

AGE DIFFERENCES IN PATIENTS WITH TYPE B AORTIC DISSECTION

Ke Zhang¹, Pimporn Thongmuang², Yuttana Sudjaroen³, Guangqiu Qin⁴

¹ Student of Doctoral Degree in Public Health Program, Graduate School, Suan Sunandha Rajabhat University

E-mail: s64584949007@ssru.ac.th

² College of Allied Health Sciences, Suan Sunandha Rajabhat University, Samut Songkhram province, Thailand.

E-Mail: pimporn.th@ssru.ac.th,

³ Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand.

E-Mail: yuttana.su@ssru.ac.th

⁴ Guangxi University of Chinese Medicine, China

E-mail: ⁴ qinguangqiu@hotmail.com

ABSTRACT

Objectives: This study aims to retrospectively review the clinical data of patients with Type B aortic dissection from a single center, in order to investigate the potential associations between clinical characteristics, treatment modalities, and age. The findings of this study are intended to provide novel insights for clinical management and prognostic evaluation. **Methods:** Collected clinical data of patients with Type B aortic dissection who were admitted to our center from January 1, 2022, to December 31, 2022, and analyzed the clinical characteristics and treatments of the patients by age group. **Results:** Query the annual inpatient cases for the year 2022, there were a total of 190 cases of Type B aortic dissection patients, and after applying the inclusion and exclusion criteria, 135 patients with Type B aortic dissection were ultimately included in this study. The patients were divided into two age groups: ≤ 60 years group ($n=87$) and >60 years group ($n=48$). Males accounted for 81.5% (110/135), females accounted for 25% (25/135), and there was a significant difference in gender distribution between the two groups ($p<0.001$). Hypertension is a significant risk factor at 92.6% (125/135), while the incidence of diabetes, atherosclerosis, and myocardial infarction diseases is not high, but there is a significant difference between groups ($p<0.05$). No statistical differences were observed in the remaining comorbidities. The D-dimer levels showed that the medians for the two groups were 2.5 mg/L (≤ 60 years group) and 3.9 mg/L (>60 years group), with a statistically significant difference between the groups ($p=0.024$). In terms of treatment options, conservative treatment was compared with surgical treatment (34 vs. 101, $p=0.014$), and within the ≤ 60 years group, conservative treatment was compared with surgical treatment (16 vs. 71), while in the >60 years group, conservative treatment was compared with surgical treatment (18 vs. 30), with a statistically significant difference between the groups. **Conclusion:** Clinical characteristics of elderly patients with type B aortic dissection: The incidence of type B aortic dissection in males is four times that of females, but as age increases, the proportion of females gradually increases. Hypertension is the main risk factor, and endovascular treatment is the primary treatment method. The elderly population tends to prefer conservative treatment. Future research needs more details about the effects of age and type of intervention to improve treatment outcomes.

Keywords: Aortic dissection; Type B aortic dissection; Age difference; Treatment methods

INTRODUCTION

Aortic dissection (AD), one of the most common and dangerous diseases among aortic syndromes [1]. The first report of autopsy findings of aortic dissection was made by Levinson as early as 1950 [2]. Its

incidence rate is relatively low, but the mortality rate is extremely high. Current literature reports that in the United Kingdom [3], the incidence of aortic dissection is 6 per 100,000, while insurance data from the United States [4] show an incidence rate of 10 per 100,000. In Miyazaki Prefecture, Japan [5], the incidence rate is higher at 17.9 per 100,000, whereas in China [6], the overall incidence of aortic dissection is lower at 2.8 per 100,000. Although there are regional differences in aortic dissection globally, the in-hospital mortality rate is approximately between 10% and 30%, and during long-term follow-up after diagnosis, the mortality rate can be as high as 50%, posing a severe threat to people's life safety [4,7,8].

Type B aortic dissection is a severe condition involving the aorta distal to the left subclavian artery, accounting for 25% to 40% of all cases of aortic dissection [9]. Existing research has observed age differences in cardiovascular diseases. According to the data analysis of one of the largest registries for aortic dissection, the International Registry of Aortic Dissection (IRAD), the average age range for patients with TBAD is between 55 and 70 years old, and the average age of onset for male patients is slightly lower than that for females [10]. At present, studies on the age-related differences in isolated type B acute aortic dissection are still very rare and need to be clarified. Therefore, research on the epidemiological characteristics of age differences has important clinical significance and public health value.

