epidural hematoma, while MR can clearly and objectively display the dural structure [6]. In the acute subdural hematoma, especially in the super-acute patients, the subdural hematoma is mostly liquid, showing equal T1 and long T2 signal greater than cerebrospinal fluid and high signal in fluid attenuated inversion recovery sequence. CT diagnosis of epidural hematoma presents uniform high density signal, but there are several atypical manifestations. First, the density of the hematoma was uneven, which may be related to the acute

hemorrhage without coagulation, serum spillover, and the subdural infiltration of cerebrospinal fluid through ruptured arachnoid membrane [7]. The second case is fusiform hematoma. The active hemorrhagic mass did not disperse in time, which compressed brain tissue. The third atypical presentation is the enlargement of the ipsilateral ventricles of the hematoma. It may be because the ipsilateral interventricular septum is rapidly compressed by the hematoma, resulting in ipsilateral ventricular obstruction. And a small amount of hematoma due to skull volume effect and skull artifacts can also lead to CT missed diagnosis. It is clear that acute subdural hematoma presents as arcuate high signal in MR fluid attenuation inversion recovery sequence. (2) MR-weighted imaging technique can not only detect focal ischemia caused by small vessel rupture, but also detect hematoma signals around axonal injury lesions and non-hemorrhagic lesions of axonal injury, so it is more sensitive to axonal injury. It is also applicable to small subarachnoid hemorrhage and small hematoma caused by cerebral contusion [8], while CT is less sensitive to small hematoma and clinical diagnosis is prone to misdiagnosis. (3) Due to the low signal performance of the skull, MR is less sensitive to skull fractures, which makes it difficult for MR to accurately judge according to indirect signs [9], resulting in misdiagnosis or missed diagnosis. Therefore, in the clinical diagnosis, it is necessary to combine the vital signs data of the patients to make comprehensive judgments. If necessary, CT and MR combined detection should be used to improve the detection rate of skull fractures.

In summary, both methods have high specificity in the diagnosis of craniocerebral trauma. However, the value of MR in the diagnosis of epidural and subdural hematoma, axonal injury, brain contusion and subarachnoid hemorrhage of traumatic brain injury is higher than that of CT, and CT is more sensitive than MR in qualitative diagnosis of skull fracture. Therefore, MR can be preferred in clinical diagnosis,

and CT and MR combined diagnosis should be taken when necessary to improve the accuracy of diagnosis.

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Clinical Value of MR Diffusion Weighted Imaging in the Differential Diagnosis of Benign and Malignant Vertebral Compression Fractures

Qing Xia & Yongjun Tao & Shenghao Ye

(Department of Radiology, Lihongqiao Hospital, Wenzhou traditional Chinese Medicine Hospital, Wenzhou, Zhejiang 325000, P.R. China)

Abstract: *Objective:* To evaluate the value of MR routine scanning and diffusion-weighted imaging (DWI) in the diagnosis of benign and malignant vertebral compression fractures. *Methods:* Sixty-eight patients with vertebral compression fracture admitted in our hospital from February 2016 to August 2017 were selected as study subjects. All patients were examined by MR routine scanning and diffusion-weighted imaging. The results of diagnosis were analyzed retrospectively. *Results:* (1) Among 68 patients (84 vertebral bodies), 37 cases were diagnosed as malignant by operation and pathology (46 vertebral bodies) and 31 cases were diagnosed as benign (38 vertebral bodies); (2) In MR routine scanning, Emax ($224.08 \pm 17.94\%$), ES ($9.72 \pm 0.63\%$) of malignant patients were higher than benign ($161.24 \pm 12.46\%$), ($7.16 \pm 0.74\%$), and TTP ($42.38 \pm 1.95\text{s}$) was significantly lower than those in benign ($50.38 \pm 2.86\text{s}$) ($P < 0.05$). (3) In the DWI scanning, the signal-to-noise ratio (SNR) (4.04 ± 2.13) and the signal intensity ratio (3.79 ± 2.63) of malignant patients were significantly higher than that of benign patients (1.42 ± 0.45), (0.24 ± 0.34) ($P < 0.05$). (4) The diagnostic accuracy of DWI scanning was 92.86%, sensitivity was 95.65%, specificity was 89.47%, significantly higher than that of MR routine scanning (75.00%, 84.78%, 63.16%), $P < 0.05$. *Conclusion:* Compared with MR routine scanning, DWI is more helpful in differentiating benign and malignant vertebral compression fractures, and is worthy of clinical application.

Key words: benign and malignant vertebral compression fracture, MR routine scanning, MR diffusion weighted imaging

Introduction

Fracture caused by compression of the vertebral body after external force is known as vertebral compression fracture^[1]. According to the different causes of vertebral compression fracture, it can be divided into vertebral benign compression fracture, vertebral malignant compression fracture. The former is caused by trauma, osteoporosis, while the latter is caused by tumor metastasis^[2-3]. Long-term compression of vertebral nerve can not only cause severe pain in patients, but also lead to vertebral instability and affect normal activities^[4]. Therefore, treatment timely is important to maintain the normal life of patients. There are differences in the treatment of benign and malignant fractures, so it is necessary to choose the appropriate method for diagnosing, identifying the type of fracture, and rationally developing a treatment plan. Magnetic resonance is a common method for diagnosing diseases in orthopedic surgery. Sixty-eight patients with vertebral compression fractures were selected for the purpose of analyzing the diagnostic results of MR routine scanning and DWI scanning. The specific reports are as follows.

1. Materials and methods

1.1 Subjects and Criteria

Sixty-eight patients with vertebral compression fracture treated in our hospital were selected as subjects, including 45 males and 23 females, aged from 21 to 72 years (average age, 46.3 ± 23.8 years). Inclusive criteria: (1) The clinical symptoms of all patients were in line with the relevant diagnostic criteria in The Guide to Clinical Diagnosis and Department of Orthopedics^[5]; (2) The patient was diagnosed by surgical pathology; (3) The patient had a clear consciousness and voluntarily signed the informed consent; (4) The study was approved by the ethics committee. Exclusion Criteria: (1) Combined with other orthopaedic diseases; (2) Combined with severe heart disease, brain organic diseases, liver and kidney functional diseases; (3) Combined with blood system diseases; (4) There are surgical contraindications; (5) Mental disorders.

1.2 Methods

MR routine examinations: GE 1.5T (Signa HDxt) superconducting magnetic resonance imaging was used to carry out sagittal scan on the spine and surrounding soft tissue,

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Author: Qing Xia, Wenzhou traditional Chinese Medicine Hospital. Yongjun Tao, Wenzhou traditional Chinese Medicine Hospital. Shenghao Ye, Wenzhou traditional Chinese Medicine Hospital.

including spin-echo T1WI, fast-spin echo T2WI and inversion recovery sequence T2WI scanning. At the same time, axial T2WI scan was performed on the diseased vertebral.

DWI examinations: The DWI/ SSH-EPI was used to conduct spinal sagittal scan on patients, collecting 8-18 layers of images and selecting three diffusion sensitivity coefficients ($b_0=0$ s/mm², $b_1=200$ s/mm² and $b_2=400$ s/mm²). The collected images were sent to the workstation to reconstruct the ADC diagram.

All images collected were analyzed by two experienced physicians. The results of the surgical pathology examination shall prevail.

1.3 Outcome Measures

(1) After MR routine scanning, the peak enhancement percentage (E_{max}), peak arrival time (TTP) and enhancement slope (ES) were calculated.

(2) After DWI scanning, signal-to-noise ratio and signal intensity were recorded.

(3) The diagnostic accuracy, sensitivity and specificity of MR routine scanning and DWI scanning were calculated. Accuracy = (number of true positive vertebral bodies + number of true negative vertebral bodies)/total number × 100%; Sensitivity = number of true positive vertebral bodies / (number of true positive vertebral bodies + number of false negative vertebral bodies) × 100%; Specificity = number of true positive vertebral bodies / (number of true negative vertebral bodies + number of false positive vertebral bodies) × 100%. Benign vertebral body is negative patient, and malignant vertebral body

is positive.

1.4 Statistical analysis

Statistical analysis was performed using SPSS19.0. The normal measurement data was expressed as $\pm s$, and the t-value test was performed, while count data was represented by rate and statistically analyzed using chi-square test. $p < 0.05$ was considered statistically significant.

2. Results

2.1 Analysis of surgical pathology

Surgical pathological examination showed that among 68 patients with vertebral compression fractures, there were 31 benign patients (38 vertebral bodies), including 17 cases of fractures caused by trauma, 14 cases of fractures caused by osteoporosis, and 37 cases of malignant cases (46 vertebral bodies), including 10 cases of tuberculosis-induced fractures, 21 cases of metastatic tumor-induced fractures, 2 cases of eosinophilic granulomatosis-induced fractures, and 4 cases of myeloma-induced fractures.

2.2 Contrastive analysis of dynamic enhancement data between benign and malignant subjects in MR routine scanning

In MR routine scanning, there were 26 cases of benign vertebral compression fracture (31 vertebral bodies) and 42 cases of malignant vertebral compression fracture (53 vertebral bodies). The dynamic enhancement data of benign and malignant patients are shown in Table 1.

Table 1. Comparison of MR dynamic enhanced scan data between benign and malignant [$\pm s$]

Patient type	Number of vertebral body(a)	E _{max} (%)	TTP (s)	ES (%)
Benign	31	161.24±12.46	50.38±2.86	7.16±0.74
Malignant	53	224.08±17.94	42.38±1.95	9.72±0.63
t	-	16.099	13.009	14.802
P	-	<0.05	<0.05	<0.05

2.3 Signal-to-noise ratio and signal intensity ratio of benign and malignant subjects in DWI scanning

In the DWI scanning, there were 30 cases of benign vertebral compression fracture (36 vertebral bodies) and 38 cases of malignant vertebral compression fracture (48 vertebral bodies). Among the benign fracture patients, 10 vertebral bodies

showed low signal, 23 vertebral bodies showed equal signal, and 3 vertebral bodies showed high signal. In patients with malignant fractures, 48 vertebral bodies showed high signal. The signal-to-noise ratio and signal intensity of benign and malignant patients are shown in Table 2.

