

Original Research Article

**Treatment of Acute Aortic Dissections: A Single Centre Experience****Donghua Pan<sup>1</sup>, Wenbin Zhang<sup>1</sup>, Tianci Qian<sup>1</sup>, Fugui Ruan<sup>1</sup>, Xiaolin Sun<sup>1</sup>, Jiangbin Sun<sup>1</sup>, Xingxing Peng<sup>2</sup>,  
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**Abstract:** The objective is to summarize initial experience in the management of acute aortic dissections. From January 2010 to July 2014, we had Debakey I aortic dissection 17 (39.5), Debakey II 4 (9.3%) and Debakey III 22(51.2%). Surgery was performed in 10 patients. Thoracic endovascular repair was performed in 15 patients. The other 10 patients received medical therapy. Aortic remodeling was evaluated comparing preoperative and most recent computed tomography scans during their follow up. In surgical treatment of 10 cases, the mean cardiopulmonary bypass time was  $203.50 \pm 109.64$  min, mean myocardial ischemia time was  $82.20 \pm 49.68$  min, and mean time of selective cerebral perfusion at 25°C was  $36.24 \pm 15.48$  min. Main complications were bleeding (10%), low cardiac output syndrome(10%), stroke (10%), prolonged mechanical ventilation (20%) and acute renal failure (20%). In-hospital mortality of 10.0%. There was no need for second-stage operation. Thoracic endovascular repair was successfully performed in 10 cases. False-lumen thrombosis was obtained in 80%. Follow up duration ranged from 20- 60 months. There was no death, reoperation or no rupture during the follow up. Timely and accurate diagnosis in early stage and individualized treatment can improve the survival of aortic dissections and reduce the incidence of serious complication. The severity of the underlying disease justifies high mortality rates. The learning curve is a reality.**Keywords:** Aortic Dissection, Thoracic, Surgery, Endovascular Procedures

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**INTRODUCTION**

Aortic dissection occurs when a tear in the intimal of the aorta causes blood to flow between the layers of the wall of the aorta, forcing the aortic layers apart. Acute aortic dissection is the most common life-threatening manifestation of the so-called acute aortic syndrome. Classification schemes for aortic dissection are based on anatomic involvement of the aortic dissection. The immediate mortality rate in aortic dissection is as high as 1% per hour over the first several hours. It is estimated that about 33% of patients die within the first 24 hours, and 50% die within half a week. The 2-week mortality rate reaches 80% in patients with undiagnosed ascending aortic dissection [1].

In recent years, the physicians raise awareness and understanding of aortic dissection. Computed tomography angiography (CTA) imaging technology and magnetic resonance imaging (MRI) continue to improve greatly in the clinical setting [2,3] . Many

patients could be timely diagnosed and accept the individualized treatment programs. Prognosis of the acute aortic dissection has improved dramatically.

From January 2010 to July 2014, our institution received a total of 43 cases of aortic dissection. The aim of this study is to summarize our initial experience in treating of acute aortic dissection.

**MATERIALS AND METHODS**

Our institution received 43 cases of acute aortic dissections, of which 33 males and 10 females; aged 23 to 80 (mean  $35.0 \pm 4.6$ ) years. The main clinical manifestations of sudden chest and back pain, which was tearing or knife-like tingling and radiation to the abdomen or thighs. 30% patients, were presented with chest tightness, shortness of breath, difficulties and other symptoms. Once they were suspected aortic dissection, 64-slice spiral CTA was performed. There were Debakey I in 17 cases, Debakey II in 4 cases, Debakey III in 22 cases (including 2 cases Debakey IIIa,

DeBakey IIIb 20 cases). Marfan syndrome was found in 4 cases. Hypertension and diabetes was found in 40, 9 cases, respectively. Pericardial and pleural effusion was in 10 cases. 1 patient had a history of stroke, and 1 patient was with renal insufficiency. Patient data were retrospectively analyzed from a database prospectively built. Full clinical follow-up was done up to May 30, 2016. Follow-up was performed at the institution's outpatient clinic.

Once the diagnosis of aortic dissection was confirmed, all patients were received perioperative management, including monitor vital signs, absolutely lying on bed rest with or without sedative drugs, oral or/and intravenous drugs controlling systolic pressure to 100 to 120 mmHg and heart rate to 60 to 80/ min. 10 surgical patients were under general anesthesia. Their radial artery and femoral artery blood pressure were monitored. The right of free axillary artery was fully exposed to insert cannula. Conventional median sternotomy and free of the ascending aorta and aortic root three major branches were performed. Intravenous heparin was given, right axillary artery perfusion tube was inserted and right atrial appendage inserted into the cavity housing management, left ventricular drainage tube inserted through the right pulmonary vein. The hypothermic cardiopulmonary bypass was established. Frozen elephant trunk technique was performed in 9 patients; Bentall surgery was performed in one case. 15 patients underwent endovascular repair in the intervention room. The other nine patients received medical conservative medical treatment. Drugs such as angiotensin receptor blockers, were routinely used. After their discharge, long-term medication continued.

