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Case Report

Giant Ascending Aortic Pseudoaneurysm With Sternal Erosion: A Complex Case Eight Years Post-Aortic Surgery

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Abstract

Background: Aortic pseudoaneurysms are a rare but potentially life-threatening complication that can occur following cardiac or aortic root surgery, with an incidence of less than 1%. These pseudoaneurysms are typically contained only by the adventitia and surrounding mediastinal structures, and surgical intervention becomes particularly challenging when erosion of nearby bony structures occurs. **Case Summary**: We present the case of a 74-year-old woman who developed a giant pseudoaneurysm of the ascending aorta eight years after undergoing aortic valve and ascending aorta replacement. This pseudoaneurysm subsequently led to sternal and bony erosion, creating additional management challenges. Multimodal imaging, including contrast-enhanced computed tomography (CT), magnetic resonance imaging (MRI), and transthoracic echocardiography (TTE), was utilized to assess pseudoaneurysm morphology and its relationship with surrounding structures. The decision of using an open graft replacement with cardiopulmonary bypass (CPB) was based on the lesion's size, its proximity to vital structures, and the presence of significant sternal erosion. The patient underwent urgent surgical intervention involving CPB and replacement of the infected graft, resulting in an uneventful recovery. Follow-up at 18 months confirmed stability, with no evidence of recurrence. **Conclusions**: Giant ascending aortic pseudoaneurysms that exhibit rapid growth and cause bony erosion present significant surgical challenges. Early recognition, multimodal imaging, and tailored surgical strategies are essential for optimal outcomes. Long-term surveillance is crucial in preventing delayed complications.

Keywords

aortic pseudoaneurysm; sternal erosion; cardiac surgery complications; multimodal imaging; graft infection; lemaitre graft

Introduction

Aortic pseudoaneurysms are uncommon but serious complications following cardiovascular surgery, often linked to infection, mechanical stress, or graft failure [1,2]. Their clinical presentation can vary, but rapid enlargement poses a high risk of rupture. Surgical intervention is challenging, particularly when pseudoaneurysms erode into adjacent structures such as the sternum. Herein, we present a case of a giant ascending aortic pseudoaneurysm causing sternal erosion, emphasizing the complexities of diagnosis, management, and surgical repair.

Pathophysiological Mechanisms

The formation of aortic pseudoaneurysms post-surgery can be attributed to multiple mechanisms, including:

- Suture line failure, which leads to structural weakening at the anastomotic site.
- Infection-related degeneration, where bacterial colonization of the prosthetic graft weakens vascular integrity.
- Hemodynamic stress, exerting continuous forces at the graft anastomotic site, contributing to expansion and eventual rupture.

In this case, bacterial colonization of the Lemaitre graft, combined with chronic mechanical stress, played a key role in pseudoaneurysm formation, further complicated by progressive sternal erosion.

Diagnostic Methods

A comprehensive diagnostic workup was performed using multimodal imaging techniques:

- Computed tomography (CT) Angiography: Used as the primary modality to assess pseudoaneurysm morphology and its relationship to surrounding structures.

Fig. 1. Preoperative Computed Tomography (CT) angiography. Axial CT scan showing a large pseudoaneurysm (10 × 4.8 cm) arising from the ascending aorta, compressing the main pulmonary artery, and eroding the sternum.

- Magnetic Resonance Imaging (MRI): Employed for additional soft tissue characterization and differentiation of infected versus non-infected tissues.
- Transthoracic Echocardiography (TTE): Evaluated any hemodynamic effects and potential intracardiac involvement.
- Positron Emission Tomography (PET) Scan: Showed rapid growth (2 cm increase during hospitalization), prompting urgent surgical intervention.

Surgical Decision-Making

The decision to perform open graft replacement with cardiopulmonary bypass (CPB) was based on:

- Lesion size and proximity to vital structures.
- Significant sternal erosion requiring extensive debridement.
- Minimally invasive options were considered but deemed unsuitable due to the need for hemostasis and complete resection of infected tissues.

Case Presentation

A 74-year-old woman presented with progressively worsening dyspnea, orthopnea, fever, and chest pain. Past medical history included diabetes mellitus, hypertension, an aortic aneurysm, and aortic valve stenosis. Eight years prior, she had undergone implantation of a metallic aortic valve prosthesis and a Lemaitre graft to replace the ascending aorta.