Table 2. Comparison of signal-to-noise ratio and signal intensity ratio of benign and malignant in DWI scanning [$\pm s$]

Patient type	Number of vertebral body (a)	Signal-to-noise ratio	Signal intensity ratio
Benign	36	1.42±0.45	0.24±0.34

Malignant	48	4.04±2.13	3.79±2.63
t	-	7.712	8.573
P	-	<0.05	<0.05

2.4 Diagnostic value analysis of two methods

In MR routine scanning, there were 39 true positive vertebral bodies, 24 true negative vertebral bodies, 14 false positive vertebral bodies, and 7 false negative vertebral bodies. The diagnostic accuracy, diagnostic sensitivity and diagnostic specificity were 75.00% [(39+24)/84], 84.78% [39/(39+7)] and 63.16% [24/(24+14)], respectively. In the DWI scanning, there

were 44 true positive vertebral bodies, 34 true negative vertebral bodies, 4 false positive vertebral bodies and 2 false negative vertebral bodies with a diagnostic accuracy of 92.86% [(44+34)/84], a diagnostic sensitivity of 95.65% [44/(44+2)], and a diagnostic specificity of 89.47% [34/(34+4)]. The differences between the groups were statistically significant (P<0.05), as shown in Table 3.

Table 3. Comparison of diagnostic accuracy, sensitivity, and specificity of the two methods [%]

Examination method	Number of vertebral body (a)	Accuracy	Sensitivity	Specificity
routine MR scan	84	75.00	84.78	63.16
DWI scan	84	92.86	95.65	89.47
χ^2	-	11.825	6.693	11.158
P	-	<0.05	<0.05	<0.05

3. Discussion

Vertebral compression fracture is a common disease in orthopedics, and trauma is an important cause of fracture. Generally, the fracture can be judged from the two aspects of post-injury symptoms and functions. In terms of symptoms, if there is obvious local edema, purple subcutaneous congestion and severe pain, indicating that patient has a high probability of fracture^[6]. In terms of functions, the main symptoms are lower back pain, which can affect standing, walking and even paralysis^[7-8]. Older patients with vertebral compression fractures are often caused by osteoporosis, even under the action of tiny external forces. Malignant fractures are caused by partial destruction of pedicle and paravertebral soft tissue by distant metastasis of malignant tumors.

Currently, there are many imaging methods for clinical diagnosis of fracture. MRI has a high resolution of soft tissue and is capable of multi-axis imaging, which can sensitively display the signal changes in the compressed vertebral body. Therefore, accurate diagnosis can be achieved in most benign and malignant vertebral compression fracture^[9-10]. In this study, the dynamic enhanced MR scanning data of malignant patients was significantly different from that of benign patients, indicating that MR routine scanning has certain practical value. However, MR routine scanning has a limited role in the diagnosis of vertebral compression fractures caused by

multiple myeloma. The clinical manifestations of these patients are basically the same as those of osteoporotic fractures, so it is easy to be misdiagnosed. In addition, it is difficult to differentiate benign fractures with lumps and malignant perivertebral soft tissue masses^[11]. MR diffusion weighted imaging is a new non-invasive functional imaging technology. The diffusion capacity of water molecules varies with the microenvironment. The basic principle of DWI imaging is to add a gradient pulse on each side of the 180° pulses of conventional sequence to identify benign and malignant fractures by observing the diffusion of water molecules^[12]. In this study, the signal-to-noise ratio and signal intensity ratio of malignant patients with DWI scanning were significantly different from those of benign patients, and the diagnostic accuracy, sensitivity and specificity of DWI scanning were superior to MR routine scanning, suggesting that MR-DWI scanning had more advantages.

In summary, MR diffusion-weighted imaging has high application value in the diagnosis of benign and malignant vertebral compressive fracture, which is worth while of commending and reference.

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The Value of Magnetic Resonance SWI Sequence Imaging in Differential Diagnosis of Simple Cerebral Hemorrhage and Brain Tumor Hemorrhage

Xuhui Li^a & Lifang Yang^b & Quanyi Zhang^a

(a. Radiology, Wenzhou Chinese Medicine Hospital, Wenzhou, Zhejiang 325000, P.R. China; b. Radiology, Wenzhou hospital of integrated traditional Chinese and western medicine Wenzhou, Zhejiang 325000, P.R. China)

Abstract: *Objective:* to investigate the value of magnetic resonance magnetic sensitivity weighted imaging (SWI) sequence in differential diagnosis of simple cerebral hemorrhage and brain tumor hemorrhage. *Methods:* the clinical data of 153 patients with intracerebral hemorrhage admitted in our hospital from August 2016 to July 2018 were retrospectively analyzed, including 77 cases of simple cerebral hemorrhage and 76 cases of brain tumor hemorrhage. All the patients were examined by enhanced MR scan with T1WI/T2WI sequence and SWI sequence imaging. To observe the differential diagnosis of cerebral hemorrhage and brain tumor hemorrhage by SWI. *Results:* the diagnostic rate of SWI was higher than that of enhanced MR, $P < 0.05$. But the diagnosis rate of both methods is lower. The diagnostic rate of SWI combined with enhanced MR was higher than that of MR and SWI, $P < 0.05$. *Conclusion:* in summary, on the basis of conventional MR scan, combined with SWI sequence imaging can improve the accuracy of differentiating simple intracerebral hemorrhage from brain tumor hemorrhage.

Key words: magnetic resonance magnetic sensitivity weighted imaging, simple cerebral hemorrhage, brain tumor hemorrhage, differential diagnosis

Introduction

Brain tumor hemorrhage is a common clinical symptom of cerebral hemorrhage, when patients have massive hemorrhage, the hemorrhage can completely cover up the parenchymal part of the tumor, which is easy to be misdiagnosed as simple cerebral hemorrhage, which has an impact on the implementation of clinical treatment program. In recent years, with the advancement of imaging technology, imaging techniques such as CT and MR have been widely used, and the correct rate of differential diagnosis of brain tumor hemorrhage has also been significantly improved. Among them, SWI is a unique sequence imaging method in MR diagnosis, which can accurately identify small blood vessels, microhemorrhage, calcification and thrombosis, and has high sensitivity to hemoglobin products, venous blood vessels and iron content, it has an irreplaceable diagnosis in brain diseases such as brain trauma, brain tumors, hemorrhagic diseases and neurodegeneration^[1]. Based on the above viewpoints, this study explored the differential diagnosis value of magnetic resonance SWI for simple cerebral hemorrhage and brain tumor hemorrhage, and adopted the retrospective study method to analyze 153 patients with cerebral hemorrhage treated in our hospital from August 2016 to July 2018, see below for details.

1. Materials and Methods

1.1 General information

The clinical data of 153 patients with intracerebral hemorrhage admitted in our hospital from August 2016 to July 2018 were retrospectively analyzed, including 77 cases of simple cerebral hemorrhage and 76 cases of brain tumor hemorrhage, there were 49 male patients with simple cerebral hemorrhage, 28 females, aged 18-71 years old, with a median age of 44.02 years, of which 23 patients had acute cerebral hemorrhage, and 9 patients had no obvious clinical symptoms; there were 48 male patients with brain tumor hemorrhage, 28 females, aged 19-69 years, with a median age of 43.98. The primary symptoms included 34 astrocytomas, 21 metastases, and 21 oligodendrogliomas.

Inclusion and exclusion criteria: ① The clinical manifestations of all patients were localized neurological symptoms, vomiting, headache, and epilepsy. All patients were diagnosed by angiography and pathological examination; ② Exclude patients with mental illness. Before the patients were diagnosed, their families signed an informed consent form with the hospital.

1.2 Method

The patients were scanned with enhanced MR, T1WI, T2WI and SWI sequences using GE Signa HDxt 1.5T magnetic resonance imager. The parameters are set as follows: Enhanced MR: layer thickness 6.0mm, layer spacing 1.2mm, T1 is 860ms, repetition time

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1875ms, echo time 24ms, scanning field 300mm × 300mm, respectively conduct T1 liquid attenuation inversion recovery sequence (FLAIR) sagittal position, T1 FLAIR axis position, T1 FLAIR coronal position scan.

Fast spin echo sequence (FSE) T2WI axis position: layer thickness 6.3mm, layer spacing 1.2mm, repetition time 4000ms, echo time 98.0ms, gradient echo sequence (GRE) T1WI axis position: repetition time 195.0ms, echo time 4.8ms, spin echo sequence (SE) T1WI sagittal position: repetition time 550.0ms, echo time 8.4ms, FLAIR axis: repetition time 8200ms, echo time 84.0ms.

SWI adopts 3D gradient echo sequence scanning, layer thickness 2.0mm, layer spacing 0.4mm, matrix 256×256, scanning field 230mm×230mm, full flow compensation, repetition time 49.0ms, echo time 40.0ms, flip angle 15°

1.3 Observation index

After acquiring the image, upload it to the software that comes with the magnetic resonance equipment to perform SWI intensity map, phase map, and minimum density projection MinIP graph data processing, the two imaging physicians with more than 10 years of working experience in our hospital will read the films together, and negotiate and unify when they have different opinions, observe and analyze the patient's tumor-related vein development, lesion area and peripheral vascular flow signals, lesion hemorrhage morphology and extent, lesion enhancement morphology and extent.

The criteria for determination of hemorrhagic foci: the hemorrhagic foci and venous structures on the SWI images are low-signal, which can be distinguished by the MinIP map, the lesions have spotted, irregular cluster-like low-signal regions that can be identified as hemorrhagic foci; the lesions have a long strip, curved, straight or barrel-shaped tubular structures, or low-signal points of more than three consecutive layers can be tracked are identified as venous vascular structures. Then count the diagnostic rate of enhanced MR, SWI and the combined diagnosis.

1.4 Data statistical analysis

Use SPSS 20.0 to statistical analysis of the data, the count data is expressed in n (%), chi-square test. $P \leq 0.05$ indicates that there is a significant difference in statistical results.

2. Result

2.1 Imaging findings of simple cerebral hemorrhage

MR examination in 77 patients with simple cerebral hemorrhage found 9 patients with hemorrhagic foci located in the central region of the semi-oval, 27 in the frontal lobe, 13 in the basal ganglia, and 28 in the occipital lobe. There were 17 cases with equal length T1 signal and short T2 signal; 29 cases showed central equal length T1 signal and long T2 signal; 28 cases showed short T1 long T2 uneven signal; 3 cases showed equal T1 Long T2 uneven signal. There were different degrees of edema around the hemorrhagic foci in 64 cases and no obvious edema signal around the hemorrhagic foci in 9 cases. Enhanced MR scanning found that 69 cases had mild enhancement signal at the edge of the lesion and 8 had no obvious enhancement. SWI sequence imaging found that all the 77 patients

had significantly thickened and circuitous tumor-like vascular-like with low signal.

