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Total Arch Replacement Combined with Stented Elephant Trunk Implantation for Acute Type A Aortic Dissection in an Octogenarian Patient

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ABSTRACT

Background: The indications and outcome of surgery for Acute type A aortic dissection (ATAAD) in elderly patients are still debated, especially when they were above 80 years old.

Case presentation: This report describes the case of an octogenarian patient with ATAAD who underwent total arch replacement (TAR) combined with stented elephant trunk (SET) implantation.

Conclusion: Emergent surgery should be performed on the ATAAD octogenarians without serious preoperative complications. Acceptable outcomes could be received by total arch replacement combined with SET implantation.

INTRODUCTION

Acute type A aortic dissection (ATAAD) is a life-threatening condition with a high mortality rate without surgical treatment. The debate about the indications and outcome of surgery for ATAAD in elderly patients is still debated, especially when they are above 80 years old. Previous studies have reported that advanced age still remains an independent predictor of mortality and is associated with neurologic complications after surgery for ATAAD, which suggests that it is not reasonable to perform surgery on elderly patients [Neri 2001; Mehta 2002; Piccardo 2009; Rylski 2011; Trimarchi 2010]. However, recent reports have shown acceptable outcomes after surgery for elderly patients with ATAAD [Tang 2012; Matsushita 2014; Malvindi 2015; Hattori 2020]. We present here the case of an octogenarian patient with ATAAD who underwent total arch replacement (TAR) combined with stented elephant trunk (SET) implantation emergently.

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CASE REPORT

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We report an 84-year-old female admitted to our hospital with acute anterior chest pain and backache lasting about 3 h. An urgent transthoracic echocardiogram (TTE) revealed a dilated ascending aorta (46 mm) with an intimal tear, normal cardiac function, and mild aortic regurgitation (AR) with normal aortic valves. Emergent computed tomographic angiography (CTA) demonstrated a 45 mm-diameter ascending aorta with acute dissection extended from the ascending aorta to descending aorta distal to the subclavian artery and the site of entry was at the aortic arch through which the false lumen was communicating with the true lumen. (Figure 1)

Emergent surgery was performed by a median sternotomy. Cannulation of the right axillary artery and two-stage venous cannulation of the right atrium was used and cardiopulmonary bypass (CPB) was established. Cold blood cardioplegia was used for cardio protection and ascending aortic replacement was performed. When the nasopharyngeal temperature dropped to 25°C, the brachiocephalic arteries were clamped respectively, and unilateral selective cerebral perfusion (SCP) was started for cerebral protection through the right axillary artery cannulation. The aortic arch then was opened longitudinally. The entry site was found at the aortic arch and the origin of the brachiocephalic arteries all were dissected. The aorta was dissected distal to the subclavian artery. Therefore, TAR combined with SET implantation was determined to perform as described by Sun and colleagues [Sun 2011]. A SET (MicroPort Medical Co Ltd, Shanghai, China) was inserted into the true lumen of the distal aorta. The distal aorta and stented graft were anastomosed to the distal end of a 4-branch prosthetic graft (Boston Scientific Inc, Boston, MA). Then, blood perfusion of the lower body was initiated via a branch of the prosthetic graft, and TAR was performed using this 4-branch prosthetic graft. Bilateral SCP was started when the anastomosis of the left common carotid artery to a branch of the prosthetic graft was accomplished. CPB gradually resumed. Then, the anastomosis of the proximal end of the 4-branch prosthetic graft to the prosthetic graft replaced at ascending aorta was performed. The myocardial blood supply was restored, and the heart returned to beating. Finally, the left subclavian artery and the innominate artery were anastomosed to the branches of the prosthetic graft,

