The Cardiothoracic Surgeon

CASE REPORT

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Pediatric precision: navigating the complexity of mycotic pseudoaneurysms in ascending aorta post-atrial septal defect repair—a case report

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Abstract

Background This case report elucidates the exceptional rarity and intricacies surrounding mycotic pseudoaneurysms in the ascending aorta, specifically post-pediatric cardiac surgery.

Case presentation The case report presents a distinctive case of a 7-year-old female developing complications 10 days after atrial septal defect repair, characterized by sternal wound infection attributed to *Pseudomonas aeruginosa*. Imaging revealed a substantial pseudoaneurysm, necessitating a meticulous surgical strategy involving femoral cannulation, redo sternotomy, and adept management of intraoperative challenges, such as a fragile sternum and dense adhesions. The successful postoperative course, marked by weaning and comprehensive management, contributes significant insights into the evolving landscape of mycotic pseudoaneurysms in pediatric populations. The discussion delves into the historical context, mechanisms, and causative organisms, emphasizing the heightened vigilance required in the postoperative care of this vulnerable demographic.

Conclusion This report enhances our understanding of pediatric cases, underscoring the imperative for increased awareness and strategic management in addressing post-cardiac surgery complications.

Keywords Mycotic pseudoaneurysm, Femoral cannulation, Atrial septal defect

Background

Mycotic pseudoaneurysms of the ascending aorta, particularly those associated with fungal infections like Aspergillus, are exceptionally rare post-cardiac surgery, especially in the pediatric population. This case report presents a distinctive case following atrial septal defect (ASD) repair in a 7-year-old female child, emphasizing the intricacies of postoperative care in this vulnerable demographic. While only a handful of pediatric cases have been reported globally, this instance contributes valuable insights into the evolving landscape of mycotic pseudoaneurysms, underscoring the necessity for heightened awareness and strategic management in pediatric cardiac surgery.

Case presentation

In this intricate case, a 7-year-old female underwent atrial septal defect (ASD) repair, encountering complications 10 days post-surgery. Manifesting as sternal wound infection marked by bloody discharge and swelling (Fig. 1),

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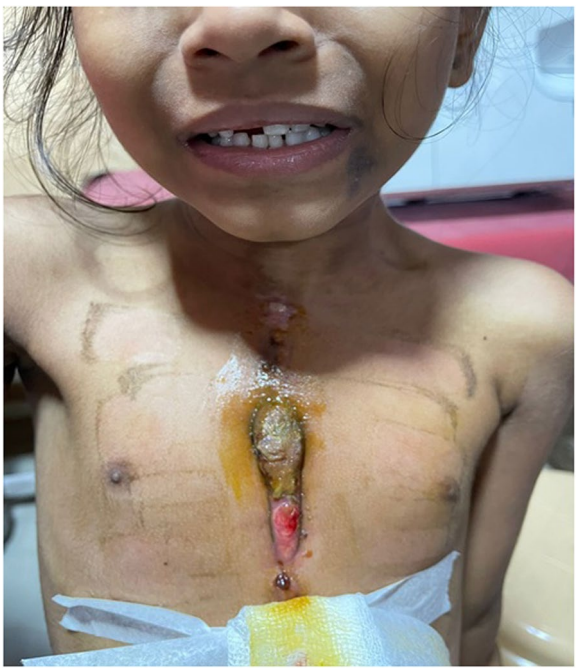

Fig. 1 Preoperative image of sternal wound infection

microbiological analysis pinpointed *Pseudomonas aeruginosa* as the culprit. Subsequent contrast-enhanced computed tomography (CECT) of the chest unveiled a 3.9 × 3.4 × 4.0 cm saccular pseudoaneurysm protruding from the anterior wall of the ascending aorta, causing unprecedented bone fragmentation in the manubrium sterni (Fig. 2). This pediatric case, while presenting unique challenges, contributes significantly to the limited literature on mycotic pseudoaneurysms in this age group.

Navigating the intricacies of this case demanded a meticulous surgical strategy. The approach involved femoral cannulation for bypass and a redo sternotomy (Fig. 3). Intraoperatively, challenges unfolded as the pseudoaneurysm had eroded the manubrium, rendering the sternum fragile. Dense adhesions between the sternum and the right atrium complicated matters. A large pseudoaneurysm, measuring 5 × 4 cm, extended perilously from the ascending aorta, with surrounding inflamed tissue and a notable rent at its base. The rupture of the pseudoaneurysm during sternotomy required adept digital pressure control. The surgical intervention included repairing a right atrium injury, utilizing 5/0 Prolene. Aortic rent was managed with 16 size Hegar dilator (Fig. 4) and proceeded with resection and debridement of the pseudoaneurysm and end-to-end anastomosis of the aorta with 6/0 Prolene pledgeted sutures (Fig. 5) and strategic avoidance of foreign material due to tissue inflammation. The meticulous sequence continued with aorta mobilization, Tissel application, and core rewarming, culminating in successful bypass weaning, hemostasis, and systematic decannulation.