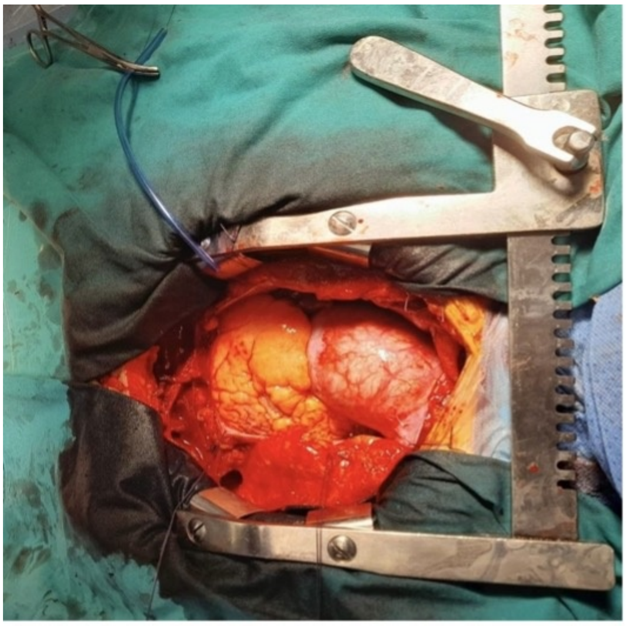

Fig. 2. Intraoperative view. Intraoperative image revealing the pseudoaneurysm with significant adhesions and deformation of adjacent tissues prior to resection.

Initial Assessment

- **Vital Signs:** Fever (38.1 °C), tachypnea, and hemodynamic stability.
- **Laboratory Results:** Leukocytosis (white blood cell (WBC) count of 18,400/mm^3).
- **Microbiology:** Blood cultures positive for *Escherichia coli*, prompting targeted antibiotic therapy.

Imaging Findings

- **CT Angiography:** Revealed a giant pseudoaneurysm (10 × 4.8 cm) compressing the pulmonary artery and eroding the sternum (Fig. 1).
- **PET Scan:** Demonstrated rapid progression, necessitating urgent surgical intervention.

Management and Outcomes

Preoperative Planning Included

- CPB via right subclavian artery perfusion and femoral venous drainage.
- Hypothermic circulatory arrest as a precaution.

Surgical Findings and Procedure

As shown in Fig. 2, intraoperative imaging revealed the pseudoaneurysm with significant adhesions and deformation of adjacent tissues prior to resection.

• Active bleeding from the proximal ascending aorta was controlled.

• Dense adhesions and infected tissues required meticulous debridement.

• The infected Lemaitre graft was excised and replaced with a new Lemaitre conduit (Figs. 3,4).

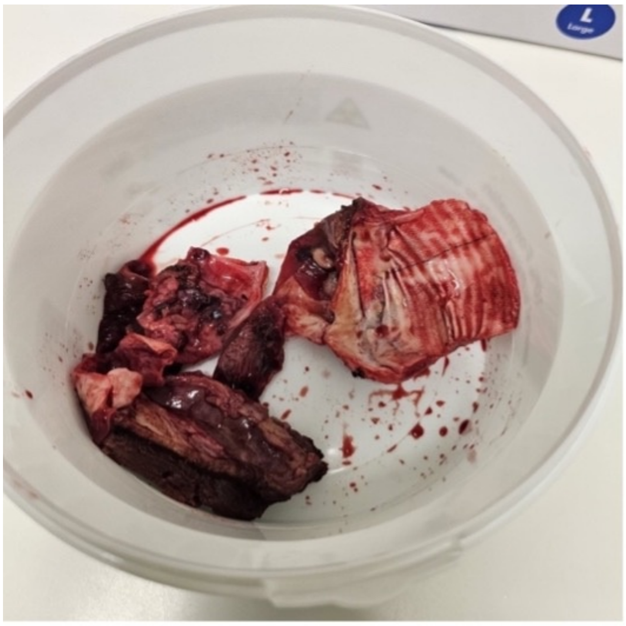

Fig. 3. Excised specimen. Resected infected Lemaitre graft and necrotic tissue collected after surgical debridement.