## RESULTS

Before operation, 9 patients died of aortic rupture. In surgical treatment of 10 cases, cardiopulmonary bypass time was 130 ~400 min (mean  $203.50 \pm 109.64$ ) min; myocardial ischemia time was 28 ~ 177 (mean  $82.20 \pm 49.68$ ) min; deep hypothermic circulatory arrest and selective cerebral perfusion time was 14 ~ 48 (mean  $36.24 \pm 15.48$ ) min. Their intraoperative blood transfusion was 600 ~ 6000 (mean  $2129.88 \pm 1696.32$ ) ml; ventilator-assisted time was 13 ~ 48 (mean  $108.60 \pm 167.28$ ) h; ICU stay time was 7 ~ 46 (mean  $19.20 \pm 2.88$ ) days; the total hospital stay time was 4 ~ 136 (mean  $49.08 \pm 48.36$ ) d. In-hospital mortality of 10.0%. Main complications were bleeding (10%), low cardiac output syndrome (10%), stroke (10%), prolonged mechanical ventilation (20%) and acute renal failure (20%). 15 cases of patients after endovascular repair therapy covered stents were successfully without released shift, internal leakage and other complications.

33 patients recovered completely and discharged. Their average postoperative follow-up review of 64-slice spiral CTA and echocardiography at

the end of the first year. False-lumen thrombosis was obtained in 80%. Imaging studies have demonstrated no new dissection, false lumen significantly reduced dissection, aortic lumen diameter became smaller, left ventricular ejection fraction was significantly increased during follow-up without dissection rupture and death.

## DISCUSSION

Aortic dissection is a serious threat to human health and quality of life of the main arterial disease. As the tear extends along the wall of the aorta, blood can flow in between the layers of the blood vessel wall (dissection). This can lead to aortic rupture or ischemia to vital organs. The aortic dissection incidence is no less than 30 cases per million individuals per year [4]. In our group of 43 aortic dissection cases, 9 cases died in the first three days of hospitalization with the mortality of 21%.

The main cause of aortic dissection is formed of connective tissue disease, high blood pressure, artery atherosclerosis, diabetes, Marfan syndrome, trauma, etc. These risk factors can lead to abnormal aortic wall structure, to form a sandwich under great pressure in the aortic lumen, thereby affecting heart function and various branches of the aortic vascular perfusion and cause systemic inflammation, leading to rupture of an artery and organ ischemia [5]. The symptoms of aortic dissection can be difficult to distinguish from those of other heart diseases, such as a heart attack. Chest and/or back pains are the most common symptoms of this condition. There's typically severe pain, coupled with a feeling that something is tearing in patients' chest. Unlike heart attack, the pain usually begins suddenly and seems to move around. Some patients had milder pain, which was sometimes mistaken for muscle strain, but this is less common.

The cardiac surgeons should quickly and accurately make a diagnosis and classification, which carried out as early as possible is the key to treatment. Aortogram has been replaced by other less invasive imaging tools, such as CTA, Transesophageal echocardiogram, and MRI are highly accurate methods in the diagnosis of aortic dissection. Among them, 64-slice spiral CTA is a faster, accurate, non-invasive tool. CTA can supply much important information, including the tear entry and reentry sites, main branch vessels involvement, extent of dissection, pericardial effusion and any signs of rupture [6]. The Transesophageal echocardiogram is a relatively good choice with a sensitivity and specificity up to 98%. [7]. It is a relatively non-invasive test, but requiring sedation and the individual to swallow the echocardiography probe. It is especially good in the evaluation of aortic valve regurgitation in the setting of ascending aortic dissection. MRI is also the gold standard test, but it is relatively time consuming which may be dangerous in people who are already very

unwell. In our institution, once the patient was suspected aortic dissection, emergency CTA examination must be performed. Disadvantages of CTA include the need for iodinated contrast material. The selection of imaging method is depending on institutional capabilities and expertise.

