



EMERGENCY SURGICAL RETRIEVAL OF A DISPLACED ATRIAL SEPTAL DEFECT OCCLUDER DEVICE IN THE MAIN PULMONARY ARTERY: A CASE REPORT

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ABSTRACT

Percutaneous closure of secundum atrial septal defect (ASD) is an established alternative to conventional surgical repair. Although generally safe, device embolization is a potentially life-threatening complication requiring urgent recognition and treatment. We present the case of a middle aged patient who developed acute displacement of an ASD occluder device into the main pulmonary artery immediately after implantation. The device migration was detected by echocardiography and confirmed by fluoroscopy. Emergency surgical retrieval was performed through median sternotomy and pulmonary arteriotomy under cardiopulmonary bypass. The ASD was subsequently closed primarily. The postoperative course was uneventful, with no residual shunt or pulmonary artery obstruction on follow-up echocardiography. Device embolization should be suspected when the occluder is not visualized in its intended position, even in a hemodynamically stable patient. Prompt multidisciplinary management is essential. [1-6]

KEYWORDS : Atrial Septal Defect; Device Embolization; Occluder Migration; Main Pulmonary Artery; Emergency Surgery; Pericardial Patch.

INTRODUCTION

Secundum ASD is one of the most common congenital cardiac lesions. Transcatheter device closure has become an important treatment option because it avoids sternotomy and cardiopulmonary bypass in appropriately selected patients. However, complications may include device malposition, embolization, residual shunting, cardiac erosion, arrhythmia, and thrombus formation. [5,6,9,10]

Device embolization most commonly occurs during the early post-implantation period and may involve the main pulmonary artery, right ventricular outflow tract, right atrium, or systemic circulation. Reported risk factors include deficient septal rims, inappropriate device sizing, unfavorable defect morphology, inadequate device capture, and excessive coughing or sudden increases in intracardiac pressure. [1,3,5,7] A published case described embolization into the main pulmonary artery after intense coughing immediately following deployment; the device was surgically removed and the ASD closed. [4]

We report a case of acute ASD occluder displacement into the main pulmonary artery requiring emergency surgical retrieval and definitive ASD repair.

Case Presentation

A 40-year-old boy was referred for evaluation of a secundum ASD. Transthoracic and transesophageal echocardiography demonstrated an approximately 29-mm ostium secundum defect. The surrounding septal rims were considered adequate for device closure, although the inferior rim was relatively deficient, measuring approximately 9 mm.

The patient underwent transcatheter ASD closure under fluoroscopic and transesophageal echocardiographic

guidance. A 24-mm self-expanding septal occluder device was deployed across the defect. Immediately after deployment, echocardiography showed apparently satisfactory positioning, with no significant residual shunt.

Following extubation, he remained hemodynamically stable, but repeat transthoracic echocardiography failed to demonstrate the occluder at the atrial septum. The device was visualized in the main pulmonary artery. Fluoroscopy confirmed embolization of the device into the pulmonary trunk. In view of the device size, its location, and the risk of obstruction or vascular injury, emergency surgical intervention was undertaken. [2-4]

Preoperative Findings

- Secundum ASD measuring approximately 29 mm.
- Occluder device displaced into the main pulmonary artery.
- No evidence of severe hemodynamic compromise.
- No significant pericardial effusion or acute pulmonary artery obstruction.
- Relatively deficient inferior rim.



Figure-1 2D -Echo showing Occluder device in Main Pulmonary Artery (MPA)

Surgical Management

The patient was transferred immediately to the operating theatre. A median sternotomy was performed, followed by opening of the pericardium. After systemic heparinization, RA and IVC cannulation was established and cardiopulmonary bypass was initiated. The aorta was cross-clamped, and antegrade cold-blood cardioplegia was administered.

A right atriotomy was performed to inspect the interatrial septum. The secundum ASD was confirmed and measured approximately 29 mm. The embolized device was palpated externally within the pulmonary trunk.

