

CASE REPORT

Surgical Concerns of Pectus Excavatum in Previous Femoral Puncture in MICS ASD Closure

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HOW TO CITE THIS ARTICLE:

Anish Gupta, Abisho Russel Starlet, Danishwar Meena et. al, Surgical concerns of Pectus Excavatum in previous Femoral Puncture in MICS ASD closure. Indian J Cardiovasc Med Surg.2025;11(2): 63–66.

ABSTRACT

Minimally invasive cardiac surgery (MICS) has become a standard and preferred approach for the surgical closure of atrial septal defects (ASDs) due to its reduced surgical trauma, faster recovery, and improved cosmetic outcomes.¹⁻² However, certain patient factors can pose significant challenges to this technique. In particular, patients who have previously undergone unsuccessful percutaneous device closure attempts may present additional complexities, such as vascular access issues from prior femoral puncture. Furthermore, the presence of chest wall deformities like pectus excavatum can complicate surgical exposure and instrument maneuverability, making MICS relatively contraindicated in these cases. This report presents a case of minimally invasive closure of an ostium secundum ASD in a patient with both pectus excavatum and a history of failed device closure. We detail the intraoperative challenges encountered, including limited access and altered anatomy, and discuss the strategies employed to overcome these hurdles, emphasizing the importance of careful patient selection and tailored surgical planning.

KEYWORDS

• Pectus Excavatum • Minimally Invasive Cardiac Surgery • Atrial Septal Defect
• Failed Device Closure

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Received: 09-07-2025

Accepted: 10-08-2025



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INTRODUCTION

Minimally invasive cardiac surgery (MICS) is increasingly favored for atrial septal defect (ASD) closure due to less trauma, quicker recovery, and better cosmetic results compared to sternotomy. While percutaneous device closure is often first-line, some patients require surgery because of unsuitable anatomy, large defects, or failed device attempts. Chest wall deformities like pectus excavatum can limit exposure and instrument access, and prior femoral access from failed device closures may complicate cardiopulmonary bypass setup. We report a case of successful MICS ASD closure in a patient with pectus excavatum and prior failed device closure, highlighting perioperative challenges and the value of meticulous preoperative planning.

CASE PRESENTATION

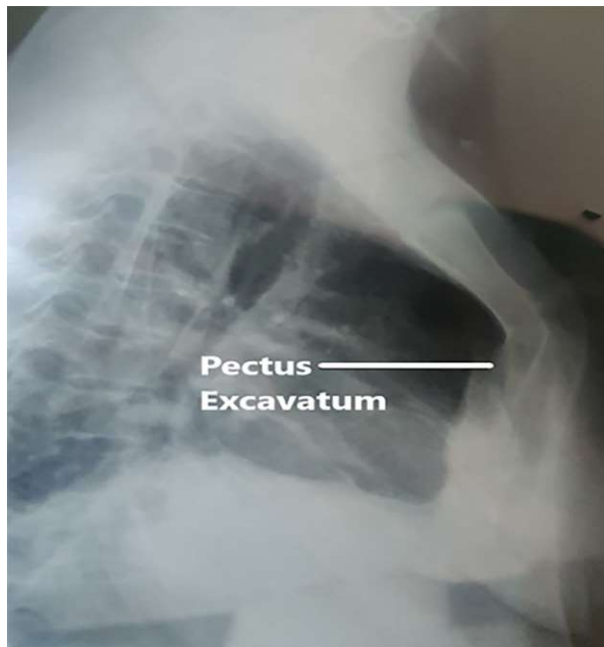


Figure 1: Lateral view of chest radiograph showing pectus excavatum

A 33-year-old female presented with complaints of breathlessness on exertion for four years and palpitations for two years. There was no history of cyanosis, pedal edema or abdominal distention. She had wide fixed splitting of second heart sound with an ejection systolic murmur in the pulmonary area. Chest X-ray showed cardiomegaly with pulmonary plethora and electrocardiogram showed right axis deviation with crochitage. Lateral chest X-ray (Figure 1) showed presence of pectus

excavatum and radiographically calculated Haller index (ratio of transverse and minimum anteroposterior diameter of the chest) was about 3.1 suggestive of mild to moderate pectus. Trans thoracic echocardiogram showed 30 mm ostium secundum atrial septal defect with adequate rims, mild tricuspid regurgitation, moderate pulmonary hypertension and normal biventricular function. She was planned for percutaneous device closure of ASD, but while ballooning, to size the device, the aortic rim ruptured. The percutaneous closure was abandoned, and she was planned for surgical closure of ASD as she refused to undergo any intervention for pectus excavatum. CT aortogram (Figure 2) was done which showed mild narrowing at the femoral puncture site. The patient underwent successful surgical ASD closure through MICS approach. The patient was given general anesthesia with double lumen endotracheal tube and put in supine position with 30-degree right side up.

