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ORIGINAL ARTICLE

Retrograde Type A Dissection after Thoracic Endovascular Aortic Repair: Surgical Strategy and Literature Review

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Background In this study, we investigated the surgical strategy for managing retrograde type A dissection (RTAD) after thoracic endovascular aortic repair (TEVAR) by reporting our experience and literature review.

Methods From June 2011 to January 2014, nine patients with RTAD received surgical repair in our institution. The mean age of these patients was 49.3 ± 10.7 years. Data on these RTAD patients was retrospectively collected for further analysis. Literature related to RTAD after TEVAR from 2006 to 2014 was reviewed using the following terms: thoracic endovascular aortic repair, retrograde type A dissection, stent induced new entry, and surgical repair.

Results We adopted a total arch replacement combined with a stented elephant trunk implantation and partly preserved the previous TEVAR stent during operation. In-hospital death rate was 11.1% (one of nine). One patient (11.1%) developed paraparesis after operation. No late deaths or complications occurred during follow-up. Literature review identified four articles on the surgical management of RTAD after TEVAR. Our literature review also showed total arch replacement with the stented elephant trunk implantation might be associated with a better prognosis.

Conclusions Retrograde type A dissection is a serious complication after TEVAR. The induced factors of RTAD were various and complicated. Our experience and literature review indicates a combination of total arch replacement, stented elephant trunk implantation and partly preserving the previous TEVAR stent is feasible for the surgical repair of RTAD after TEVAR.

Keywords Retrograde type A dissection • Thoracic endovascular aortic repair • Surgical repair

Introduction

Thoracic endovascular aortic repair (TEVAR) is an effective treatment for type B dissection [1]. Compared with traditional surgical repair, it is less invasive and associated with reduced mortality and fewer complications [2,3]. But retrograde type A dissection (RTAD) may occur in patients who have received TEVAR and it is a fatal complication after TEVAR [4,5].

Most RTADs are introduced by the previously implanted TEVAR stent and need surgical repair. But the management strategies for the implanted stent are various, and the pros and cons of these procedures are not clear, since there are limited studies and the number of these studies is small [6–11]. Our institution experienced several RTAD cases after TEVAR for type B dissection. In this study, we focussed on the surgical strategy and outcomes of RTAD after TEVAR by reviewing our experience and literature review.

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Methods

Patients' Data Collection

From June 2011 to January 2014, 312 patients with type A dissection received surgical repair in our institution. Among them, the number with RTAD after TEVAR was 9. Data for these RTAD cases was retrospectively collected for further analysis. There were five males (55.6%), seven (77.8%) patients received TEVAR because of acute type B dissection and the other two were because of chronic type B dissection. Four patients experienced their initial endovascular treatment in our hospital and the others received TEVAR in other hospitals. One patient received left subclavian artery (LSA) chimney graft implantation and TEVAR simultaneously because the landing zone of the TEVAR stent covered the LSA. The interval between TEVAR and RTAD ranged from 11 days to 48 months. One patient (11.1%) was diagnosed with RTAD within 14 days after TEVAR. Patients usually complained of a new onset chest or back pain before RTAD was confirmed. No patients had Marfan syndrome or other connective tissue diseases. The enhanced spiral CT scan and intraoperative exploration was used to confirm the RTAD. This study was approved by the institutional review board of Changhai Hospital. Informed consent was signed by patients or their relatives. Details of the TEVAR procedure are shown in Table 1.

Surgical Procedures

The operation was performed under general anaesthesia with moderate hypothermia. Median sternotomy was performed in all cases. The left femoral artery (LFA) and right axillary artery (RAA) were cannulated for cardiopulmonary bypass (CPB) and unilateral antegrade selective cerebral perfusion (SCP). Through a Y-tube, the arterial line was bifurcated for the RAA and LFA perfusion. After cross-clamping, cold blood cardioplegia (4 °C) was perfused through the coronary ostia. Then the aortic root procedures were undertaken if necessary and a four-branch vascular prosthesis was anastomosed to the aortic root. When the rectal temperature reached 25 °C, CPB was arrested and SCP started. Then the cross-clamp was removed and inspection of the descending aorta was performed.

After inspection, the proximal part of the TEVAR stent was removed by a wire scissor, the section removed was from the proximal end to the distal anastomosis. The distal part of the TEVAR stent in the descending aorta was preserved. Then a stented elephant trunk (MicroPort Medical Co Ltd, Shanghai, China) was implanted into the descending aorta and securely sewn to the distal trunk of the four-branch vascular prosthesis (Boston Scientific Inc, Boston, Mass, USA) with the residual TEVAR stent, like a sandwich structure. In the patient who received the chimney graft implantation, the chimney graft was totally removed with the vessels it anchored, and this patient received a debranch procedure from LSA to left common carotid artery. Brachiocephalic arteries were anastomosed to the branches of the prosthetic graft during rewarming.

Follow-up

Clinic reexamination and telephone contact were used to gain the follow-up information. All patients were followed up at six months and one year after discharge, after which the follow-up was annual until the patient was lost to follow-up or death. Loss to follow-up or death occurred at any time during recorded follow-up.

Literature Review

By searching on PubMed, we reviewed literature related to RTAD after TEVAR from 2006 to 2014 using the following terms: thoracic endovascular aortic repair, retrograde type A dissection, stent induced new entry and surgical repair. All the references cited in the papers were also reviewed. Studies published in English were included. Case reports and animal studies were excluded. Only cases that experienced surgical repair were included in our study.

Table 1 Details of the TEVAR procedure.

Patient	Gender	Stanford type of dissection	Endovascular intervention	TEVAR stent		Interval to RTAD
				Type	Proximal end design	
1	F	Chronic type B	TEVAR	Ankura (Lifetech)	Bare spring	48 months
2	F	Acute type B	TEVAR	Zenith (COOK)	Membrane-covered	3 months
3	M	Acute type B	TEVAR	Ankura (Lifetech)	Bare spring	11 days
4	M	Acute type B	TEVAR + CGI (LSA)	Zenith (COOK)	Membrane-covered	3 months
5	F	Acute type B	TEVAR	Zenith (COOK)	Membrane-covered	12 months
6	M	Acute type B	TEVAR	Ankura (Lifetech)	Bare spring	6 months
7	M	Chronic type B	TEVAR	Valiant (Medtronic)	Bare spring	1 months
8	M	Acute type B	TEVAR	Ankura (Lifetech)	Bare spring	48 months
9	F	Acute type B	TEVAR	Valiant (Medtronic)	Bare spring	6 months

Abbreviations: TEVAR, thoracic endovascular aortic repair; LSA; left subclavian artery; CGI, chimney graft implantation; RTAD, retrograde type A dissection.

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