2.2 Imaging findings of brain tumor hemorrhage

MR examination in 76 patients with brain tumor hemorrhage, found 5 patients' hemorrhagic lesions were in the cerebellum, 18 in the occipital lobe, 23 in the temporal lobe, and 30 in the frontal lobe. There were 14 cases of annular hemorrhage, 22 cases of focal hemorrhage, and 40 cases of nodular mass hemorrhage (including 19 cases of hemorrhagic foci completely covering the tumor itself). 39 cases were equal T1 long T2 uneven signals, and 37 cases were short T1 long and short T2 signals. There were 65 cases with different degree of edema around lesions, and 11 cases without obvious edema around lesions. Enhanced MR scanning showed that 14 patients with nodular mass type hemorrhagic foci completely covered the tumor itself had no obvious enhancement signal, while another 26 had slight enhancement at the edge of the hemorrhagic foci; 22 patients with focal hemorrhage, enhancement signal can be seen at the non-bleeding site; 14 patients with ring hemorrhagic showed slight enhancement signal of the wall. SWI scan found 20 patients with nodular mass-type hemorrhage foci completely covered tumor, a thickened and tortuous hypovascular signal was found in the local unbleeding site, another 20 patients with nodular mass-type hemorrhage foci, the local was no thickened and tortuous vascular low signal; 14 patients with ring-shaped hemorrhage had a markedly thickened vascular low signal within the hemorrhagic range; 22 patients with focal hemorrhage, thickened and tortuous vascular low signal was found in the unbleeded site.

2.3 Comparison of diagnostic rates for enhanced MR, SWI and combined diagnosis

The diagnostic rate of SWI is higher than that of enhanced MR, $P < 0.05$. But the diagnostic rate of both methods is low, the diagnosis rate of SWI combined with enhanced MR is higher than that of enhanced MR and SWI alone, $P < 0.05$. See table 1.

Table 1. Comparison of diagnostic rates for enhanced MR, SWI and combined diagnosis [n (%); n=153]

Method	Diagnostic rate	Misdiagnosis rate
Enhanced MR	83 (54.25)	70 (45.75)
SWI	112 (73.20)	41 (26.80)
Combined diagnosis	146 (95.42)	7 (4.58)

Note: The combined diagnosis rate is compared with enhanced MR: $\chi^2=68.877, P=0.000$; The combined diagnosis rate is compared with SWI: $\chi^2=28.564, P=0.000$; Diagnostic rate of SWI compared with enhanced MR: $\chi^2=11.889, P=0.001$. Enhanced MR has 38 patients with simple cerebral hemorrhage misdiagnosed as cerebral infarction, another 32 cases of cerebral tumor hemorrhage were misdiagnosed as vascular malformation hemorrhage; SWI has 24 patients with simple cerebral hemorrhage misdiagnosed as cerebral infarction, another 17 cases of cerebral tumor hemorrhage were misdiagnosed as hypertensive cerebral hemorrhage.

3. Discuss

Brain tumor lesions usually invade surrounding brain tissue, resulting in intracranial hematoma or subarachnoid hemorrhage,

when brain tumor patients have more hemorrhage, the hemorrhagic foci will cover the tumor itself, which is easy to be confused with simple cerebral hemorrhage[2]. If the two hemorrhagic lesions can be diagnosed as early as possible, it is beneficial to take targeted therapy to reduce the risk of worsening the patient's condition. The signal obtained during routine MR scan is lack of obvious features, and the sensitivity to lesion calcification is low. It is impossible to accurately diagnose the nature of the hemorrhagic foci. It is often necessary to wait until the subacute phase to confirm the diagnosis in the MR routine sequence [3], however, the changes of blood flow signal in acute phase were not obvious and could not be diagnosed. Therefore, it is necessary to seek a method of sequence imaging with high sensitivity to hemorrhage to accurately identify the characteristics of hemorrhage foci.

The results of this study show: the diagnostic rate of SWI is higher than that of enhanced MR, $P < 0.05$. But the diagnostic rate of both methods is low, the diagnosis rate of SWI combined with enhanced MR is higher than that of enhanced MR and SWI alone, $P < 0.05$. Cause analysis: ① It takes at least 2 hours to enhance the MR scan to detect bleeding, and it is easy to be misdiagnosed due to the influence of false positive hemorrhagic foci and micro-hemorrhagic foci caused by the expansion and folding of cerebrovascular vessels, and the utility is not good; ② SWI sequence imaging can use the phase map information filtered by 3D gradient echo with full flow compensation, long echo time, high signal to noise ratio, high resolution, thin layer reconstruction [4], improve the magnetic sensitivity difference between the hemorrhagic foci and the surrounding tissue, so SWI is highly sensitive to hemorrhage, and the signal changes can be found early in the hemorrhage, therefore, the number and extent of the hemorrhagic foci displayed are more accurate than the enhanced MR, even if it is volume. 10mm² microhemorrhage can also be displayed completely [5]; ③ Brain tumors that are prone to cerebral hemorrhage are mostly high-grade gliomas, oligodendrogliomas, malignant melanomas, metastases, etc [6], the main pathological basis is tumor angiogenesis, and most of the tumor blood vessels are immature, structurally disordered, without normal grading and branching, different lumen thickness, blood flow disorder is easily blocked, and increased interstitial fluid pressure, which is significantly different from normal blood vessels [7]. There is no similar tumor blood vessel in simple cerebral hemorrhage, this difference can be used as an important index to identify simple cerebral hemorrhage and brain tumor hemorrhage. Although enhanced MR can observe tumor blood supply, but can not clearly show tumor neovascularization, SWI can clearly and completely display the tumor vein structure, boundary, hemorrhage products, edema and other information, and distinguish the intratumoral hemorrhage and calcification. In addition, because the tumor tissue grows faster and relatively few perfusion vessels that provide blood for it, so the blood oxygen utilization in the perfusion blood vessel is higher, and the deoxyhemoglobin content is increased, therefore, the signal of tumor blood vessels on SWI sequence

imaging is similar to that of venous blood vessels, showing a low signal. Chen Ling [8] thinks, brain tumor hemorrhage due to the mixing of tumor tissue and hemorrhagic components, resulting in decreased hemoglobin concentration, T1 signal will have different degrees of attenuation, and intensity is uneven, while simple cerebral hemorrhage is high intensity uniform T1 signal; ④ In the case of brain tumor patients with massive hemorrhage, although the hemorrhage foci will cover the tumor itself, Through SWI, the thickened and tortuous low-signal tumor vessels can be observed at the edge of the hemorrhagic foci or in the part of the tumor without local bleeding, however, enhanced MR can only observe the degree of damage of the blood-brain barrier at the edge of the tumor and the cystic necrosis of the tumor. The tumor vascular structure can not be observed. Therefore, SWI has unique advantages in displaying tumor blood vessels, and the identification value is more significant.

In summary, on the basis of conventional Mr scan, combined with SWI sequence imaging can improve the accuracy of differentiating simple intracerebral hemorrhage from brain tumor hemorrhage.

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Clinical Diagnostic Value of MR Susceptibility Weighted Imaging and CT in Craniocerebral Trauma

Quanyi Zhang & Yongjun Tao & Yunli Qi

(Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine, Zhejiang 325000, P.R. China)

Abstract: *Objective:* To evaluate the value of MR susceptibility weighted imaging (SWI) and CT in the diagnosis of craniocerebral trauma. *Methods:* The clinical data of 83 patients with craniocerebral trauma admitted in our hospital from October 2016 to June 2018 were retrospectively analyzed. MR routine sequences and SWI examinations were performed on the patients with craniocerebral trauma. The imaging findings of various methods and the results of focal examination were observed. The sensitivity of SWI and CT was compared. *Results:* The results of plain CT scan were as follows: 8 cases of subarachnoid hemorrhage, 12 cases of epidural hematoma, 20 cases of ventricular hemorrhage, 23 cases of cerebral contusion and laceration combined with hematoma and 25 cases of subdural blood swelling; SWI sequence confirmed 11 cases of subarachnoid hemorrhage, 13 cases of epidural hematoma, 22 cases of ventricular hemorrhage, 28 cases of cerebral contusion and laceration combined with hematoma and 30 cases of subdural hematoma. Susceptibility to craniocerebral hemorrhage was 94.55% higher than that of plain CT scan (80.91%), $P < 0.05$. In plain CT scanning, the imaging findings of hematoma focus were high density or flaky high density and the imaging findings of hemorrhage complicated with edema were low density around, slightly high density or flake high density shadow. SWI examined subarachnoid hemorrhage and intraventricular hemorrhage, presenting as either spot-low, cast, or linear low signal. Diffuse axonal injury in the SWI series showed a few hyperintense and speckle hypo-signal. *Conclusion:* Compared with plain CT scan, SWI sequence can improve the detection rate of small lesions, and can be used to evaluate the degree of craniocerebral injury. It can be used as the first choice in the diagnosis of craniocerebral trauma.

Key words: MR susceptibility weighted imaging, CT, craniocerebral trauma, diagnostic value

Introduction

Craniocerebral trauma is caused by indirect or direct force on the head of the patient. The patient's condition is very critical. Some patients may have symptoms such as disturbance of consciousness, coma and so on^[1]. Improper treatment or missed treatment timing will all lead to increased risk of death of patients, so improving the accuracy of early diagnosis of craniocerebral trauma, and taking targeted treatment according to the diagnosis result and the progress of the disease timing is an important prerequisite to save patients' lives. CT examination is often used to diagnose craniocerebral trauma in clinical practice, but the sensitivity of early diagnosis is relatively low, and misdiagnosis and missed diagnosis are easy to occur, thus affecting the follow-up treatment of patients. With the advancement of MRI technology, SWI sequence examination has been widely used in clinical applications. This program technology can not only provide multiplanar histological structure images, but also have significant diagnostic advantages for small hemorrhagic foci^[2]. Based on the above discussion, the diagnostic value of SWI and CT in craniocerebral trauma is discussed. Retrospective analysis method was adopted to take 83

cases of craniocerebral trauma patients admitted to our hospital from October 2016 to June 2018 as study samples. Plain CT scan and SWI scan were adopted to compare the imaging features and sensitivity of various diagnostic methods. See details below.

