

Case Report

Stanford Type A Aortic Dissection After Cheatham–Platinum Stent Insertion for Aortic Coarctation: A Case ReportYong Mao¹, Yalin Wei¹, Yinchang Zhang¹, Xiangyang Wu^{1,*}, Weixun Duan^{1,2,*}¹Department of Cardiac Surgery, The Second Hospital & Clinical Medical School, Lanzhou University, 730000 Lanzhou, Gansu, China²Department of Cardiovascular Surgery, The First Affiliated Hospital, The Air Force Medical University, 710032 Xi'an, Shaanxi, China*Correspondence: wuxyok@163.com (Xiangyang Wu); duanweixun@126.com (Weixun Duan)

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Abstract

Background: Coarctation of the aorta (CoA) stenting can lead to late vascular complications, but Stanford type A aortic dissection years after Cheatham–Platinum (CP) stent implantation is exceptionally rare. We report a successfully managed case to discuss an effective surgical approach. **Case:** A 16-year-old female presented with sudden loss of consciousness caused by a substantial pericardial effusion. Seven years prior, she had undergone CP stent implantation for CoA. Aortic computed tomography angiography (CTA) revealed a penetrating ulcer in the anterior wall of the ascending aorta with an intramural hematoma, and intraoperative findings confirmed a Stanford type A aortic dissection. The patient underwent one-stage bypass grafting from the ascending to the descending aorta, aortic sinusoplasty, and ascending aorta replacement under cardiopulmonary bypass. The postoperative course was uneventful, and she was discharged in stable condition. **Conclusions:** One-stage bypass grafting combined with ascending aorta replacement and sinusoplasty provides a safe and effective treatment strategy for complex aortic dissections following CoA stenting. This surgical approach may be considered for a broader population of patients with similar presentations.

Keywords: stanford type a aortic dissection; stent implantation; coarctation of the aorta**1. Introduction**

Aortic coarctation (CoA) is a common congenital cardiovascular anomaly, traditionally managed via surgical repair or transcatheter interventions, such as Cheatham–Platinum (CP) stent implantation. Despite high initial success rates, patients with a history of CoA treatment remain predisposed to late cardiovascular complications, including persistent upper-body hypertension, aneurysm, pseudoaneurysm, even aortic dissection. In the emergency setting of acute Stanford type A aortic dissection, managing the life-threatening proximal pathology remains the absolute priority. However, the optimal surgical strategy for addressing concomitant residual coarctation to guarantee long-term hemodynamic stability remains a clinical challenge. Herein, we present a rare case of a 16-year-old female who developed acute Stanford type A aortic dissection seven years after receiving a CP stent for CoA. We successfully performed a comprehensive, one-stage reconstruction comprising ascending aorta replacement, aortic sinusoplasty, and an ascending-to-descending aortic bypass under cardiopulmonary bypass.

2. Case Presentation

A 16-year-old female patient presented to a local hospital with a primary complaint of sudden loss of consciousness lasting 30 minutes. Transthoracic echocardiogram (TTE) indicated a possible aortic dissection with a significant pericardial effusion, prompting emergent pericardio-

centesis. The pericardial effusion was hemorrhagic, with an estimated volume of approximately 200 mL. Seven years earlier, the patient had undergone Cheatham–Platinum (CP) stent implantation for aortic coarctation.

The patient was transferred to our hospital for further management and presented with blood pressure (BP) readings of 127/96 mmHg in the upper extremity and 108/80 mmHg in the lower extremity, a heart rate of 90 beats/min, a respiratory rate of 20 breaths/min, and a body temperature of 36.2 °C. On admission, laboratory investigations revealed an elevated creatine kinase-MB (CK-MB) level of 4.94 ng/mL (range, 0–3.61 ng/mL) and a high-sensitivity Troponin T (TnT) level of 122 ng/L (range, 0–14 ng/L). The reported fibrinogen level is 1.63 g/L, whereas the reference range is provided as 2.00–5.00 g/L, thrombin time (TT) of 19.5s (range, 10.3–17.6 s), antithrombin III (AT III) at 76% (range, 83–128%), D-dimer level of 3.77 µg/mL (range, 0–0.5 µg/mL) and fibrin degradation products (FDPs) of 6.61 µg/mL (range, 0–5.00 µg/mL). Aortic computed tomography angiography (CTA) identified a penetrating ulcer in the anterior wall of the ascending aorta with an associated intramural hematoma of the ascending aorta, following previous aortic coarctation stent implantation (Figs. 1,2). Additional CTA findings included concurrent scoliosis, horseshoe kidney, and bilateral ureteral dilation. Echocardiography revealed an ascending aortic hematoma with an increased internal diameter (ascending aortic diameter = 51 mm), a bicuspid aortic valve (BAV) anomaly (Type 1, Sievers classi-