OBJECTIVE

To explore whether there is an association between the clinical characteristics, treatment methods, and other aspects of Type B aortic dissection with age differences.

Scope of the Research

1. Population Scope

This study is a single-center retrospective study that collected patients with type B aortic dissection who were hospitalized for the first time at the Vascular Interventional Surgery Center of Liuzhou Workers' Hospital in Guangxi, China.

2. Variable range

Inclusion and exclusion criteria: (1) Age ≥ 18 years old; (2) Referencing the diagnostic criteria established by the ESC in 2014 [11], for the first episode of illness, all patients underwent CTA examination for confirmation (confirmed by two researchers); (3) Preliminary results were obtained through ICD-10 coding searches, and further case quality was screened and classified statistically according to "Type B Aortic Dissection".

Exclusion Criteria: (1) Patients with thoracic aortic aneurysm, simple thoracic aortic intramural hematoma, and ulceration; (2) Cases with missing basic information, or missing information about the content to be discussed; (3) Severe coronary heart disease, liver and kidney dysfunction, diabetic hemorrhagic retinopathy, bleeding disorders, etc; (4) Hereditary vascular diseases: such as hypertension secondary to congenital aortic coarctation or bicuspid aortic valve disease; (5) Other immune system disease factors: systemic lupus erythematosus, polyarteritis nodosa; (6) Traumatic dissection, dissection during pregnancy.

3. Time frame

This research was conducted between January 2022 to December 2022.

METHODOLOGY

1. Research Methodology

By using the hospital's electronic medical record HIS system, and based on ICD-10 coding, we conducted a search to identify cases of "Type B aortic dissection" as a condition, retrospectively collecting patients' clinical case data.

2. Research Steps

Extract all basic information of patients upon admission from the electronic medical record system, including patient medical record numbers, names, genders, ages, admission and discharge times, past medical history, past surgical history, D- dimer levels upon admission, and treatment status (conservative/surgical) .

3. Data Collection

The study collected data from January 1, 2022, to December 31, 2022, and established a database using Excel software for subsequent analysis.

4. Data Analysis

After the collection and organization of clinical data, FreeStatisticsV2.0 software was used to perform descriptive analysis on the data. Normally distributed measurement data are expressed as mean $\pm$ standard deviation ($\bar{x} \pm s$), and independent sample t-tests were used for comparisons between groups. For measurement data that do not conform to normal distribution, the median M(IQR) is used, and the Mann-Whitney U test is applied for comparisons between groups. Categorical data are expressed as the number and frequency (%), and the chi-square test or Fisher's exact test ($n < 40$ or $T > 5$) is used to compare the percentage differences between groups. A difference is considered statistically significant if $P < 0.05$ (two-sided).

RESULTS

By using the "ICD-10-CM Codes for Aortic dissection [any part], I71.000" in the medical case HIS system, a query for all inpatient cases in 2022 was conducted, resulting in 190 cases. Following the previous inclusion and exclusion criteria, 135 patients with type B aortic dissection were ultimately included in this study. The patients were divided into two groups based on age: the ≤ 60 years group ($n=87$) and the >60 years group ($n=48$). The two groups were compared and analyzed in terms of gender, ethnicity, seasonal distribution, length of hospital stay, prevalence of chronic diseases, treatment methods, and D-dimer levels. From Table 1.

The results of the epidemiological characteristic analysis indicate that there is a significant difference in gender distribution between the two groups ($p < 0.001$). Specifically, in the age ≤ 60 group, males account for 90.8% (79/87) of the total number of people in this group, while females account for 9.2% (8/87); in the age >60 group, males account for 64.6% (31/48), and females account for 35.4% (17/48). In terms of ethnic composition, no significant difference was observed between the two groups ($p=0.499$). In the age ≤ 60 group, Han nationality account for 65.5% (57/87), Zhuang nationality account for 25.3% (22/87), and other nationality account for 9.2% (8/87); in the age >60 group, Han nationality account for 66.7% (32/48), Zhuang nationality account for 18.8% (9/48), and other nationality account for 14.6% (7/48). Regarding the distribution of disease onset by season, no significant difference was found between the two groups ($p=0.57$). The distribution of each season in the two groups is relatively even, and no obvious seasonal pattern of disease onset was observed. Further analysis of hospitalization time shows that the average length of hospital stay for the two groups is 11.5 days (age ≤ 60 group) and 12.9 days (age >60 group), respectively, with no statistically significant difference ($p=0.444$).