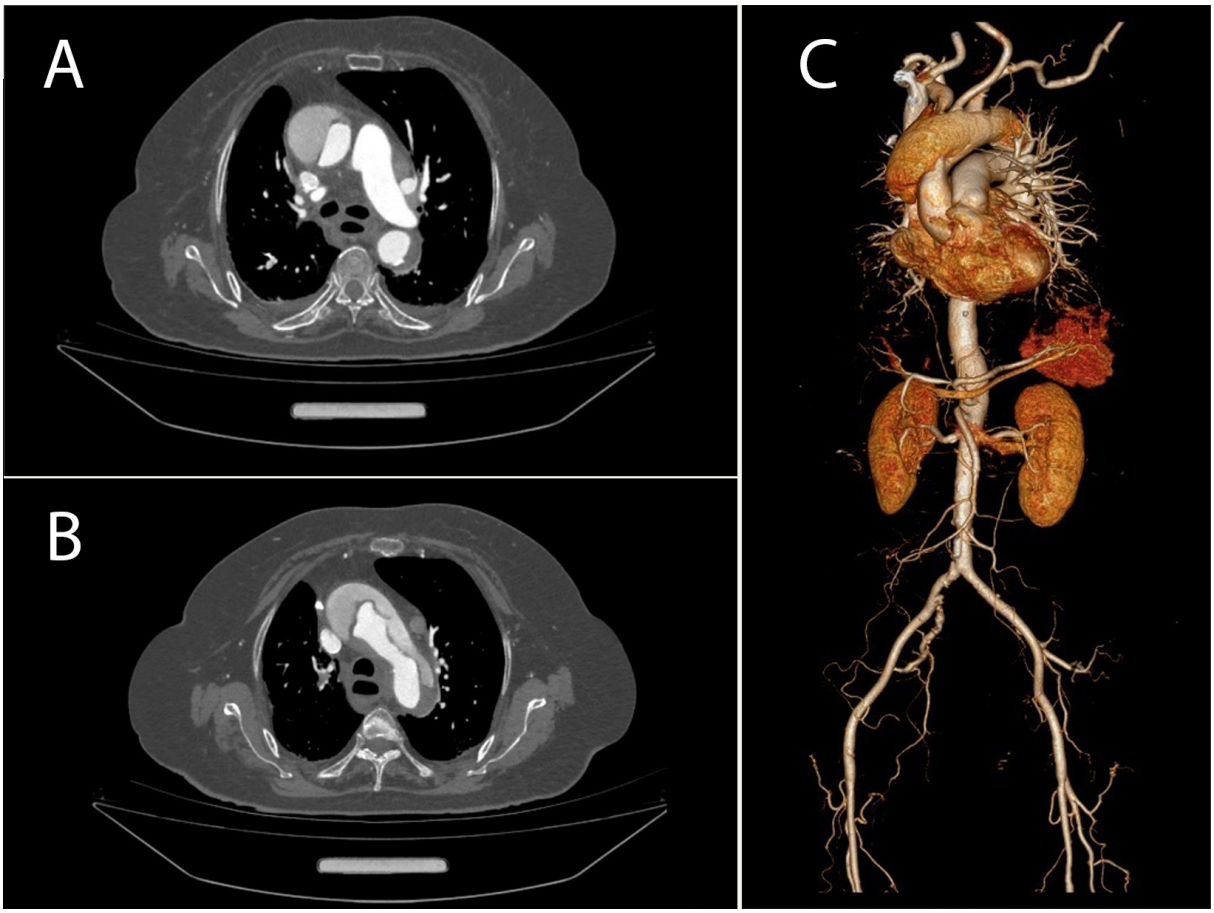

Figure 1. computed tomographic angiography (CTA) of the octogenarian with ATAAD. (A) Acute dissection can be observed both in the ascending aorta and the descending aorta. (B) The site of primary entry was found at the aortic arch (yellow arrow). (C) 3D reconstruction of preoperative CTA showed the aortic dissection extended from the ascending aorta to the descending aorta.

respectively. The CPB time was 203 min, aortic cross-clamp time was 108 min, and deep hypothermic circulatory arrest time was 19 min.

The duration of mechanical ventilation support was 18 h. The duration of stay in the intensive care unit was 52 h. There were no obvious neurologic complications after surgery. Postoperative TTE showed mild aortic insufficiency and CTA showed that the SET was in the true lumen of descending aorta and expanded to its full diameter. (Figure 2) The patient was discharged on the 15th postoperative day, and she made a good recovery 6 months after the surgery.