1. Materials and methods

1.1 Subjects and Criteria

The clinical data of 83 cases of craniocerebral trauma treated in our hospital from October 2016 to June 2018 were retrospectively analyzed, including 51 cases of male and 32 cases of female, aged from 16 to 72 years (median age ,43.94 years). The causes of injury were: 15 cases of blow injuries, 27 cases of falling injuries, and 41 cases of car accidents.

Inclusion and Exclusion Criteria: (1) All patients had a clear history of brain trauma with varying degrees of disturbance of consciousness, coma, dizziness and headache. The Glasgow coma score was no more than 8 points. Under the premise of stable vital signs, the MR routine sequence, CT and SWI scans were completed, and the imaging data were complete. The examination time was 10h to 72h after injury. (2) Patients with openness craniocerebral injury, contraindications on MRI, severe combined chest and abdomen injuries, limb fractures, central

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Author: Quanyi Zhang, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.
Yongjun Tao, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.
Yunli Qi, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.

nervous system history, and psychiatric history were excluded.

1.2 Methods

Plain CT scan: The patient was in a supine position. The skull was scanned using GE Optima 680 64-slice spiral CT, and the skull OM was used as the base line axis for thin layer scanning of suspected lesions. The parameters were set as follows: tube voltage was 120kV, tube current was 200mA, layer thickness was 10mm, layer spacing was 5mm, thickness of skull top section was 10mm, scanning field was 24×24 , matrix was 512×512 , window width was narrow window frame (50-70Hu) and window position was narrow window position (10-20Hu).

MR routine sequence and SWI examination: The GE 1.5T (Signa HDxt) magnetic resonance imaging was used with 8-channel phased array coil to scan the patients from the skull base to the top of the skull. The parameters were set as follows: slice thickness = 6mm, gap = 1mm. Routine sequences include T1WI (repetition time, TR = 2200 ms; echo time, TE = 24 ms; scanning field= 24×24), T2WI (TR = 5657 ms, TE = 24 ms, scanning field= 24×24), DWI (TR = 2400 ms, TE = 65 ms, scanning field= 24×24) and FLAIR (TR = 10000 ms, TE = 95 ms, scanning field = 24×24 , matrix = 256×256). High-resolution 3D gradient echo sequence was adopted in SWI scan (TR = 84.6 ms, TE = 46.6 ms, scanning field = 24×24 , matrix = 256×256). And the 3D reconstruction takes a minimum intensity projection method.

1.3 Outcome Measures

The imaging findings and examination results of various methods were observed. The image quality was reviewed by two image doctors double-blindly. The number, distribution, size and signal characteristics of the lesions in MR routine sequence, CT and SWI were observed. The SWI image lesion volume was determined by the image processing workstation. If there were different opinions, the opinions were unified after consultation.

Sensitivity of SWI and CT was then compared.

1.4 Statistical analysis

Statistical analysis was performed using SPSS 20.0. The normal measurement data was expressed as $\pm s$, and the t-value test was performed, while count data was represented by n (%) and statistically analyzed using chi-square test. $p < 0.05$ was considered statistically significant.

2. Results

2.1 Comparison of pathological results and diagnostic results

The pathological examination results of 83 patients showed 62 cases of single brain trauma and 21 cases of compound brain trauma. Their specific pathological conditions were: 12 cases of subarachnoid hemorrhage, 15 cases of epidural hematoma, 24 cases of intraventricular hemorrhage, 28 cases of cerebral contusion and laceration combined with hematoma and 31 cases of subdural hematoma, of which 27 cases were associated with hemorrhage and 3 cases had diffuse axonal injury.

The diagnostic results of plain CT scanning were: 8 cases of subarachnoid hemorrhage, 12 cases of epidural hematoma, 20 cases of intraventricular hemorrhage, 23 cases of cerebral contusion and laceration combined with hematoma, and 25 cases of subdural hematoma.

The confirmed results of SWI sequence scanning were: 11 cases of subarachnoid hemorrhage, 13 cases of epidural hematoma, 22 cases of ventricular hemorrhage, 28 cases of cerebral contusion and laceration combined with hematoma and 30 cases of subdural hematoma.

The sensitivity of SWI to hemorrhage of craniocerebral trauma was higher than that of plain CT scan ($P < 0.05$). See Table 1.

Table 1. Comparison of the number of lesions in SWI and CT scan of 83 craniocerebral trauma patients (n=110)

Methods	subarachnoid hemorrhage	epidural hematoma	ventricular hemorrhage	cerebral contusion and laceration combined with hematoma	subdural hematoma	Sensitivity
Plain CT scan	8	12	20	23	26	80.91 (89/110)
SWI sequence	11	13	22	28	30	94.55 (104/110)
χ^2	/	/	/	/	/	8.642
P	/	/	/	/	/	0.003

2.2 Imaging findings

A total of 89 foci were detected by CT plain scanning, including 29 simple hematoma foci and 60 hemorrhage combined with edema foci. Among them, the imaging findings of simple hematoma foci were relatively high density or patchy high-density shadow, while the imaging findings of hemorrhage combined with edema foci were relatively low density, slightly high density or patchy high-density shadow.

A total of 104 foci were detected in the SWI sequence, including 48 simple hematoma foci and 56 hemorrhage combined with edema foci, which showed intracranial low-signal hematoma and high-signal edema around the hematoma. Among them, subarachnoid hemorrhage and intraventricular hemorrhage showed as spot-low, cast and linear low signal. Diffuse axonal injury was manifested as a little high signal and a spotty low signal in SWI sequence. In terms of foci distribution, the basal ganglia region, white matter region and interjunction region of brain endothelium and medullary matter were the multiple sites, followed by cerebellum, brainstem and corpus callosum. The SWI sequence of 3 patients with diffuse axonal injury identified by pathological examination revealed low signal hemorrhagic foci at basal ganglia and left corpus callosum.

3. Discussion

Patients with craniocerebral trauma are very critical, and some patients have multiple sites with multiple lesions. Its complications are numerous and complex, and its clinical manifestations include aphasia, hemianopia, epilepsy, sensory disturbance, headache, and vomiting. Inadequate treatment can lead to ischemia and hypoxia in the brain of the patient, resulting in shock or death. Therefore, early diagnosis of craniocerebral trauma, timely targeted treatment, and reduction of brain tissue damage are the focus of current research. Considering that the patients with craniocerebral trauma are complicated and the clinical symptoms of different diseases are very similar, thus it is difficult to accurately determine the type of the disease according to the clinical manifestation, which is easy to affect the early diagnosis and treatment of the patient. Therefore, the diagnosis is often made by imaging means. In the past, CT examinations were used to diagnose by detecting the signal difference between normal brain tissue and diseased brain tissue^[3]. This examination can observe the vascular condition of the patient's brain, but it's not sensitive to microscopic foci such as cerebral contusion and laceration combined with hematoma and diffuse axonal injury^[4], which is prone to missed diagnosis and misdiagnosis. With the advancement of MRI technology, the use of multi-sequence, multi-level imaging to diagnose craniocerebral trauma is conducive to improve the accuracy of early diagnosis.

The results of this study are as follows. The results of

plain CT scan were: 8 cases of subarachnoid hemorrhage, 12 cases of epidural hematoma, 20 cases of intraventricular hemorrhage, 23 cases of cerebral contusion and laceration combined with hematoma, 25 cases of subdural hematoma; while SWI sequence scan confirmed the results: 11 cases of subarachnoid hemorrhage, 13 cases of epidural hematoma, 22 cases of ventricular hemorrhage, 28 cases of cerebral contusion and laceration combined with hematoma, 30 cases of subdural hematoma. The sensitivity of SWI to traumatic brain injury was 94.55% higher than that of CT scan 80.91% ($P < 0.05$). In the plain scan of the CT, the imaging findings of the hematoma were higher density or flaky high-density. The imaging of hemorrhagic edema was characterized by low density, slightly high density or high density of the surrounding. SWI examination of subarachnoid hemorrhage, ventricular hemorrhage showed a point-like low signal and cast, linear low signal; and diffuse axonal injury in the SWI series showed a little high signal and spotted low signal. The reasons for the analysis are as follows: (1) SWI is a special gradient echo imaging technique that uses phase information to further enhance local tissue contrast. Its principle lies in the magnetic-sensitive effect caused by uneven magnetic field^[5]. The biggest advantage of SWI is that it can accurately detect the blood metabolites and hemorrhagic foci, such as intracerebral hematoma, subarachnoid hemorrhage, epidural hematoma and subdural hematoma. Ouyang et al^[6] thought that, compared with the routine T1WI and ordinary gradient echo T2Wi sequences, high resolution 3D scanning gradient echo sequence of SWI has higher resolution. After removing the effect of magnetic field heterogeneity on the phase by image processing station, 3D reconstruction was conducted with the help of the minimum intensity projection method and phase weighting, which can improve the sensitivity of metabolins including hemosiderin, deoxyhemoglobin and methemoglobin after hemorrhage. Therefore, it can show the microscopic hemorrhage that can not be displayed by plain CT scan, and improve the detection rate of cerebral contusion and laceration combined with hematoma and axonal injury. Besides, microhemorrhage foci can be detected within 2min~2.5h after the patient's cerebral trauma hemorrhage. All these indicate that SWI is of great value in early diagnosis. (2) SWI can also show the deep cerebral vascular structure of patients and directly delineate the specific site of brain injury. Due to the inclusion of T2* effect^[7], the microscopic hemorrhagic foci with clear boundaries, can be marked with different sizes of dots, plaques, clumps, circles and other obvious low signals on SWI series. Wu et al^[8] considered that the circular uniform low signal presented by SWI sequence is not entirely within the bleeding range, but indicates the paramagnetic effect area of the bleeding metabolites, which is significantly larger than the hematoma's own range, so the sensitivity to hemorrhagic

lesions of SWI is higher than that of plain CT scanning. In this study, DWI and FLAIR belong to two important sequences of the central nervous system. Considering the risk of patients with diffuse axonal injury, these two sequences need to be added for diagnosis.

To sum up, compared with plain CT scan, SWI sequence imaging is more clear, which can improve the detection rate of microscopic foci and also can be used to evaluate the degree of craniocerebral injury. Its clinical diagnostic value is significant, and it can be used as the first choice for the diagnosis of craniocerebral trauma.