Fig. 1. Preoperative CTA demonstrates false lumen thrombosis (indicated by the white asterisk). CTA, computed tomography angiography.

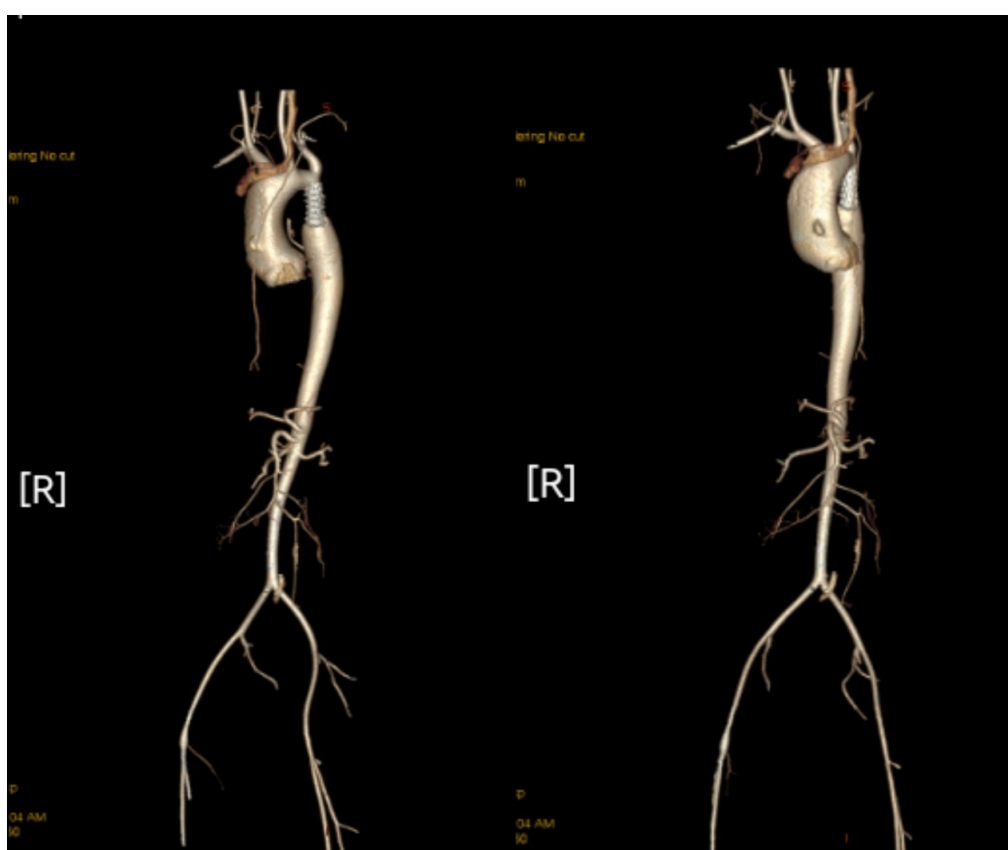


Fig. 2. Three-dimensional rendering of preoperative aortic CTA.

fication), and postoperative changes following pericardiocentesis and aortic coarctation stent placement.