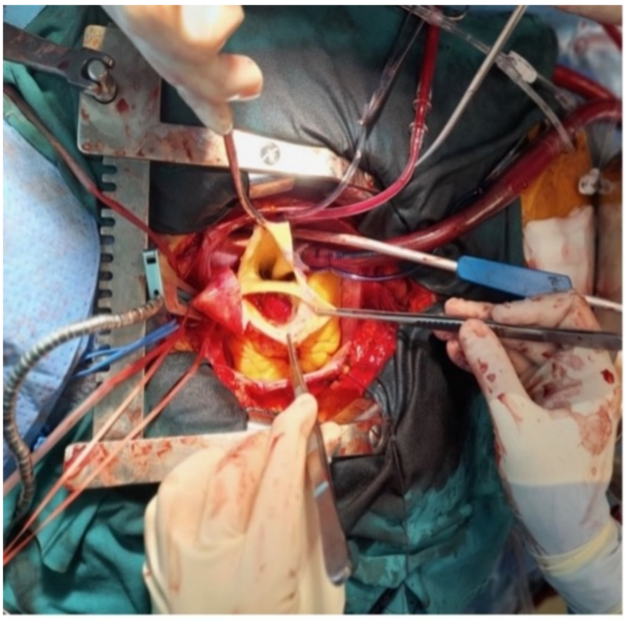

Fig. 4. Surgical resection and debridement. Intraoperative image showing the removal of the infected graft and preparation of the aortic stump for reconstruction.

• Intraoperative transesophageal echocardiography confirmed repair integrity.

The patient was extubated on the third postoperative day and discharged on the seventh postoperative day with long-term antibiotic therapy. Her postoperative course was uneventful. Follow-up CT imaging at six months showed no further pseudoaneurysm growth. She remained symptom-free and actively engaged in rehabilitation. Subsequent CT scans after one year and 18 months (Fig. 5) confirmed a completely stable postoperative course, with no signs of recurrence, infection, or graft-related complications, reaffirming the success of the surgical intervention.

Discussion

Aortic pseudoaneurysms are rare but serious complications following cardiac surgery, with a high potential for rupture, especially when associated with infection or structural erosion [1,2]. These lesions often develop due to suture line failure, persistent infection, or chronic inflammation, all of which compromise vascular integrity. Given the life-threatening nature of pseudoaneurysms, timely recognition and intervention are paramount.

Advanced imaging modalities play a crucial role in both diagnosis and surgical planning. CT angiography remains the gold standard, providing high-resolution images that delineate the morphology of the pseudoaneurysm and its relationship with adjacent structures. PET scans help differentiate between infectious and noninfectious pseudoaneurysms, guiding the use of antimicrobial therapy and surgical debridement [3,4]. In this case, multimodal imaging allowed for an accurate assessment of the expansion of the pseudoaneurysm and its effect on surrounding tissues, facilitating appropriate surgical decision-making.

A multidisciplinary approach is essential for optimizing outcomes. Collaboration between cardiac surgeons, infectious disease specialists, and microbiologists ensures comprehensive patient management, particularly when infection plays a role in pseudoaneurysm formation. In our case, targeted preoperative antibiotics helped control the infection, and meticulous surgical debridement and graft replacement prevented further complications. Intraoperative transesophageal echocardiography provided real-time assessment, confirming the integrity of the repair and minimizing the risk of residual defects.

Comparison With Existing Literature

This case aligns with existing reports of pseudoaneurysm formation after aortic surgery, where late presentation, mechanical stress, and infection are recognized contributors [3,4]. However, unlike many previously described cases, this pseudoaneurysm resulted in severe bony erosion,

