Journal Pre-proof

Endovascular repair of retrograde Stanford type A aortic dissection with a new stented graft

Jue Yang, MD, Qiang Liu, MD, Jinlin Wu, MD, Jianfang Luo, MD, Tucheng Sun, MD, Changjiang Yu, MD, Xin Li, MD, Yucheng Peng, MA, Yuan Liu, MD, Yong Cao, MD, Ruixin Fan, MD

PII: S2666-2507(22)00601-0
DOI: https://doi.org/10.1016/j.xjtc.2022.12.005
Reference: XJTC 1300

To appear in: JTCVS Techniques

Received Date: 15 November 2022
Accepted Date: 20 December 2022


This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Copyright © 2022 The Authors. Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery
Endovascular repair of retrograde Stanford type A aortic dissection with a new stented graft

Jue Yang, MD†, Qiang Liu, MD‡, Jinlin Wu, MD†, Jianfang Luo, MD†, Tucheng Sun, MD†, Changjiang Yu, MD†, Xin Li, MD†, Yucheng Peng, MA4, Yuan Liu, MD3, Yong Cao, MD2#, Ruixin Fan, MD1#

1. Department of Cardiac Surgery, Guangdong Cardiovascular Institute, Guangdong Provincial People’s Hospital, Guangdong Academy of Medical Sciences, Guangzhou, Guangdong, China.
2. Department of Cardiovascular Surgery, The People's Hospital of Gaozhou, Gaozhou, Guangdong, China
3. Department of Cardiology, Guangdong Cardiovascular Institute, Guangdong Provincial People’s Hospital, Guangdong Academy of Medical Sciences, Guangzhou, Guangdong, China
4. Shenzhen Chuangxin Medical Technology co. Ltd, Shenzhen, Guangdong, China

#Address for Correspondence:

Yong Cao, MD

Department of Cardiovascular Surgery, The People's Hospital of Gaozhou, 89 Xiguan Road, Gaozhou, Guangdong, China

Phone: +86-0668-6664366

Email: wildness@163.com

Ruixin Fan, MD
Disclosure Statement:
All the authors have nothing to disclose.

Funding Statement:
Supported by the National Key Research and Development Program of China (2017YFC1308003), the Science and Technology Program of Guangzhou (202102020160) and the Medical Scientific Research Foundation of Guangdong Province (A2022493).

Institutional Review Board (IRB):
This graft and the clinical trial were approved by the research ethics committee of Guangdong Provincial People’s Hospital. The IRB number was QX2021-032-04 and the data of IRB approval was February 18th, 2022.

Informed Consent Statement:
Informed written consent was obtained from each patient to include their information in this report.

Article word count: 748 words.
Glossary of Abbreviations:

- IRB = institutional review board
- MDCT = multidetector computed tomography
- TAAD = Stanford type A aortic dissection
- TEVAR = thoracic endovascular aortic repair

Central Message:

We have developed a new stented graft which can be used in Stanford type A aortic dissection and the early results were satisfactory.

Legend for Central Picture:

The new stented graft for Stanford type A aortic dissection.
Introduction

Stanford type A aortic dissection (TAAD) is a catastrophic aortic disease with high mortality rates\[1\]. Although many researches have showed that open aortic replacement is effective for TAAD, these procedures must be performed with the assistance of deep hypothermic cardiac arrest and extracorporeal circulation, and thus are complex and traumatic, as well as having a high rate of postoperative complications and mortality ranging from 10.3% to 24.2%\[2,3\]. Thoracic endovascular aortic repair (TEVAR) has been demonstrated safe and effective in patients with thoracic aortic aneurysms and Stanford type B dissection\[4\]. However, there have been no commercial devices designed specifically for TAAD till now.

We have developed a new stented graft which can be used in TAAD. The new stented graft (Shenzhen Chuangxin Medical Technology co. LTD, Shenzhen, China) consists of three segments, the proximal and distal end of the graft are covered stents, and the middle part is bare metal stent (as shown in Figure 1). The bare stent is the key to ensure the blood flow in the arch while maximizing the true lumen and promoting the closure and remodeling of the false lumen. This graft and the clinical trial were approved by the research ethics committee of Guangdong Provincial People’s Hospital and informed consent was obtained from these patients. The institutional review board (IRB) number was QX2021-032-04 and the data of IRB approval was February 18th, 2022.

In the current study, we aimed to report our early experiences with this novel graft.
Clinical summary

A 30-year-old man who presented with chest and back pain and dyspnea was admitted to our hospital with acute retrograde TAAD. Multidetector computed tomography (MDCT) revealed acute retrograde TAAD with primary intimal tear locating in descending aorta and massive pleural effusion in the left side which suggested the possibility of aortic rupture (as shown in Figure 2). Because of the possibility of aortic rupture, the mortality rate of conventional aortic replacement may be extremely high. Therefore, an endovascular approach was preferred. The size of proximal graft equals to the sum of the true lumen and half of the false lumen. The MDCT images analysis was shown in Supplementary Figure 1.