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Study on the Diagnostic Value of Multislice Spiral CT and MR in Atherosclerotic Plaque and Carotid Artery Stenosis

Shenghao Ye^a & Lifang Yang^b & Sunxi Pan^a

(a. Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine, Wenzhou, Zhejiang 325000, P.R. China; b. Department of Radiology, Wenzhou Hospital of Integrated Traditional Chinese and Western Medicine, Wenzhou, Zhejiang 325000, P.R. China)

Abstract: *Objective:* to evaluate the value of multislice spiral CT and MR in the diagnosis of atherosclerotic plaque and carotid artery stenosis. *Methods:* from April 2017 to May 2018, 94 patients with ischemic cerebrovascular disease were selected as the study samples, and the multislice spiral CT and MR were used to compare the diagnosis results of atherosclerotic plaque and carotid artery stenosis. *Results:* there was no significant difference between multislice spiral CT and MR in detecting arterial stenosis (95.7442% vs 93.62%) ($P > 0.05$). The detection rate of calcified plaques by multi-row spiral CT (90.00%) was higher than that of calcified plaques. MR (63.33%), but the detectable rate of MR for lipid plaque (100.00%), fibrous plaque (96.77%), mixed plaque (88.24%) and plaque hemorrhage (100.00%) was higher than that of multi-row spiral CT (65.222.2941.180.000%) ($P < 0.05$). *Conclusion:* multislice spiral CT and MR have a good detection rate for carotid artery stenosis, but the detection rate of MR is higher in atherosclerotic plaque examination.

Key words: atherosclerotic plaque, carotid artery stenosis, multislice spiral CT, MR, diagnostic value

Introduction

Carotid artery stenosis is a high risk factor for ischemic cerebrovascular disease, while atherosclerotic plaque is the pathological condition for carotid artery stenosis. Therefore, to do a good job in the prevention of ischemic cerebrovascular diseases, it is necessary to strengthen the Diagnosis and identification of clinical symptoms such as early atherosclerotic plaque and carotid artery stenosis^[1]. At present, multislice spiral CT and MR are often used to diagnose individual atherosclerotic plaque and carotid artery stenosis, but the detection of the two methods are different, based on the above discussion, this study compared the diagnostic value of multislice spiral CT and MR for atherosclerotic plaque and carotid artery stenosis, 94 patients with ischemic cerebrovascular diseases admitted to our hospital from April 2017 to May 2018 were selected as study samples, which were diagnosed by CT and MR respectively, as detailed below.

1. Materials and methods

1.1 General information

94 patients with ischemic cerebrovascular diseases admitted to our hospital and Wenzhou Hospital of Integrated Traditional Chinese and Western Medicine from April 2017 to May 2018 were selected as study samples, which were 53 males and 41 females, aged from

59 to 81 years, with a median age of 69.89 years old, the time from onset to treatment was 1~5h, with an average of (2.97±0.13)h, the specific conditions were 46 cases of cerebral infarction and 48 cases of cerebral infarction.

Inclusion and exclusion criteria: ①All patients appeared clinical symptoms such as nausea, vomiting, dizziness, and confusion, some patients appeared partial abnormal sensation, hemianopia, and hemiplegia after conscious awake; ②Patients with iodine allergies, thrombosis, coagulation dysfunction, liver and kidney dysfunction, and abnormal thyroid function were excluded. All patients and their families signed informed consent with the hospital before the diagnosis.

1.2 Methods

Multislice spiral CT diagnosis: The patient remained in a supine position and was examined using a GE Optima Model 680 and a SIEMENS Definition AS 64-layer spiral CT machine, the parameters were set accurately before scanning, with a tube voltage of 120 kV, a tube current of 500 mA, a layer thickness of 0.625 mm, and a layer spacing of 5 mm. Scanning from the patient's automatic arterial arch level to the skull base level, through the elbow vein, using a high-pressure syringe to inject 90mL of Uvita 270, injection velocity in a 4.50 mL/s, then inject 50mL normal saline with the same speed, after the CT angiography image were determined will be transmitted to the workstation for 3D reconstruction, and the reconstructed image is analyzed in detail.

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Author: Shenghao Ye, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.
Lifang Yang, Department of Radiology, Wenzhou Hospital of Integrated Traditional Chinese and Western Medicine.
Sunxi Pan, Department of Radiology, Wenzhou Hospital of Traditional Chinese Medicine.

MR diagnosis: The instrument is a GE Signa HDxt 1.5T magnetic resonance imager, which scans the center of the patient's carotid artery 2 cm above and below, the parameters are set to: focal length 14cm, layer thickness 1mm, repetition time 21ms, echo time 3.6ms, flip angle 25°, matrix 384mm×256mm, the obtained data were then reconstructed in 3d and used as the horizontal axis positioning basis, then, the T1WI and T2WI proton weighted imaging sequence scans were performed, 30 mL of contrast agent was injected into the cubital vein before the scan, the speed was 2 mL/s, and then 2 mL of normal saline was injected, scanning after 3min. Black blood technology is needed to improve detection accuracy when necessary^[2].

1.3 Observation index

The two imaging physicians with more than 10 years' experience in the hospital will read the films together, negotiate and unify when they have different opinions. ①Diagnostic criteria for carotid stenosis: grade 0 is normal; grade I is vascular wall structure can not be shown, stenosis rate <50%; grade II can show arterial wall, but the outer wall of blood vessels is blurred, stenosis rate <70%; grade III is the clear structure of the arterial wall but the edge of the outer wall of the blood vessel is blurred, and the stenosis rate <100%; the grade IV is clear inside and outside the arterial wall, and

the stenosis rate is 100%. ②Judging criteria of atherosclerotic plaque: CT value <60Hu is lipid necrosis nucleus, CT value 60~130Hu is fibrous component, CT value >130Hu is lipid calcification; during MR examination, the high signal in the plaque under the sequences of T1WI and T2WI indicated the intra-plaque hemorrhage, while no signal under the sequences of T1WI and T2WI indicated the calcification within the plaque. Cerebral angiography was used as the gold standard for the control study.

1.4 Statistical analysis

Use SPSS 20.0 to statistical analysis of the data, the count data was expressed in n (%), the chi-square test. P ≤ 0.05 indicates that there is a significant difference in statistical results.

2. Result

2.1 Detection of arterial stenosis

94 patients with the late stage cerebral angiography diagnosis showed that 37 patients had grade I stenosis, 28 cases of grade II stenosis, 17 cases of grade III stenosis, 12 cases of grade IV stenosis. The detection rate of arterial stenosis by multislice spiral CT and MR was no statistically significant, P > 0.05. See table 1.

Table 1. Comparison of detection rates of multislice spiral CT and MR in carotid stenosis

Method	grade I stenosis (n=37)	grade II stenosis (n=28)	grade III stenosis (n=17)	grade IV stenosis (n=12)	total detection rate (n=94)
Multislice spiral CT	35 (94.59)	26 (92.86)	17 (100.00)	12 (100.00)	90 (95.74)
MR	34 (91.89)	25 (89.29)	17 (100.00)	12 (100.00)	88 (93.62)
χ^2	/	/	/	/	0.423
P	/	/	/	/	0.516

2.2 Detection of atherosclerotic plaque

94 patients with the late stage cerebral angiography diagnosis showed a total of 101 cervical atherosclerotic plaques were found, including 17 mixed plaques, 31 fibrous plaques, 30 calcified plaques, 23 lipid plaques, there were 12 internal plaque hemorrhages. The

detection rate of calcified plaques by multislice spiral CT was higher than that of MR, but the detection rate of MR on lipid plaques, fibrous plaques, mixed plaques and plaques was higher than that of multislice spiral CT, P < 0.05. See table 2.

Table 2. Comparison of detection rates of multislice spiral CT and MR in atherosclerotic plaque

Method	Fibrous plaque (n=31)	Calcified plaque (n=30)	Lipid plaque (n=23)	Mixed plaque (n=17)	Internal plaque hemorrhage (n=12)
Multislice spiral CT	19 (61.29)	27 (90.00)	15 (65.22)	7 (41.18)	0 (0.00)
MR	30 (96.77)	19 (63.33)	23 (100.00)	15 (88.24)	12 (100.00)
χ^2	11.777	5.963	9.684	8.242	24.000
P	0.001	0.015	0.002	0.004	0.000

3. Discuss

The formation of atherosclerotic plaque is the main cause of carotid stenosis^[3], the formation of atherosclerotic plaque is closely related to the patient's eating habits and lifestyle^[4]. Early atherosclerotic plaques are uniformly distributed in the intima of vessels, as the disease progresses, the plaques will gradually

protrude into the cardiovascular system, leading to different degrees of stenosis of arterial vessels, eventually, thrombosis will cause obstruction of blood vessels^[5]. Carotid artery stenosis can lead to obstruction of blood circulation in the brain tissue, and symptoms of ischemia and hypoxia, which is also the cause of sudden fall, dizziness, headache, nausea and vomiting^[6]. Because there is no specific sign before the onset of ischemic cerebrovascular disease,

the early judgment of the nature, range, location and quantity of atherosclerotic plaques, timely understanding of the degree of carotid artery stenosis in patients, have important guiding significance for the assessment of the occurrence of ischemic cerebrovascular disease risk^[7]. At present, clinical use angiography (DSA) as a "gold standard" for the diagnosis of cervical vascular disease^[8], however, DSA is a kind of traumatic diagnosis mode, which has certain requirements on patient tolerance and can easily cause adverse reactions such as vasospasm in patients, resulting in limited application; multislice spiral CT and MR are convenient to operate, less trauma and high diagnostic accuracy, and play an important role in the diagnosis of cerebrovascular diseases.