Postoperatively, the patient was extubated on POD-1, with no neurological or ischemic complications. Pseudoaneurysm wall tissue culture revealed *Pseudomonas aeruginosa*, necessitating a 6-week antibiotic course. After successful surgery, the patient recovered smoothly. Communication with the family ensured a tailored antibiotic course, leading to positive outcomes and collaborative, patient-centered care. The patient is now under regular follow-up, showcasing comprehensive management of this challenging case.

Discussion

The term "mycotic aneurysm," coined by Osler [1] in 1884, persists despite semantic inaccuracies, particularly in discussions about infectious etiology in the ascending aorta. The incidence of mycotic pseudoaneurysms has markedly risen with the advent of open-heart procedures.

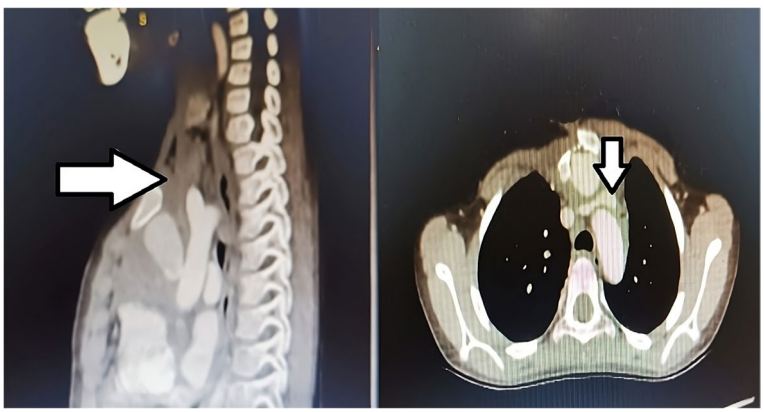

Fig. 2 Contrast-enhanced computed tomography (CECT) chest—3.9 × 3.4 × 4.0 cm saccular pseudoaneurysm (indicated by arrow) protruding from the anterior wall of the ascending aorta

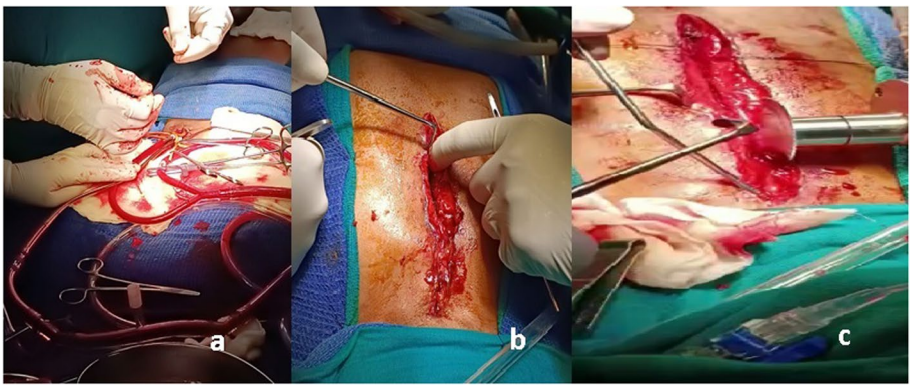

Fig. 3 **a** Femoral cannulation. **b** Redo sternotomy. **c** Redo sternotomy with oscillating saw

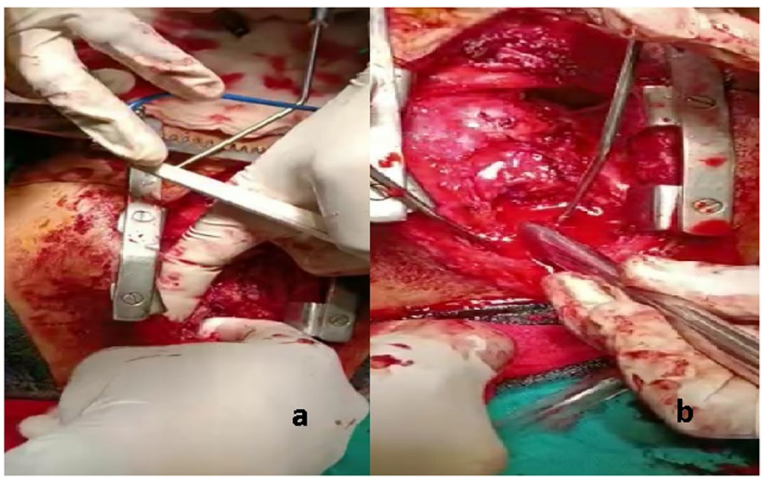

Fig. 4 **a** Rupture of the pseudoaneurysm required adept digital pressure control. **b** Aortic rent managed with 16 size Hegar dilator