To start with, a 6F pigtail angiographic catheter was threaded through the left femoral artery into the left ventricle with segmental aortography to make sure the catheter was in the true lumen. A temporary pacemaker was placed through the right jugular vein. Then, a 5F pigtail angiographic catheter was threaded through the right radial artery into the aortic sinus and thoracic aortography was performed (as shown in Supplementary Figure 2). A 300 cm extra stiff wire was placed into the left ventricle through the pigtail angiographic catheter. After that, the new stented graft was transferred to the ascending aorta via the extra stiff wire and was released under temporary rapid pacing (140/min). Then a descending thoracic stent graft (34*30*190mm, Shenzhen Chuangxin Medical Technology, China) was released to cover the primary intimal tear. Finally, thoracic aortography was performed again (as shown in Supplementary Figure 3). The whole operative procedure was shown in
Video 1. The operation time was 90 minutes and the contrast medium volume was 115ml.

The patient was discharged eight days after operation uneventfully. The maximum false lumen in ascending aorta shrunk from 10 mm to 4mm one month later (as shown in Supplementary Figure 4).

Discussion

The primary treatment for TAAD is open surgery. However, patients with advanced age, poor general condition, or other comorbidities cannot tolerate these procedures. There are rapid technological advances in endovascular therapy providing new insights for the treatment of TAAD. The hybrid procedure takes advantage of openly surgical and TEVAR to reduce the damage. Total endovascular therapy may be the ultimate goal. The first endovascular repair of TAAD was reported by Dorros in 2000, in which only the ascending aorta was covered[5]. Many challenges still exist for the application of TEVAR in the setting of TAAD, among which is the anatomically complex and functionally important branch of the arch. Techniques such as fenestrations and chimneys are only seen as transitional methods. We simplified the procedure by using a bare stent to cover the arch. The early results were satisfactory, and the middle and long-term follow-up is ongoing. Recently, we have successfully performed endovascular repair in a Debakey II aortic dissection with this new stented graft. We think it can be used in TAAD without intimal tears in aortic arch or lesions in aortic valve or orifices of coronary artery which need more studies to confirm.
Declarations of interest:
Yucheng Peng, MA: Employee of Shenzhen Chuangxin Medical Technology co. Ltd.

REFERENCES


The legends of figures:

**Figure 1.** The structure of the new stented graft. L0: Three bare metal tips (the length is 5 mm). L1: The proximal covered stent part (the length is ranging from 40 to 60 mm). D1: The diameter of proximal end of the stented graft (ranging from 28 mm to 46 mm). L2: The bare metal stent part (the length is ranging from 80 to 110 mm). L3: The distal covered stent part (the length is ranging from 140 to 160 mm). D2: The diameter of distal end of the stented graft (D1-8mm).

**Figure 2.** Preoperative multidetector computed tomography.

**Supplementary Figure 1.** The multidetector computed tomography images analysis. (A) The diameter of the true lumen and half of the thickness of aortic hematoma in ascending aorta 5 mm from sinus tube junction. (B) The length of ascending aorta. (C) The length of aortic arch and the distance of primary intimal tear from left subclavian artery.

**Supplementary Figure 2.** The thoracic aortography before stent graft was released.

**Supplementary Figure 3.** The thoracic aortography after stent graft was released.

**Supplementary Figure 4:** (A) Preoperative multidetector computed tomography. (B) multidetector computed tomography one month after surgery.

The legend of video:

**Video 1.** Operative procedure of this case report.

Step 1: A 6F pigtail angiographic catheter was threaded through the left femoral artery
into the left ventricle with segmental aortography to make sure the catheter was in the
true lumen.

Step 2: A 5F pigtail angiographic catheter was threaded through the right radial artery
into the aortic sinus and thoracic aortography was performed. A temporary pacemaker
was placed through the right jugular vein.

Step 3: A 300 cm extra stiff wire was placed into the left ventricle through the pigtail
angiographic catheter in the left ventricle. After that, the new stented graft was
transferred to the ascending aorta via the extra stiff wire.

Step 4: Thoracic aortography was performed to make sure the stented graft in a suitable
position. Then it was released under temporary rapid pacing (140/min). Thoracic
aortography was performed again to observe position of stented graft and patency of
aortic arch branch vessels.

Step 5: A descending thoracic stent graft (34*30*190mm, Shenzhen Chuangxin
Medical Technology, China) was released to cover the primary intimal tear. Finally,
thoracic aortography was performed to evaluate operative result.