The results of this study show: The detection rate (95.74%, 93.62%) of arterial stenosis by multislice spiral CT and MR was not statistically significant, $P > 0.05$. The detection rate (90.00%) of calcified plaques by multislice spiral CT was higher than that of MR (63.33%), but the detection rate of MR on lipid plaques (100.00%), fibrous plaques (96.77%), mixed plaques (88.24%) and plaques (100.00%) was higher than that of multislice spiral CT (65.22%, 61.29%, 41.18%, 0.00%), $P < 0.05$. Cause analysis: ① Multislice spiral CT has a higher spatial resolution, and can quickly generate neck vascular effects under contrast agent intervention to determine the degree of lumen stenosis. MR examination is easily affected by individual blood flow, therefore, in the diagnosis of carotid stenosis, the detection rate of MR is not as high as that of multislice spiral CT, but MR can be combined with black blood sequence, bright blood sequence and other axial images for joint analysis, so, the detection rate of carotid stenosis can still be guaranteed; ② MR is mainly based on the plaque fiber signal in the T1WI sequence to determine whether the patient has atherosclerosis, normally, the hardened plaque calcified T1WI enhanced scan is expressed as no signal area, If the hardened plaque fiber cap is uneven in texture, the T1WI enhanced scan is characterized by a fiber cap signal of varying strength, so the MR can accurately reflect the specific structural changes of the patient's arterial wall and the imaging is clear. In addition, MR is highly sensitive to instability of arterial fiber caps^[9], high resolution of high-hardening plaques such as intravascular fibrous plaques and lipid plaques, Wang Junbin^[10] research results show that, multislice spiral CT and MR in the diagnosis of vascular stenosis degree compared with no statistical significance, $P > 0.05$. In the diagnosis of atherosclerosis, although more than 80 calcified plaques were detected in multislice spiral CT, plaque bleeding could not be detected, the MR detected 68 calcification signals, which showed that there were small

hemorrhages in the plaque, the effect of MR on atherosclerosis was better than that of multislice spiral CT. It shows that MR can not only determine the degree of carotid stenosis, but also show the location of tiny bleeding, which is helpful to determine the source of bleeding within the plaque.

In summary, multislice spiral CT and MR have a good detection rate of carotid stenosis, but the detection rate of MR in atherosclerotic plaque examination is higher.

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Two Simple and Practical Self-made Devices in Functional Experiment Teaching

Hailing Yu ^a & Yanhua Xuan ^b

(a. Functional Experimental Center, Medical College, Yanbian University, Yanbian, Jilin 133002, P.R China; b. Department of Pathology, Medical College, Yanbian University, Yanbian, Jilin 133002, P.R China)

Abstract: In functional experiment teaching and scientific research, some small experimental devices often are used in higher frequency. A simple and practical experimental device, is crucial to the smooth progress of experimental operation and the accuracy of experimental data. For this reason, some laboratories would make minor alterations on some small experimental devices to suit the specific experimental requirements of their respective laboratories. Therefore, most laboratories have their own unique experiences and skills in some specific experimental links. In our long-term teaching and research practice, has also summed up some of its own experiences and tips in our laboratory. In this paper, we intend to share in the teaching and research, more common, but also more convenient, two self-made small experimental equipment to the teaching and research workers at the medical colleges.

Key words: Experimental teaching, self-made; simple, experimental device, frog heart perfusion, anti-inflammatory

Introduction

In the process of functional experiment teaching and scientific research practice, it is inevitable to use some instruments and equipment to test some indicators or data. During this period, some small experimental devices are often used, most of which can be purchased, but some experimental devices often need to be processed in the laboratory to be more handy. So many laboratories have their own unique experience and skills (LIN, & LU, 2011). In the long-term teaching and scientific research experiments, the laboratory also summarized some of its own experience according to the specific needs of the experiment, hoping to share with the teaching and scientific researchers of medical colleges and universities the self-made small devices that are matched in the two common experimental projects.

1. A Simple Fluid Exchange Device in Frog Heart Perfusion Experiment

The frog heart perfusion experiment is one of the most classical and common experimental projects in functional experiment teaching. It is also widely used in scientific research experiments (AN, HONGRI, & ZHENG, 2017). Tension transducer is the main experimental device used in this experiment, but the transducer is also one of the most easily damaged devices in undergraduate experiment teaching. The most important reason is that the leakage of frog heart or the droplet of Ren's liquid on the transducer caused by the students'

transfusion or wetting the outer wall of the frog heart in frog heart perfusion experiment.

1.1 The traditional connection mode of our laboratory (Fig. 1A)

In order to avoid the unstable phenomenon of frog heart contraction curve recorded by touching the connecting wire on the transducer, the laboratory of our university once used the connecting way of Fig. 1A to place the frog heart intubation on the top layer, and then connected with pulley to adjust the angle and basic tension of the transducer. This connection method is very convenient in scientific research practice, but in teaching practice, the transducer is often damaged by the improper dripping liquid infiltration for a long time due to the miscellaneous operation of undergraduates and other reasons. (QI, HUANG, & HUANG, 2016)

1.2 The recommended connection mode in experimental teaching (Fig. 1B)

In order to overcome this drawback, the laboratory requires the connection method used in undergraduate experiment teaching as shown in Fig. 1B. Placing the tension transducer on the top layer can effectively avoid the artificial damage of the transducer caused by the above reasons. But the biggest disadvantage of this connection mode is that when adding medicine or replacing Ren's liquid, the transducer in the top layer easily affects the operation. Therefore, in order to cooperate with the experiment smoothly, the laboratory made a very simple small experimental device, which effectively solved this problem. In several years of experimental teaching practice,

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Author: Hailing Yu (1972-), female, associate professor, research direction is functional laboratory technology and management, E-mail: hlyu@ybu.edu.cn

Yanhua Xuan (1973-), female, associate professor, research direction is oncology pathology. E-mail: xuanyh1@ybu.edu.cn

the connection mode of Fig. 1B is used to cooperate with this small drug delivery and liquid exchange device (Fig. 1C). In the experimental teaching, it is easy to operate and effectively avoids the unnecessary damage of the transducer. It runs smoothly and achieves very satisfactory experimental results.

1.3 Simple liquid exchange device recommended in experimental teaching (Fig. 1C)

The simple drug delivery and liquid exchange device (see Fig. 1C) is fabricated and operated as described below. The scalp needle hose removing the needle is inserted vertically into the bottom of the frog heart intubation tube, and all the liquid in the tube is extracted with a 5 ml syringe. The hose does not need to be taken out. The liquid-adding tube above is dripped with Ren's liquid into the tube until it is properly calibrated. After the liquid in the tube is self-mixing, it is extracted again with a 5 ml syringe through the hose. When the fluid is changed, the heart beat curve of frog can be restored to normal by repeating 3-4 times. Fresh Ren's liquid can be continuously dripped into the tube by another syringe for continuous fluid exchange or drug test to continue the next experiment. In addition, the two devices used for adding and exchanging medicines in Fig. 1C can be combined into one and connected with a three-way pipe, which can be converted through the three-way pipe during the process of adding and exchanging liquids.

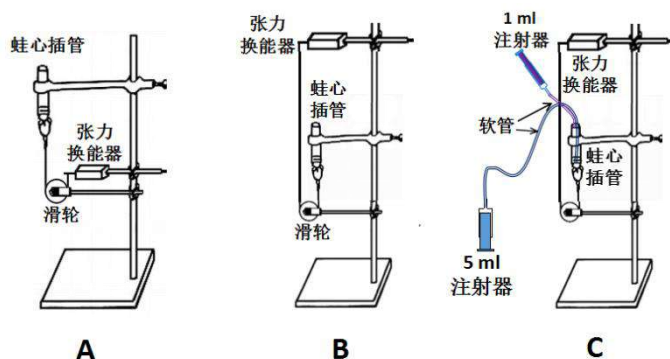


Fig. 1 Connection method of transducer and simple transducer in frog heart perfusion experiment

The traditional connection mode of the laboratory (Fig. 1A) is often used in scientific research experiments. The recommended connection mode in experimental teaching (Fig. 1B); Simple liquid exchange device recommended in experimental teaching (Fig. 1C).

2. A Simple Self-made Device for Measuring Paw Volume of Small Mouse

Mouse paw edema model is a classical experimental model commonly used in anti-inflammatory drug research (REN, NONG & CHEN, 2017). Volumetric measurements were used to measure the degree of paw edema (TIAN, LI,) & HUANG, 2017).

The measuring devices used in various laboratories are different, some of them are small cups, and some of them are plantar volume measuring instruments (JIANG, LI,)&LI, 2016), each method has its own advantages and disadvantages. (TAO, ZENG, &ZHANG, 2016)In order to overcome the shortcomings of the traditional paw edema volume measuring device, a simple experimental device was developed to detect the changes of paw edema volume before and after inflammation in small mouse. The simple measuring device used in the laboratory of the university is described in order to share.

2.1 Laboratory Traditional Measuring Device

The measuring device used in the laboratory in the past consists of a glass with a side hole and a small pointed measuring cup. The glass is pre-filled with distilled water at the same level as the side hole. When the paws of the small and big mouse are put into the glass, water of the same volume as the foot of the small mouse will be discharged from the glass. The water will flow into the small pointed measuring cup. The foot volume of mice can be measured by reading the height of the liquid surface.(SUN, WANG,& LI, 2016)。 However, due to inaccurate calibration of small cups and large errors, the difference of the edema degree of the big mouse paw before and after the test can be observed preliminarily, but it is difficult to reflect the change of the edema degree of the small mouse before and after inflammation.

2.2 Simple Foot Volume Measuring Instrument Made In Laboratory

2.2.1 Principle

Principle of capillary pipette amplification

2.2.2 Required spare parts and reagents

Two iron stands, three universal clamps, one three-way pipe, two frog core tube clamps, 0.5 ml basic burette, 3 ml single-use syringe, 2.5 ml single-use syringe barrel, 0.5 cm inner diameter rubber tube, neutral red dye, distilled water.

2.2.3 Self-made Simple Foot Volume Measuring Instrument

The connection of the experimental device of the simple foot volume measuring instrument is shown in Fig. 3, which is completed by referring to Cai Dehai's method. The zero calibration line of the inverted 2.5 ml single-use syringe barrel (which can not be used to replace the single-use syringe because the glass syringe is too heavy and slippery) and the zero calibration line of the inverted 0.5 ml basic burette are kept in the same horizontal line, and the two are fixed on the iron support platform with universal clamps respectively. The syringe barrel of the inverted 2.5 ml single-use syringe is connected with a 3 ml single-use syringe through a three-way pipe (to suck liquid and control liquid level height). The three-way pipe is connected with the inverted 0.5 ml basic burette through a 0.5 cm inner diameter rubber tube and a 0.3 cm inner diameter rubber tube (which can be replaced by a stilligout). Then 1 mg neutral red dye was added to 100 ml distilled water (10 ng/ml) to

form a light pink dye solution (in which a drop of about 0.5 ml neutral detergent could be added) and placed it in the device for reading numbers. The device is based on the principle of capillary pipette amplification. A mouse hind foot is put into a foot volume measuring device (inverted 2.5 ml single-use syringe barrel syringe). The small change of the device's content volume can be accurately displayed in the basic burette after the capillary pipette amplification, so the accuracy of the test is greatly improved.