Emergency surgery was performed via median sternotomy with cardiopulmonary bypass (CPB). Arterial can-

nulation was achieved via the right brachiocephalic and left femoral arteries. CPB was performed using a single pump with two arterial cannulas and a single-stage venous drainage system. The femoral arteries had relatively small diameters. An 8-mm prosthetic graft was anastomosed to the left femoral artery, and a catheter was placed through the graft. At a body temperature of 32 °C, the ascending aorta was occluded, proximal to the origin of the innominate artery. Intraoperatively, a 6 × 6 mm tear was identified in the anterior wall of the ascending aorta (Fig. 3A). The dissection involved the ascending aorta and aortic root, with hematoma formation in the aortic arch. The dissection extended to the ostium of the right coronary artery, where thrombus formation was observed between the intima and adventitia at the right coronary ostium (Neri type A). A fresh thrombus, primarily located in the false lumen, was also removed. Cardioplegia was administered via both the left and right coronary ostia, resulting in an effective cardiac arrest. A 14 mm linear synthetic graft (INTERGARD, Maquet Getinge Group, Rastatt, Germany) was used. The pericardial space was accessed via an incision level with the apex of the heart, followed by dissection of the descending aorta. The synthetic graft was sutured to the descending aorta, and the opposite end was clamped for subsequent reconstruction. A 3 × 10 mm cardiothoracic biopatch (trimmed from a 10 × 10.5 cm patch, Beijing Balance Medical Technology Co., Ltd., Beijing, China) was excised and placed between the intima and adventitia at the right coronary ostium and subsequently secured with continuous 5-0 Prolene sutures to stabilize the right coronary ostium. Following assessment of dissection in the right and non-coronary aortic sinuses, the Teflon felt was precisely tailored to match the dissection and placed within the false lumen of the proximal aortic dissection. A vascular graft and cardiothoracic biopatch were placed internally and externally within the aortic sinus (Fig. 3B). Two circular patches were fixed with continuous horizontal mattress sutures using 5-0 Prolene for fixation and reinforcement, while additional continuous 5-0 Prolene sutures were applied to strengthen the suture line on the outer wall of the aorta. Subsequently, 4-0 Prolene sutures with Teflon pledgets were used to strengthen the sinotubular junction affected by the dissection (Fig. 3). The right brachiocephalic artery and aortic arch were occluded, and an intramural thrombus was excised. A cardiothoracic biopatch was employed to strengthen the suture line at the aortic arch. A 26 mm synthetic graft (MAQUET, Germany) was anastomosed proximally to the sinotubular junction and distally to the aortic arch. The opposite end of a 14 mm synthetic graft (MAQUET, Germany) was then anastomosed to the synthetic ascending aortic graft. The aortic cross-clamp duration was 185 min, and the total CPB duration was 247 min. The withdrawal from CPB was completed without complications. The patient was discharged without complications and attended routine postoperative follow-ups at 1, 3, 6, and

12 months. Blood flow in the bypass grafts remained unobstructed (Fig. 4), and no significant pressure gradients were observed between the upper and lower extremities.

3. Discussion

Following stent placement for aortic coarctation complicated by Stanford type A aortic dissection, the patient underwent aortic sinusoplasty, ascending aortic replacement, and ascending aorta-to-descending aorta bypass grafting.

Coarctation of the aorta (CoA) is a common congenital heart disease (CHD) that occurs in isolation or with other cardiac anomalies. Its incidence is 3–4 cases per 10,000 live births, with a male predominance of 2:1 [1]. The 2024 European Society of Cardiology (ESC) Guidelines for the management of peripheral arterial and aortic diseases recommend the repair of coarctation or re-coarctation (surgical or endovascular) in patients with hypertension and an increased non-invasive gradient between the upper and lower limbs, confirmed by invasive measurement (peak-to-peak >20 mmHg), with stenting preferred when feasible [2].

According to the 2020 ESC Guidelines for the Management of Adult Congenital Heart Disease, intervention should be considered in patients with a significant anatomical narrowing (greater than or equal to 50% relative to the aortic diameter at the diaphragm), even when the invasive gradient is less than 20 mmHg [3]. In this case, the patient's CTA measured an internal diameter of the previous descending aortic stent of only 10 mm, compared to 24 mm at the diaphragm level, representing a severe luminal constriction of approximately 58%. Furthermore, considering that the patient was only 16 years old with remaining potential for somatic growth, this relative obstruction was bound to worsen in adulthood. Crucially, in the setting of an acute type A dissection, eliminating this anatomical narrowing via a one-stage bypass was vital for intraoperative and postoperative blood pressure management. It effectively reduced left ventricular afterload and protected the fragile proximal aortic anastomoses from persistent upper-body hypertension, thereby validating our concomitant surgical choice.