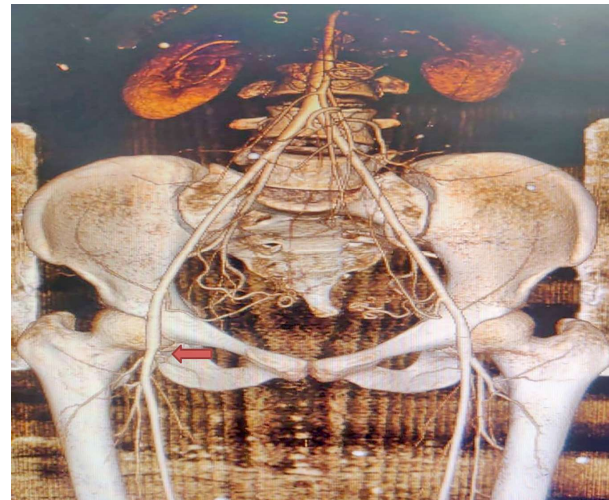


Figure 2: 3-D reconstruction image of CT aortogram showing mild narrowing of right femoral artery at the previous puncture site

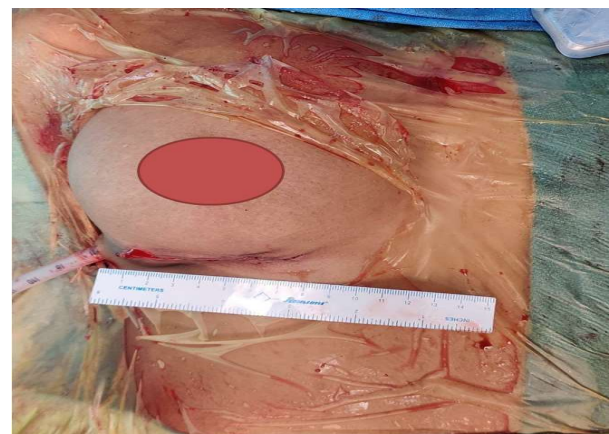


Figure 3: Post-operative image of MICS scar

The right femoral artery was cannulated with 18 Fr cannula and right femoral vein via 21 Fr two stage cannula. There were dense adhesions around the puncture site and artery had to be cannulated below it, near the bifurcation. A 5 cm right infra mammary incision was made, and pericardium was opened 2 cm anterior to right phrenic nerve. Cardiopulmonary bypass (CPB) was established, patient cooled to 30 degrees, chitwood clamp was used for aortic cross clamping. The right ventricle was not in vision due to sternal depression and looping of inferior vena cava was difficult. A Satinsky clamp was used from right to left for looping inferior vena cava. The ASD was closed with a Dacron patch and the patient was weaned from CPB. After femoral decannulation, the femoral artery was repaired with a vein patch. The patient was reversed with protamine and both incisions were closed in layers (Figure 3). There was no post-operative complication, and the patient was discharged on the third post-operative day.

DISCUSSION

Chest deformity is a relative contra-indication for MICS.³⁻⁵ Said and colleagues⁶ published a video in ctsnet describing trans axillary closure of atrial septal defect in severe pectus excavatum. The main challenge is with exposure due to displacement of heart and blockage of view by bony deformity. In our case looping of inferior vena cava was one-step, which was difficult, compared to routine MICS cases, because there was very less space to introduce a satinsky clamp.

In cases where patients have undergone previous attempts at percutaneous device closure, femoral vascular access is frequently utilized, sometimes involving puncture of both groins.⁷ This can lead to complications such as hematoma, pseudoaneurysm, or arteriovenous fistula formation at the femoral site. It is advisable to allow a waiting period of 1-2 weeks post-puncture, during which imaging (e.g., CT angiography) should be performed to rule out vascular complications before proceeding with cardiopulmonary bypass (CPB) via the femoral route.⁸⁻⁹ If no complications are detected, femoral cannulation for CPB is generally safe and effective. However, the exact site of cannulation may need to be adjusted based

on the location of prior punctures, and in some cases, patch repair of the femoral artery may be necessary after decannulation to ensure vascular integrity. In our experience, after waiting for 1-2 weeks and ruling out complications of femoral puncture, like hematoma or pseudoaneurysm via CT angiography, CPB can be easily established by femoral route. However, cannulation site may have to be altered as per site of puncture and a patch repair of femoral artery may be required after decannulation.¹⁰

CONCLUSION

MICS ASD closure approach may be used safely in patients with sternal deformities and previous attempt for percutaneous device closure. However, proper pre-operative planning using CT aortogram and CT chest may be done to safely contemplate minimally invasive strategy.

Financial support: This research received no specific grant from any funding agency, commercial, or not-for-profit sectors.

Competing interests: None

Ethical standard: Not applicable

Declaration of patient consent. The authors certify that they have obtained the appropriate patient's family consent. They were informed that anonymous radiographic, CT and intra-operative images would be posted in the journal.

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