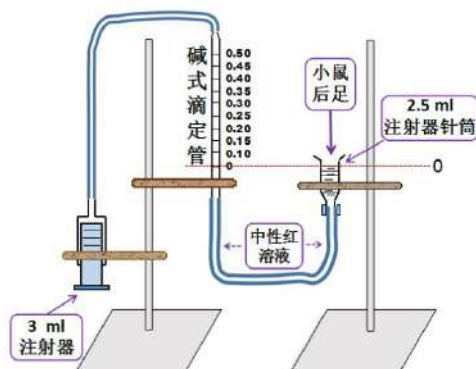


Fig. 2 Simple Foot Volume Measuring Instrument

3. Conclusion

Although these two small self-made experimental devices seem insignificant, they are easy to use and very practical. These two experimental devices have been widely used in the author's teaching and scientific research, and have gained good experience in using them. Therefore, it is hoped that the two experimental devices will be more widely promoted so that more

teaching and scientific researchers can benefit from them.

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Study on a Novel Thiourea Probe with Copper Ion Recognition Capability

Yunlong Xu

(Suzhou Zhongsheng Environmental Remeiation Company, Suzhou, Jiangsu 215000, P.R China)

Abstract: Based on fluorescent probe to the identification principle, the article has synthesized two similar thiourea derivatives which one of them has good effect for copper ion selective detection. After synthesis of the two compounds, we use the Fourier infrared spectrum (FTIR) and element analysis (EA), ^1H nuclear magnetic resonance ($^1\text{H-NMR}$) and other methods for the characterization. Because of synthesis of thiourea derivatives were as ligands with copper ion complexing reaction, make its original disappeared fluorescence properties, namely the fluorescence quenching effect, so as to achieve the purpose of selective recognition and detection. This paper provides given mass of theoretical and experimental basis for the design of fluorescent probe.

Key words: thiourea derivatives, Fluorescent probe, Ion detection, Fluorescence quenching, copper ions

1. Introduction

Copper is one of the essential trace elements in cells. However, as a heavy metal ion, copper ion can cause protein denaturation in vivo. The toxicological manifestations of copper are hemolysis and anemia caused by damage to red blood cells. Usually copper accumulates mainly in the liver when it enters the human body. Once it exceeds the treatment level of the liver, copper is released into the blood, causing oxidative inactivation of the enzyme system^[1]. Excessive copper ions not only do harm to the human body, but also to plants and the whole environment. In the development of modern industry, wastewater discharged from the glass industry, smelting industry and various coal-fired power plants often contains a high concentration of copper, which is a huge challenge to human health. Before treating it, we must develop efficient and convenient detection and identification methods^[2].

Due to the interference of other metal ions in the process of detecting copper ions, it is difficult to conceal these metal ions.

People usually use the method of extracting and separating copper ions and then detecting them, but this method is very complicated. In recent years, due to the rapid development of instruments, Instrumental analysis of copper ions has been widely used, such as: Spectrophotometry, atomic emission spectrometry, ion-selective electrode and fluorescence spectrometry, but these methods have some limitations because the instruments used in these methods are valuable, and the samples often require rigorous pretreatment^[3-10]. In recent years, fluorescent probe technology has become an important means and micro-visualization technology in the field of life science

and biomedical research. As a new reagent in physiology and pathology, new fluorescent probes have been widely used in clinical diagnosis and imaging research of many major diseases. Developing new fluorescent probes with high sensitivity has become one of the research hotspots in the field of biology and medicine^[11-15].

In recent years, people have tried to use different ion acceptors to make fluorescent probes. Among them, compounds containing amine, amide, (sulfo) carbamide, guanidine, pyrrole, phenolic hydroxyl and acylhydrazone, which contain amide, thiourea and five-membered heterocyclic units, are the most commonly used methods to design fluorescent probes^[16-20]. Thioureas are excellent hydrogen-bonded donors with biological activity. They can form stable hydrogen-bonded complexes with different anions such as Ac^- , HPO_4^{2-} , H_2PO_4^- or F^- ions. Therefore, in the past decades, a large number of ion receptors containing thiourea structural units have been designed, synthesized and tested to identify various anions and cations. At the same time, coumarin fluorescent compounds have many advantages, such as high fluorescence quantum yield, large Stokes shift and good photostability. It is important to design and synthesize new coumarin fluorescent compounds^[21-26].

Two new thioureas were synthesized by introducing coumarin thiourea group and NN- dimethyl group as an electron donor. The selectivity of thiourea to copper ion was investigated by testing its recognition performance to various ions in DMF solvent. The results show that coumarin thiourea probe has a strong ability to compete with other ions. They can be used for the actual detection of analyte DMF solution.

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Author: Yunlong Xu, graduation of postgraduate students from Suzhou University in 2014, now working in the Engineering Department of Suzhou Zhongsheng Environmental Remeiation Company, mainly responsible for R&D.

2. Experiments

2.1 Laboratory Instruments and Reagents

2.1.1 reagent

4-diethylaminosalicylic aldehyde, absolute ethanol, piperidine, glacial acetic acid, ethyl acetoacetate, salicylaldehyde, distilled water, diethyl malonate, CDCl_3 , DMF.

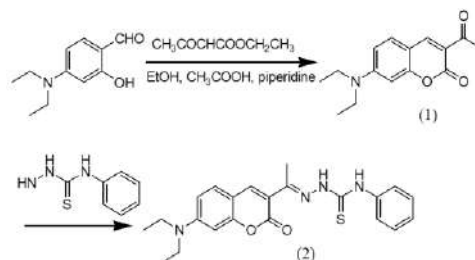
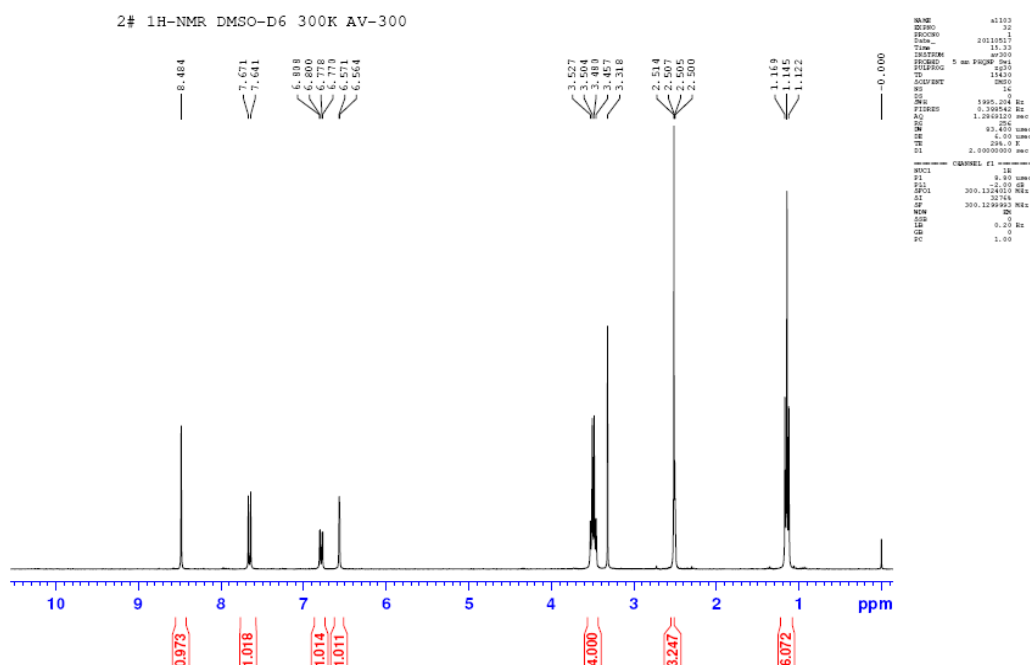
2.1.2 instrument

^1H NMR (400.13MHz) was determined by INOVA 400 nuclear magnetic resonance instrument, and CDCl_3 was used as solvent. Element analysis was carried out by YannaCO CHNSO Corder MT-3 analyzer. Ultraviolet-visible spectra and fluorescence spectra were measured by JASCO V530 and Perkin Elmer LS-55 spectrophotometers, respectively. The chromatographic grade DMF was purchased by Merck Company. The water solvent used in the experiment was deionized water. All other materials for synthesis were purchased from Aldrich Chemical Company without further purification.

2.2 synthesis

4-diethylaminosalicylic aldehyde (1.2g) was dissolved in anhydrous ethanol (80mL), slowly dripped with glacial acetic acid (0.2ml) and piperidine (0.2ml) as catalysts, heated to reflux, then dripped with ethyl acetoacetate (0.92mL) ethanol solution, heated to reflux for 6 hours, stopped heating and cooled overnight in ice water, then filtered with ethanol and washed to obtain yellow products.

The ^1H NMR spectra are as follows:

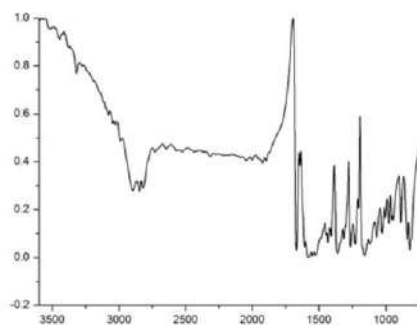


The 3-acetyl-7-diethylaminocoumarin and thiourea derivatives were refluxed in ethanol solution (with a small amount of glacial acetic acid as catalyst) to form compound 2 (probe 1).

2.3 Elemental Analysis, Infrared Spectra and ^1H NMR Spectra of the Products

The results of elemental analysis are as follows:
 $\text{C}_{22}\text{H}_{24}\text{O}_2\text{N}_4\text{S}$: C, 64.71; N, 13.72; H, 5.88; S, 7.84.

The results of infrared spectroscopy are as follows:



3. Results and Discussion

In order to improve the ionic affinity of the probe, the optical properties of the probe were measured by fluorescence spectroscopy. In the test, all the samples were vacuum dried, and the sample compounds were weighed by one-thousandth balance (error is $\pm 0.1\text{mg}$). The probe 1(2) was dissolved in DMF, the dissolved into 5.0×10^{-4} concentrated solution in a volumetric bottle. Then 1.0mL was placed in 10mL volumetric bottle with pipette volume, and then diluted into 5.0×10^{-5} mol/L solution with DMF to measure its ultraviolet absorption spectrum. The cations were prepared into 1.0×10^{-4} mol/L DMF solution, adding 3 mL in a 1 cm wide colorimetric dish at a time, and then adding various cations (less than 100 mL, basically keeping the volume unchanged) with a micro syringe.