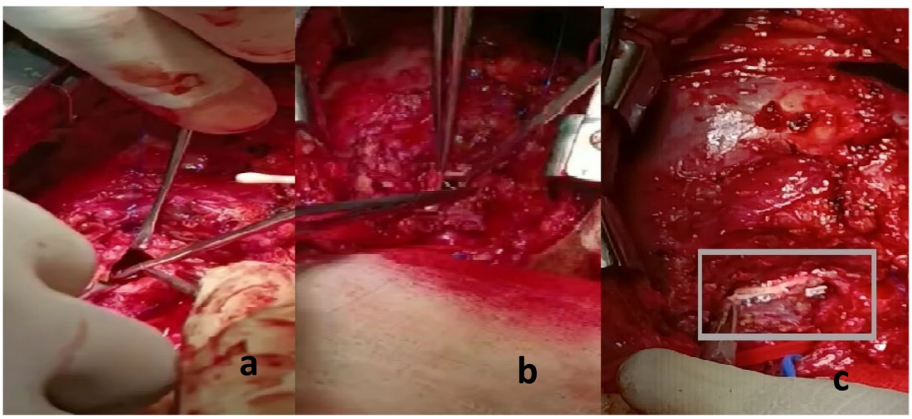

Fig. 5 **a** Resection and debridement of the pseudoaneurysm. **b** End-to-end anastomosis of the aorta. **c** Post-anastomosis of the aorta

Historically, only nine cases were reported in the first half of the twentieth century, sharply contrasting the documented 31 cases from 1964 to the present [2].

In our case, the intricate mechanisms underlying mycotic pseudoaneurysms involve a complex interplay of inflammatory processes. Surgical interventions like cannulation, aortotomy, and donor/recipient aortic anastomosis in transplant patients can compromise the endothelium, creating a conducive environment for bacterial growth [3]. The introduction of foreign materials like Teflon felt further compromises local defenses, especially in immunocompromised post-transplantation patients. Additionally, septic emboli from endocarditis or bacteria from distant infections can infiltrate the vasa vasorum, obstructing their terminal portion and infecting the media [4].

Staphylococcus aureus is the most commonly reported causative organism, with exceptions noted in transplant patients where *Candida* and Gram-negative organisms prevail [2]. Negative cultures may occasionally result from factors like impaired healing during steroid use and discordant aortic calibers between donor and recipient.

Regarding an alternative approach, the contemplation of trans-femoral aortic endoclamping requires meticulous planning and is unsuitable for urgent or emergency cases. Despite potential advantages, such as avoiding deep hypothermic circulatory arrest (DHCA) and reducing cardiopulmonary bypass time [5], this approach was excluded due to associated risks of pseudoaneurysm rupture by applying radial force on the aortic wall. Consequently, this strategy was deemed unsuitable for our case, prioritizing patient safety and minimizing the risk of hypoxic brain injury.

Conclusions

In conclusion, our case illuminates the evolving landscape of AscAo mycotic pseudoaneurysms. The surge in incidence with open-heart procedures underscores the importance of heightened vigilance. Our tailored surgical approach, including resection and debridement of the pseudoaneurysm and end-to-end anastomosis of the aorta, and strategic decision-making contribute to the expanding knowledge crucial for optimal patient care.

Abbreviations

CECT Contrast-enhanced computed tomography
ASD Atrial septal defect

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s43057-024-00122-4.

Additional file 1.

Acknowledgements

We extend our heartfelt thanks to the Department of Anesthesia, perfusion technicians, and staff for their invaluable contributions, expertise, and dedication, which played a pivotal role in the success of this case report.

Authors' contributions

All authors contributed equally to the drafting of the manuscript and critical revision. All authors have read and approved the final version of the manuscript

Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of data and materials

The data generated and/or analyzed during the preparation of this case report are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Not required as it is a case report.

Consent for publication

Written consent for the publication of this case report and accompanying images was obtained from the patient's legal guardian. The authors respect the patient's right to privacy, and all identifying information has been removed or anonymized.

Competing interests

The authors declare that they have no competing interests.

Received: 5 December 2023 Accepted: 3 January 2024
Published online: 15 January 2024

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