There are limited published reports of aortic coarctation complicated by Stanford type A aortic dissection. This condition poses significant surgical challenges and remains a matter of debate regarding optimal operative strategy. The treatment approach described in this report contributed to the patient's successful recovery and distinguishes this case. The patient subsequently experienced type A aortic dissection following CP stent placement. The management of coarctation of the aorta after stenting remains challenging. Addressing coarctation of the aorta prior to treating the proximal aorta, whether via balloon dilation or vascular replacement, may cause hemodynamic instability and severe complications. Secondly, regarding the choice of surgical incision in the patient, Iosifescu et al. [4] utilized a clamshell incision for surgical access, while Milovanović

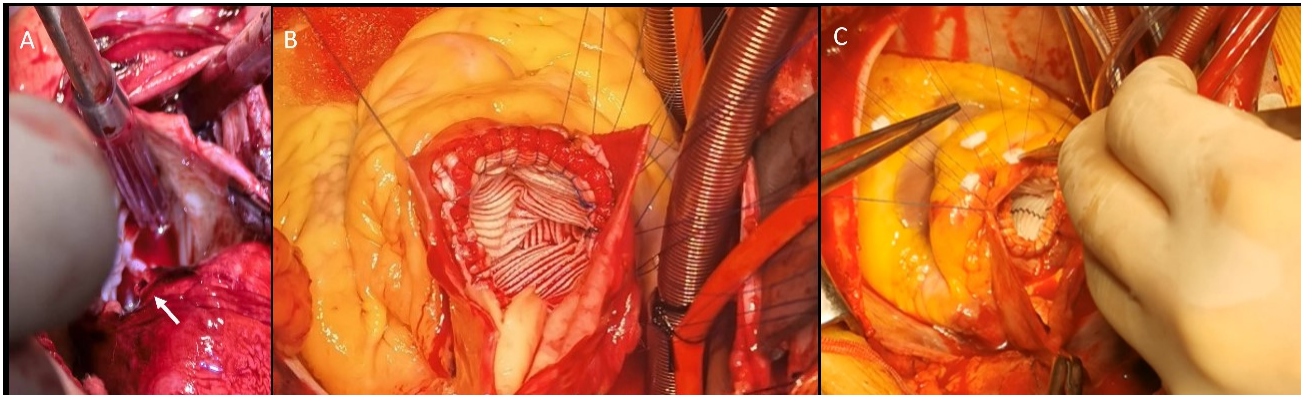


Fig. 3. Intraoperative view. (A) Intraoperative view demonstrating the intimal tear in aortic dissection (white arrow); (B) Intraoperative appearance of the aortic root following reinforcement; (C) Reinforcement of the dissected segment of the sinotubular junction using 4-0 Prolene sutures with Teflon pledgets.



Fig. 4. Three-dimensional rendering of postoperative aortic computed tomography angiography (CTA).

et al. [5] reported using both incisions (sternotomy and posterolateral left thoracotomy). The median incision offers a greater advantage in terms of invasiveness. Additionally, Yang et al. [6] selected the abdominal aorta as the site for bypass anastomosis. This surgical method increases the risk of intestinal paralysis, hemorrhage, and abdominal infection, while laparotomy results in greater trauma to the patient. In cases requiring dual-stage therapy, untreated coarctation of the aorta persists, leading to increased car-

diac afterload following CPB, greater anastomotic tension, and a higher risk of anastomotic hemorrhage.

In conclusion, recurrent Stanford type A aortic dissection following stent implantation for aortic coarctation can be effectively managed with a single-stage surgical procedure. One-stage bypass grafting from the ascending to descending aorta, aortic sinusoplasty, ascending aortic replacement are potential surgical options for patients with this condition.

Availability of Data and Materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Author Contributions

Methodology and manuscript writing: YM and YLW. Data collection: YM, YLW, YCZ. Conceptualization and supervision: XYW and WXD. All authors participated in the revision of the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The patient was a 16-year-old female and considered a minor. Informed consent was obtained from the patient's mother (legal guardian).

Acknowledgment

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Conflicts of Interest

The authors declare no conflicts of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at <https://doi.org/10.31083/HSF53821>.

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