DISCUSSION

ATAAD is a life-threatening disease with a high mortality rate without surgical treatment. With the progressive aging of populations, the number of elderly patients with ATAAD undergoing surgery has been increasing. However, surgery for ATAAD in elderly patients is still debated. Previous studies have shown that advanced age still remains an independent predictor of mortality in patients with ATAAD [Neri 2001; Mehta 2002; Piccardo 2009; Rylski 2011; Trimarchi 2010]. In 2001, Neri et al. reported extremely poor outcomes of surgery for ATAAD in octogenarians with 33% intraoperative mortality and 83% hospital mortality [Neri 2001]. An analysis of 550 patients with ATAAD from the International Registry of Acute Aortic Dissection (IRAD) showed that operative mortality among the elderly patients was increased gradually with age, which were 31.6% in 70 to 74 years, 42.5% in 75 to 79 years, 45.5% in 80 to 84 years, and 50% in 85 years [Mehta 2002]. Piccardo and colleagues reported 45.6% hospital mortality in 57 octogenarians undergoing surgery for ATAAD from 2000 to 2006, with a 5-year survival of 44% [Piccardo 2009]. A study from the German Registry for Acute Aortic Dissection Type A (GERAADA) also revealed that octogenarians (83 patients) had a significantly higher 30-day mortality in comparison with patients between 70 and 80 years (381 patients) (34.9 vs. 15.8%, $P < 0.0001$) [Rylski 2011].

However, recently many researchers found that surgery could result in more acceptable outcomes in elderly patients with ATAAD compared with conservative treatment [Tang 2012; Matsushita 2014; Malvindi 2015; Hattori 2020]. Research from IRAD showed that the hospital mortality after

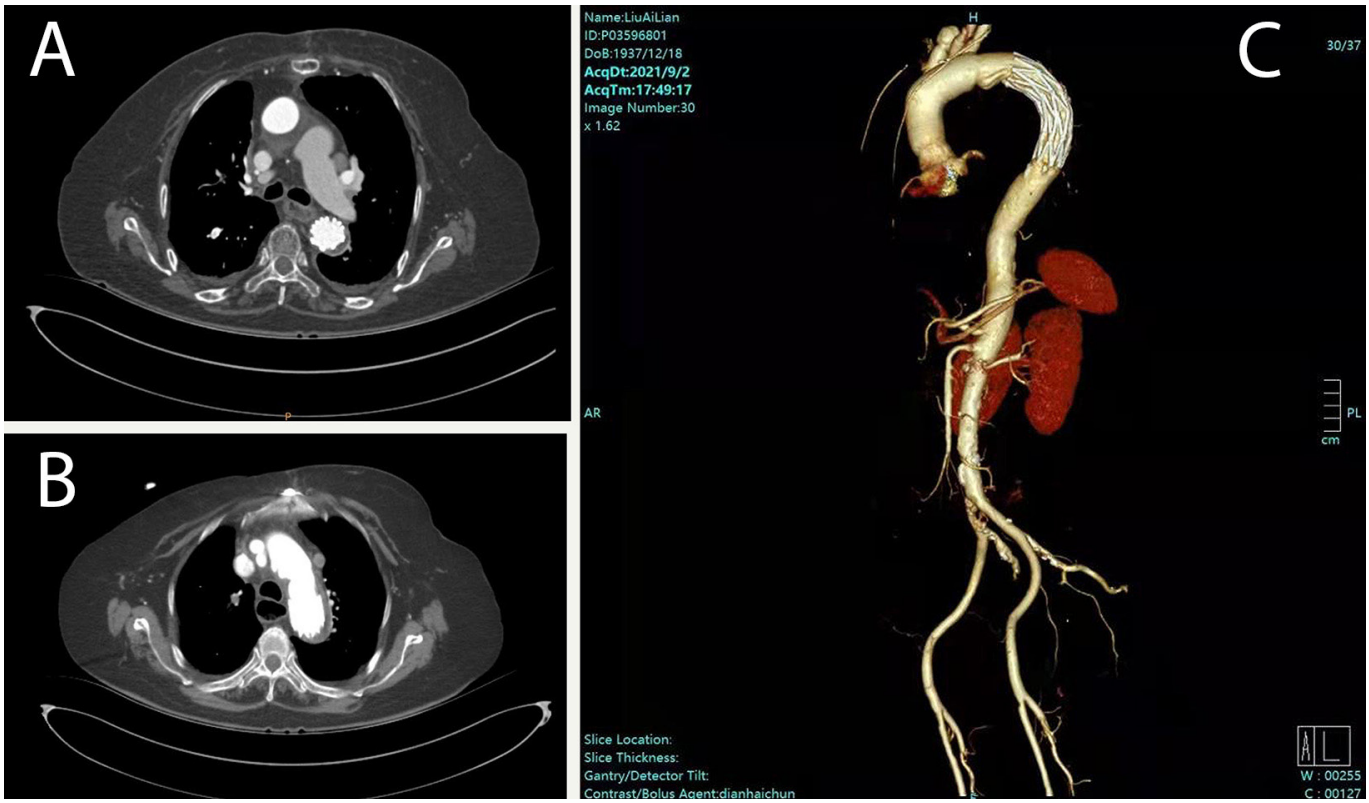

Figure 2. CTA of the octogenarian with ATAAD after surgery. (A) The SET in the descending aorta expanded to its full diameter. (B) The anastomosis of the 4-branch prosthetic graft to the SET can be observed at the aortic arch. (C) 3D reconstruction of postoperative CTA showed the replacement of the ascending aorta and the SET.