Aortic dissection is a life-threatening condition and needs to be treated right away. In patients with acute thoracic aortic dissection, it is vital to decrease the elevated blood pressure and heart rate. Oral and intravenous antihypertensive drugs should be prescribed. Beta-blockers are the first line choice. Strong pain relievers are very often needed. The current guidelines advocated therapeutic targets of a heart rate of 60 beats/min and a systolic blood pressure less than 120 mm Hg. Dissections that occur in the part of the ascending aorta are treated with surgery. Dissections that occur in the descending aorta may be managed with surgery or medicines. Acute type B aortic dissection comprises approximately one-third of all aortic dissection cases. According to international guidelines, stable patients with uncomplicated Type B aortic dissection should receive optimal medical treatment. Complicated type B dissections may require surgery to repair when there was aortic rupture or branch vessel ischemia. Endovascular grafts have been widely used to treat many complications of type B dissections with relatively low short-term morbidity and mortality rates [9]. An expert consensus suggest that medical management with close imaging follow-up is the best strategy for uncomplicated type B aortic dissections with acute subacute and chronic presentation, whereas endovascular repair should be applied to complicated cases and suitable anatomy, to decrease the mortality risk of open surgery[10].When acute type B aortic dissection is the indication for endovascular repair, complete or nearly complete coverage of the entire descending thoracic aorta is also required. Whether excessive coverage is worthing should be considered. No one wants to compromise the critical blood supply to the spinal cord [11]. In our group, however, the risk of endovascular repair-related paraplegia is rare.

Surgical management of type A dissection involves excision of the intimal tear when possible, obliteration of entry into the false lumen proximally and distally, and interposition graft replacement of the ascending aorta [12]. The involved aortic valve should be replaced. If the heart arteries are involved, a coronary bypass is also performed. Mortality associated with unoperated type Aortic dissection has been estimated at 1%/h to 2%/h during the first two days. So all patients who was diagnosed as type A dissection should be prepared for immediate surgical repair [13].The patients with Stanford An aortic dissection would presented rapid onset of pericardial tamponade caused hemopericardium, aortic valve involvement and lead to acute left ventricular failure and cause adverse

involving branch vessels perfusion syndrome is the leading cause of death before surgery conservative treatment could be performed. There is no little or no sense for medical stabilization prior to surgery. Pre-operative coronary angiography was not need to be performed routinely; which would increases the risk for aortic rupture. In our group, 9 patients were died in the first three inhospitality days because of various reasons.

In recent years, some reports [14, 15] summited the frozen elephant trunk technique has lower postoperative complications and mortality were lower, long-term effect is good. It has been applied to mature and thoracoabdominal aortic dissection in recent years and so the treatment of diseases, which includes the ascending aorta and arch replacement plus stent elephant trunk technique. This hybrid approach allows the distal graft anastomosis, protect the vascular endothelium and promote the false lumen thrombosis, thereby reducing distal arterial neoplasia. With the help of Professor Zhu Jun Ming from Anzhen hospital, we also went through a learning curve. The learning curve is a reality. In the nine cases of Type A patients who underwent surgical treatment, there were less intraoperative bleeding, low complication rate, good postoperative prognosis. The patient with Marfan syndrome was died at 10<sup>th</sup> postoperative day, which was due to the longer cardiopulmonary bypass time, severe blood coagulation function disorders leading to multiple organ failure. The success of surgical lie in much experience, including the left subclavian artery and free reconstruction, aortic graft and suture techniques, emergency treatment, etc.

Choosing the correct suitable artery cannula method and intraoperative cerebral and kidney, heart and other protection methods were also important to improve surgical treatment of aortic dissection. In Pacini and his colleague's study [16], the advantages of axillary artery cannulation was not only for convenience antegrade cerebral perfusion, but also for not causing limb necrosis against atherosclerosis. The choice of performing axillary artery antegrade cerebral perfusion method is considered the most effective measures to protect the brain, which can reduce the adverse effects of deep hypothermia circulatory arrest brought neurological complications [17]. In their study, in the axillary artery group, intraoperative brain and kidney lower limb blood perfusion were well, only one case with preoperative presence of vascular atherosclerosis, which had postoperative coma had a good recovery after active treatment. The main treatment for aortic dissection include intervention therapy, surgery and drug therapy, in which surgical surgery is the most effective means of treatment. In recent years, domestic and international studies have confirmed endovascular stent graft implantation for treatment Stanford B type, early hospital mortality rate is far lower than medical therapy and long-term

morbidity and mortality is higher than the long-term surgery.

## CONCLUSION

Aortic dissection is a life threatening cardiovascular disease. Early diagnosis and timely individualized treatment of individual correct effective in reducing mortality, reducing the occurrence of serious complications, and the need to work closely with the surgeon, anesthetist, effective management of cardiopulmonary bypass and postoperative intensive care.

## CONFLICT OF INTERESTS

None declared.

## AUTHOR'S CONTRIBUTION

Donghua Pan and Haiyong Wang wrote the paper. Wenbin Zhang, Fugui Ruan, Zhenzong Du, Jianfei Song, Tianci Qian, Xiaolin Sun and Jiangbin Sun supervised the composition of the paper. All authors read and approved the final paper.

## ACKNOWLEDGEMENTS

This work was supported by Health Department of Guangxi Zhuang Autonomous Region Grant [Z2014313]. We thank Jiangwei Hu and for his contribution to this article.

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