Table 1 Characteristics Description Table Grouped by Age

Variables	Total (n = 135)	Age≤60 Years (n = 87)	Age>60 Years 2 (n = 48)	P value
Sex, n (%)				< 0.001
Female	25 (18.5)	8 (9.2)	17 (35.4)	
Male	110 (81.5)	79 (90.8)	31 (64.6)	
Nationality, n (%)				0.499
Han nationality	89 (65.9)	57 (65.5)	32 (66.7)	
Zhuang nationality	31 (23.0)	22 (25.3)	9 (18.8)	
Other nationality	15 (11.1)	8 (9.2)	7 (14.6)	
Quarter, n (%)				0.57
Quarter 1	44 (32.6)	29 (33.3)	15 (31.2)	
Quarter 2	31 (23.0)	21 (24.1)	10 (20.8)	
Quarter 3	33 (24.4)	18 (20.7)	15 (31.2)	
Quarter 4	27 (20.0)	19 (21.8)	8 (16.7)	
Length.of.hospital.stay, Mean ± SD	12.0 ± 9.6	11.5 ± 9.6	12.9 ± 9.7	0.444
Hypertension, n (%)	125 (92.6)	80 (92)	45 (93.8)	1
Diabetes, n (%)	11 (8.1)	3 (3.4)	8 (16.7)	0.017
Atherosclerosis, n (%)	86 (63.7)	50 (57.5)	36 (75)	0.043
Hyperlipidemia, n (%)	34 (25.2)	22 (25.3)	12 (25)	0.971
Smoking, n (%)	36 (26.7)	25 (28.7)	11 (22.9)	0.464
Cerebrovascular.diseases, n (%)				0.136
Ischemic.stroke	27 (20.0)	13 (14.9)	14 (29.2)	
Cerebral.hemorrhage	3 (2.2)	2 (2.3)	1 (2.1)	
Chronic Obstructive Pulmonary Disease (COPD), n (%)	2 (1.5)	0 (0)	2 (4.2)	0.125
Pneumonia, n (%)	93 (68.9)	58 (66.7)	35 (72.9)	0.453
Pleural.effusion, n (%)	28 (20.7)	15 (17.2)	13 (27.1)	0.177
Myocardial.Infarction, n (%)	4 (3.0)	0 (0)	4 (8.3)	0.015

Chronic.Kidney.Disease, n (%)	7 (5.2)	4 (4.6)	3 (6.2)	0.699
Treatment methods, n (%)				0.014
Conservative treatment	34 (25.2)	16 (18.4)	18 (37.5)	
Endoscopic surgery	101 (74.8)	71 (81.6)	30 (62.5)	
D-dimer(mg/L), Median (IQR)	2.7 (1.3, 5.6)	2.5 (1.2, 4.9)	3.9 (2.0, 8.5)	0.024

The analysis of the prevalence of comorbidities revealed that the incidence of hypertension was as high as 92.6% (n=125), atherosclerosis was 63.7% (n=86), smoking was 26.7% (n=36), and hyperlipidemia was 25.2% (n=34). However, no statistically significant differences were observed between the two age groups in these comorbidities. In contrast, significant between-group differences were noted in the incidence of diabetes, myocardial infarction, and atherosclerosis ($p<0.05$), despite their relatively low overall prevalence. Further analysis of D-dimer levels showed that the median values were 2.5 mg/L in the ≤ 60 -year-old group and 3.9 mg/L in the >60 -year-old group, with a statistically significant difference between the groups ($p=0.024$). This indicates that patients in the >60 -year-old group had significantly higher D-dimer levels compared to those in the ≤ 60 -year-old group. Regarding treatment modality, a significant difference was observed between the two age groups ($p=0.014$). Specifically, the proportion of patients opting for conservative treatment was significantly higher in the >60 -year-old group (37.5%) than in the ≤ 60 -year-old group (18.4%), while the proportion choosing endovascular repair was significantly lower in the >60 -year-old group (62.5%) compared to the ≤ 60 -year-old group (81.6%).