surgery was significantly low, when compared with conservative treatment for patients between 70 and 80 years (29.7 vs. 54.7%, P = 0.001) and for patients between 80 and 90 years (37.9 vs. 55.2%, P = 0.188) [Trimarchi 2010]. In 2014, Matsushita reported that in 124 patients (with a mean age of 78.6 years) the operative mortality was only 4.8% [Matsushita 2014]. A report in 2015 from Malvindi also revealed that emergent surgery for ATAAD in elderly patients (with a mean age of 79 years) resulted in an acceptable early mortality rate of 15% and a satisfactory intermediate survival rate (1-, 5- and 8-year survival rates were 82%, 76%, and 67%, respectively) [Malvindi 2015]. In 2020, Hattori indicated that preoperative clinical frailty assessment is very important for surgery for elderly patients with ATAAD and even nonagenarians could receive acceptable outcomes of zero in-hospital mortality, zero 30-day mortality, and 90% 1-year survival when their preoperative clinical frailty score is not higher than 4 [Hattori 2020]. Piccardo and colleagues stated that postoperative complications and mortality was higher significantly in octogenarians with preoperative complicated conditions of stroke, paraplegia, coma, visceral ischemia, and cardiopulmonary resuscitation [Piccardo 2009]. Therefore, they considered that emergent surgery could be beneficial to octogenarians with uncomplicated ATAAD.

We believe that advanced age should not be considered a contraindication to surgery for ATAAD. Preoperative complicated conditions, such as acute neurologic complications, cardiac tamponade, hypotension, myocardial ischemia, acute renal failure, and visceral ischemia also should be considered as risk factors [Trimarchi 2010; Malvindi 2015]. Therefore, preoperative assessment is very important. For this 84-year-old patient with ATAAD, who had no preoperative complicated conditions, emergent surgery was determined to be performed in our hospital. As a result, the patient benefited from such decisions and surgical treatment.

Among multiple postoperative complications, neurologic complications are considered to be the most related to advanced age [Piccardo 2009; Rylski 2011; Trimarchi 2010]. However, with the development of brain protection technology during surgery, the rate of stroke after surgery showed an obvious downward tendency [Sun 2011; Di Eusanio 2013; Conzelmann 2012]. Recent reports from IRAD and GERAADA revealed that elderly patients with preoperative neurologic complications who received surgery showed a better outcome compared with those who underwent conservative treatment [Di Eusanio 2013; Conzelmann 2012]. Therefore, brain protection during surgery is very important, especially in elderly patients. In this case, we use unilateral SCP with deep hypothermic circulatory arrest during TAR combined with SET implantation. Bilateral SCP immediately was initiated when the anastomosis of the left common carotid artery to the branch of the prosthetic graft was accomplished. The

deep hypothermic circulatory arrest time was only 19 min, and there were no postoperative neurologic complications.

Another important factor closely related to outcomes after surgery in elderly patients is efficiency of the surgical process. Previous studies showed that a prolonged operation may increase in-hospital mortality resulting from cerebral ischemia, infection, and multiple organs failure [Matsushita 2014]. Therefore, a simple, quick operation was promoted [Matsushita 2014]. Our surgical procedure of TAR combined with SET implantation proved to be encouraging, with promising surgical results [Sun 2011]. The true lumen of the distal aorta was expanded after the SET was inserted. And, the anastomotic process of the distal aorta, the SET, and distal end of the 4-branch prosthetic graft were more reliable. Furthermore, the sequence of anastomosis of brachiocephalic arteries to the prosthetic graft was improved over time and resulted in an obvious reduction in the hypothermia and SCP time.

CONCLUSION

Emergent surgical repair should be performed on ATAAD octogenarians without serious preoperative complications. Acceptable outcomes could be received by TAR combined with SET implantation.

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