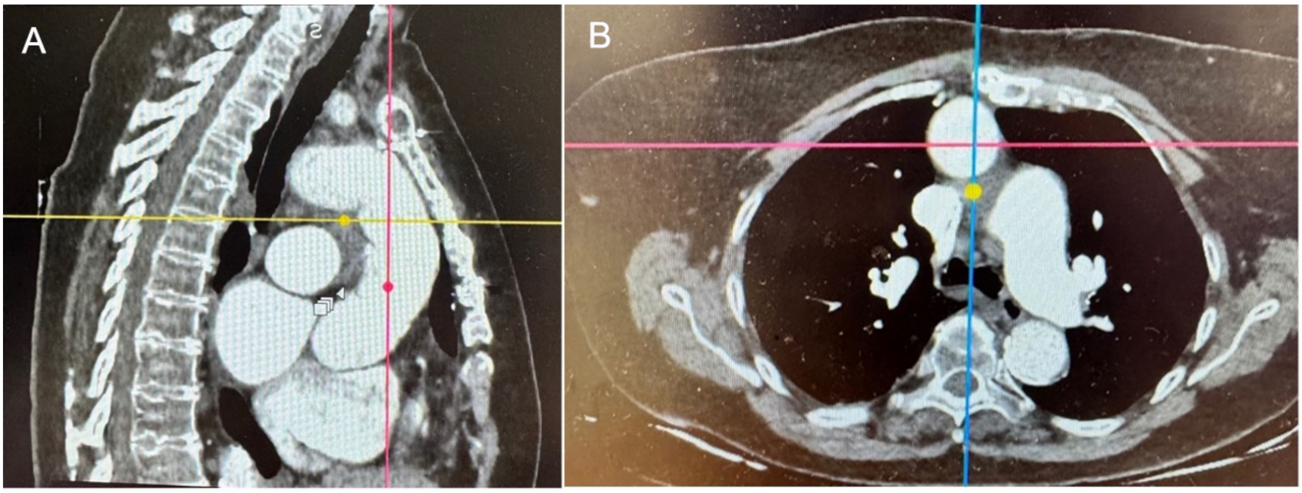

Fig. 5. Postoperative computed tomography (CT) scan at 18 months post-surgery. (A) Sagittal view demonstrating an intact aortic graft with no signs of pseudoaneurysm recurrence or structural complications. (B) Axial view showing stable positioning of the graft with no extravasation, dehiscence, or abnormal contrast enhancement. Surrounding structures, including the pulmonary artery and mediastinum, appear unremarkable, confirming a successful long-term surgical outcome.

a feature that added complexity to the surgical intervention. The presence of sternal and sternoclavicular joint destruction necessitated a more aggressive approach, involving not only vascular reconstruction but also extensive debridement to prevent reinfection and structural compromise.

Moreover, the use of multimodal imaging, preoperative planning, and aggressive infection control measures, in this case, reflects best practices highlighted in the literature. Similar to studies advocating for individualized treatment strategies, our approach emphasized patient-specific factors such as infection status, anatomical considerations, and surgical feasibility. Long-term follow-up remains essential, as recurrence rates, although low, warrant continued surveillance with imaging and clinical evaluation.

Clinical Implications and Future Directions

The findings from this case underscore the need for ongoing advancements in surgical techniques and infection management. While open surgical repair remains the gold standard for large pseudoaneurysms, evolving endovascular techniques may provide alternative options in select cases. Future research should focus on the optimization of hybrid approaches, combining minimally invasive techniques with traditional open repair to reduce perioperative morbidity while maintaining long-term durability.

In conclusion, the successful management of this patient was facilitated by early recognition, a multidisciplinary approach, and the integration of advanced imaging and surgical techniques. This case reinforces the importance of individualized patient care, particularly in the setting of complex post-surgical vascular complications.

Conclusions

This case highlights the significant challenges in managing giant ascending aortic pseudoaneurysms with sternal erosion, emphasizing the importance of early diagnosis, multimodal imaging, and a multidisciplinary approach to optimize patient outcomes. The successful resolution of this case underscores the critical role of preoperative infection control, precise surgical intervention, and rigorous postoperative monitoring in reducing the risk of complications and recurrence. Long-term surveillance remains essential, as delayed complications can arise even years after the initial aortic surgery.

Advancements in hybrid surgical approaches, endovascular techniques, and infection-resistant graft materials may offer promising solutions in future cases, reducing surgical risks while maintaining structural integrity. Further research into infection prevention strategies and minimally invasive options could significantly improve management strategies for complex aortic pathologies. Ultimately, individualized patient care, guided by an experienced multidisciplinary team, remains the cornerstone for achieving optimal long-term outcomes.

Author Contributions

NS: Conceptualization, investigation, drafting the manuscript, and visualization. IS: Surgical management, methodology, and critical revision for important intellectual content. ET: Data curation, surgical assistance, and critical revision. DG: Microbiological analysis, antibiotic management, and critical revision of the manuscript. OP: Imaging assessment, orthopedic consultation regarding sternal erosion, and critical revision. PD: Supervision, project administration, and final approval of the manuscript. All authors contributed to the conception and editorial revisions of the manuscript. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study was carried out in accordance with the guidelines of the Declaration of Helsinki. This manuscript is a case report, and as per our institution's guidelines, ethics committee approval was not required. However, informed consent for publication was obtained from the patient.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.59958/hsf.8349.

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