3.1 Fluorescence Spectrum

3.1.1 Fluorescence Properties of Probes in the Presence of Different Ions

Fluorescence properties of probe 1,2 can be obtained by measuring the fluorescence emission spectra of DMF solution excited at 365 and 360 nm. The DMF solution of the probe used for testing is still 5.0×10^{-5} mol L⁻¹.

Fig. 3-5 (a) shows that the fluorescence emission peak can be observed at $\lambda_{\text{max}} = 465$ nm in the blank solution of probe 1. When 2 equivalent Cu^{2+} was added, the position of the peak shifted, and the fluorescence decreased obviously, while the fluorescence did not change significantly when other ions were added. The fluorescence quenching efficiency of Cu^{2+} at 465 nm ($(F_0 - F)/F_0 \times 100\%$) is close to 12 (Fig. 3-9(a)). However, the addition of other cations did not cause significant changes in fluorescence intensity. This shows that other ions do not affect the fluorescence of the probe, so the probe has a high selectivity for copper ions.

As shown in Fig. 3-5 (b), the fluorescence emission peak of probe 2 is also at $\lambda_{\text{max}} = 465$ nm. Only copper ion improves the fluorescence of DMF solution of the probe, and makes its maximum excitation wavelength red shift. The fluorescence quenching efficiency of Cu^{2+} at 465 nm ($(F_0 - F)/F_0 \times 100\%$) is close to 8 (Fig. 3-9(b)). Other ions have no obvious quenching effect.

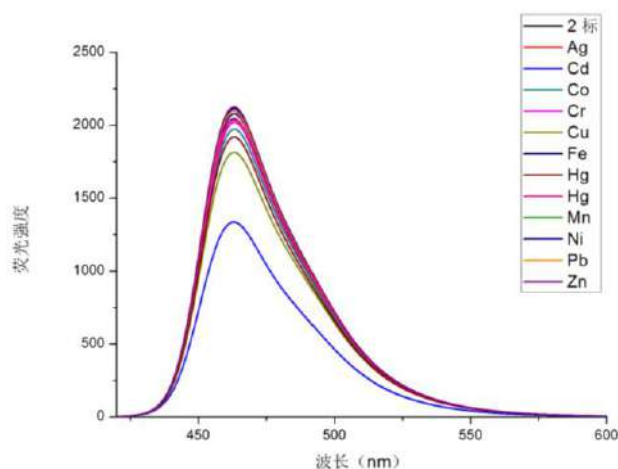
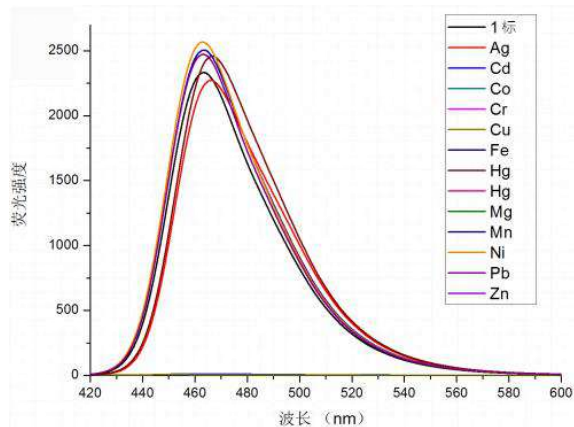
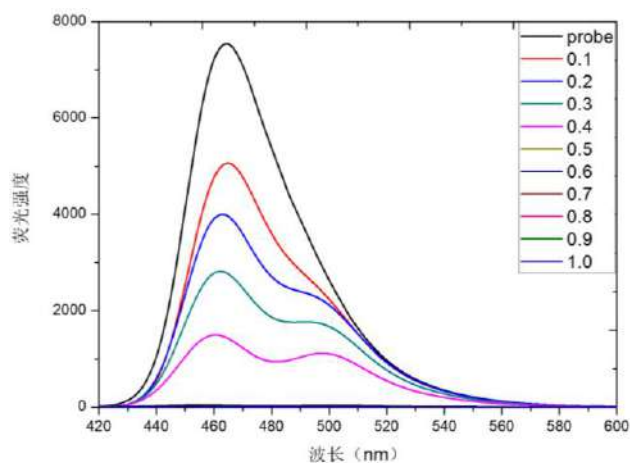


Fig. 3-5 Fluorescence changes of probe 1(a) and probe 2(a) (5×10^{-5} mol.L⁻¹) with the addition of different ions (1×10^{-1} mol.L⁻⁴)

3.1.2 Quenching effect of different concentration of Cu^{2+} on fluorescence of the probe

In order to study the effect of copper ions on probe 1 and probe 2, we used different concentrations of copper ions to carry out fluorescence experiments. With the increase of Cu^{2+} concentration, the fluorescence intensity of the probe 1 decreased gradually at 465 nm (Fig. 3-6). When the receptor binds to the substrate, it affects the push-pull electronic system of the probe molecule, weakens the fluorescence effect of the probe, and causes spectral changes. When 0.6-1.0 equivalent of Cu^{2+} was added, the fluorescence intensity decreased significantly. At 1.0, the fluorescence effect disappeared completely. It can be considered that the binding of the receptor with Cu^{2+} ion reached an equilibrium state.

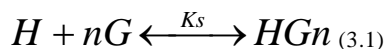


3.1.3 Determination of the Binding Ratio of Compounds to Copper Ions

Equimolar continuous variation method [26] is a commonly used method to determine the stoichiometric ratio between subject and object. This method was first widely used by Job in analytical chemistry, so it is also called Job

curve method [27].

Assuming that the subject molecule H and the object molecule G can form a complex HG_n, formula 3.1 is expressed as follows:



During the experiment, a series of solutions were prepared to keep the total concentration of the subject molecule H and the object molecule G as a constant.

$$[H]_0 + [G]_0 = C \quad (3.2)$$

The molar fraction of subject molecule G is expressed by x, while the equilibrium concentration of the three components can be expressed as follows:

$$[H] = C(1-x) - [HG_n] \quad (3.3)$$

$$[G] = Cx - n[HG_n] \quad (3.4)$$

$$[HG_n] = K_s[H][G]^n \quad (3.5)$$

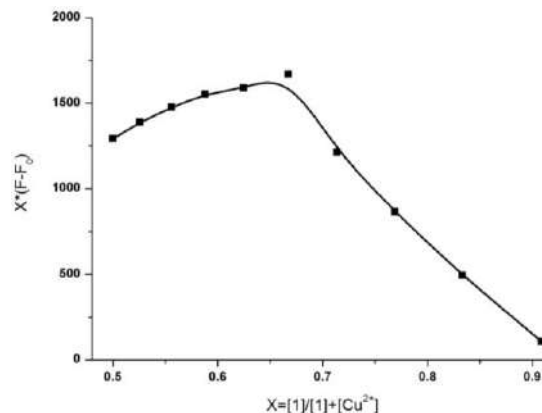
The first-order differential of formulas (3.4) and (3.5) is made, and then the terms [H], [G] and [HG_n] are eliminated. The following relations are obtained:

$$n = x_{\max} / (1 - x_{\max}) \quad (3.6)$$

Among them, n is the stoichiometric ratio between subject and object.

In order to determine the composition of the complexes formed by copper ions and the main compounds, the Job curve of the complexes was obtained by taking the fluorescence intensity of the solution as the ordinate and the fraction (x) of copper ions in the total concentration as the abscissa. If the ion and the host compound form a 1:2 complex, the maximum fluorescence intensity of the continuous change curve appears at $f=0.33$. If the maximum value of A corresponds to x_{\max} of 0.5, and it is brought into the formula (3.6), the stoichiometric ratio of the complex is 1:1.

In this experiment, the concentration of the immobilized compound was 50 μM and the concentration of Cu^{2+} was 100 μM . The compound and the F-solution were formulated into a series of mixed solutions of different volume ratios. The solutions were analyzed by absorption spectroscopy one by one to detect the absorbance at 465 nm. The absorption intensity at 362 nm and the molar fraction of Cu^{2+} is plotted in abscissa. The curves shown in Fig. 3-7 are obtained. In Fig. 3-7 of the working curve, when the molar fraction of Cu^{2+} is 0.5, the fluorescence of the probe reaches its maximum value, which is the ratio of the main compound to the fluoride ion. This indicates that the main compound and Cu^{2+} are in accordance with the stoichiometric ratio of 1:2.



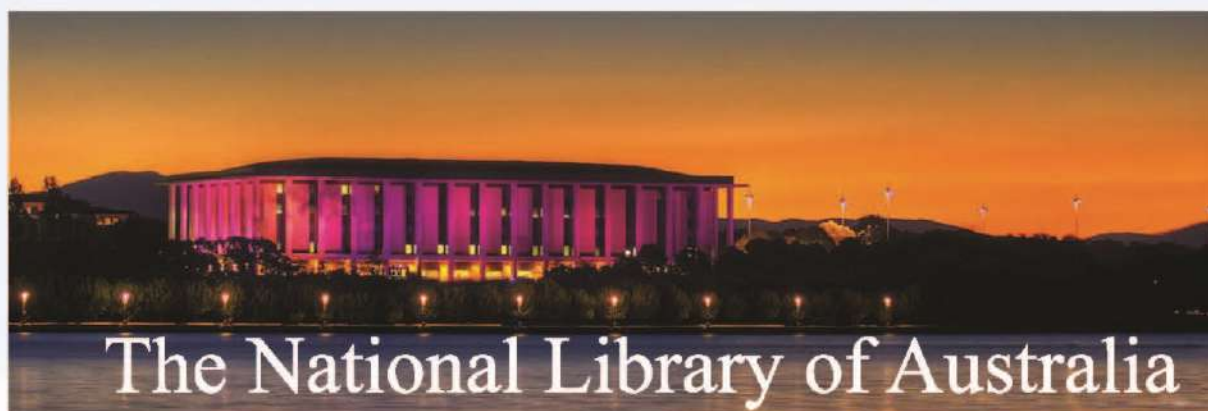
4. Conclusion

In summary, we designed and synthesized a new fluorescent probe for the detection of trace copper ions, probe 1. In addition, the coordination between the probe and copper ions has been confirmed by fluorescence spectra. Because the probe is simple and sensitive, it is likely to be used in various copper ion detection devices in the future.

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