CONCLUSION AND FUTURE WORK

This study found that the incidence rate in males compared to females is 4:1, with males accounting for 81.5% of the total incidence rate. Moreover, as age increases, the proportion of females significantly increases, while the proportion of males relatively decreases ($p<0.001$). These results are consistent with the trend of global demographic changes, where the average life expectancy of females is generally longer than that of males. This may be due to a combination of biological factors (such as the protective hormonal effects in females) and social factors (such as higher occupational exposure risks and unhealthy lifestyles in males). According to the statistics by Suzuki et al. [12], the average age of onset for Type B aortic dissection in males is 65 ± 13 years, accounting for 71%. Another study that included 9,855 TBAD patients showed that females had a later onset age compared to males (69.8 ± 15.5 vs 62.8 ± 15.6 , $P < 0.001$) [13]. In the formulation of public health policies, this age difference needs to be fully considered. For instance, in health interventions targeting specific populations, special attention should be paid to the health needs of the elderly, including the prevention of chronic diseases, mental health support, and the increase of opportunities for social engagement. Therefore, in public health practice, personalized prevention and treatment strategies should be developed based on age differences to enhance the effectiveness and safety of interventions.

The results of this study indicate that the incidence of hypertension (92.6%) is the major risk factor for type B aortic dissection, and the prevalence of diabetes, atherosclerosis, and myocardial infarction in the group over 60 years of age is significantly higher than that in the group aged 60 years or younger ($p<0.05$). This finding is consistent with previous studies, suggesting that the incidence of chronic diseases significantly increases with age. This trend also reflects changes in the elderly population in terms of physiology, metabolism, and lifestyle, such as increased insulin resistance, abnormal lipid metabolism, and reduced physical activity. Globally, the proportion of patients with high blood pressure is generally high, especially in the United States [14], where the proportion is as high as

80.9%. Additionally, elderly TBAD patients are more likely to have a history of hypertension and cardiovascular diseases, which may exacerbate the damage to the aortic wall and increase the risk of dissection [15]. Therefore, from a public health perspective, these results suggest the need for stronger chronic disease management among the elderly population. First, health education and community intervention measures should be used to enhance the elderly's awareness and self-management skills regarding chronic diseases. Second, the healthcare system needs to provide more accessible and personalized medical services to ensure early diagnosis and effective treatment of chronic diseases. Moreover, considering the significant consumption of medical resources by chronic diseases, public health policies should prioritize preventive measures such as promoting healthy lifestyles, strengthening vaccination programs, and chronic disease screenings.

In our study, it is visible that 74.8% of patients overall chose endovascular treatment, but the proportion of patients over 60 years old choosing conservative treatment increased. This result is related to the development of endovascular treatment technology and the physical condition and surgical risk of the elderly population. According to the International Aortic Intersection Dissection Registry (International Registry for Aortic Dissection, IRAD), TBAD is increasingly treated, rising from 35% in 1996-2001 to 68% in 2008-2013 [16]. Global data reveals that TEVAR, compared to traditional open surgery or OMT, can significantly improve outcomes in the treatment of complex TBAD and has become the preferred method for treating TBAD. However, as people age, organ function gradually declines, surgical tolerance decreases, and the risk of postoperative complications increases. Therefore, clinicians often tend to choose conservative treatment when formulating treatment plans, to reduce surgical risks.

This study has certain limitations. Firstly, the design of this study is based on retrospective case analysis, which means that it is not possible to directly observe the actual situation of the subjects, but rather to conduct research by collecting and analyzing past data. Therefore, the study cannot clearly determine the direct causal relationship that leads to the onset of aortic dissection, that is, it cannot be determined which factors are the direct causes of the disease. Secondly, the sample size is small, which may not fully reflect the impact of age factors on health. Finally, the data source is single, which may not comprehensively reflect the health status of different regions and populations. In future studies, it is recommended to expand the sample size and adopt a multicenter prospective study design to improve the reliability and representativeness of the research results.

This study, through a systematic analysis of the characteristics of age-stratified populations, reveals the impact of age on gender distribution, ethnic composition, prevalence of chronic diseases, choice of treatment methods, and D-dimer levels. The findings indicate that the incidence of Type B aortic dissection in males is four times that of females, but as age increases, the proportion of females gradually rises, which may be related to the biological advantages of females and their higher average life expectancy. Additionally, hypertension is a major factor in the occurrence of Type B aortic dissection, and the prevalence of chronic diseases such as diabetes, atherosclerosis, and myocardial infarction is significantly higher in the age group over 60 compared to those aged 60 or younger, suggesting a higher chronic disease burden in the elderly population. In terms of treatment options, endovascular treatment is the primary method, but the elderly are more inclined towards conservative treatment, which may be related to their physical condition and increased surgical risks.

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