A longitudinal incision was made in the main pulmonary artery over the site of the device. The occluder was carefully extracted through the pulmonary arteriotomy, taking care to avoid injury to the pulmonary valve, pulmonary artery wall, and bifurcation. The pulmonary arteriotomy was closed primarily with fine polypropylene sutures. [3,4]

The ASD was then closed primarily using Prolene sutures with continuous technique. The right atriotomy was closed, the heart was de-aired, and the patient was weaned from cardiopulmonary bypass without difficulty.

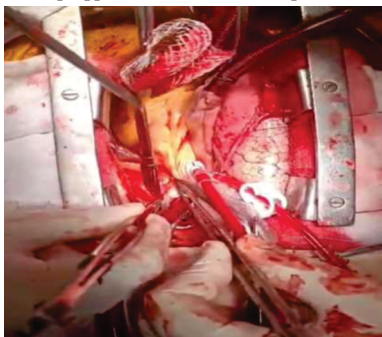


Figure 2. Intraoperative View During Surgical Retrieval of the Embolized ASD Occluder Device.

Postoperative Course

The patient was transferred to the intensive care unit for routine postoperative monitoring. He was extubated uneventfully and had no clinical evidence of pulmonary artery obstruction, low cardiac output, or significant arrhythmia.

Postoperative transthoracic echocardiography demonstrated:

- No residual interatrial shunt.
- Normal right ventricular function.
- No pulmonary artery stenosis.
- No significant pulmonary regurgitation or tricuspid regurgitation.
- No pericardial effusion.

The remainder of the postoperative course was uneventful, and the patient was discharged after clinical recovery. Follow-up echocardiography showed no residual shunting or valvular regurgitation.

DISCUSSION

Device embolization is an uncommon but important complication of transcatheter ASD closure. The main pulmonary artery is a recognized destination for an embolized ASD occluder because the device may pass through the right ventricle and become lodged in the pulmonary trunk or at the pulmonary artery bifurcation. The presentation may be asymptomatic, particularly when the device lies longitudinally within the vessel. Nevertheless, delayed treatment can result in pulmonary artery obstruction, thrombosis, vascular perforation, hemolysis, or further distal migration. [1-6]

Possible Mechanisms

The likely mechanisms of displacement in this case were:

- Sudden elevation of right atrial pressure during intense coughing.
- Relatively deficient inferior rim.
- Inadequate device anchoring despite initially satisfactory echocardiographic positioning.
- Possible oversizing of the occluder relative to the defect and septal anatomy.

Inadequate rims and oversized devices are recognized risk factors for embolization. Paradoxically, excessive oversizing may worsen stability by distorting the septum or increasing mechanical forces at the defect margins. [1,3,7]

Diagnosis

The diagnosis should be considered when:

- The device is no longer seen across the atrial septum.
- A new cardiac murmur or unexplained hemodynamic change occurs.
- There is sudden respiratory distress, chest pain, cyanosis, or arrhythmia.
- The occluder is seen outside its expected position on fluoroscopy or chest radiography.

Transthoracic echocardiography is usually sufficient for initial detection, while transesophageal echocardiography and fluoroscopy help define the exact location and relationship of the device to the pulmonary valve and pulmonary artery branches. [3,6]

Treatment Considerations

Percutaneous retrieval using a snare or basket catheter may be considered in selected patients, particularly when the device is small, freely mobile, and accessible. However, large occluders lodged in the main pulmonary artery, devices associated with tissue entanglement, or failed catheter retrieval attempts generally require urgent surgery. Surgical treatment offers the advantage of removing the embolized device and closing the ASD during the same procedure. [1,3,4,8]

The recommended surgical approach includes:

1. Immediate multidisciplinary consultation between interventional cardiology, cardiothoracic surgery, cardiac anesthesia, and intensive care teams.
2. Median sternotomy and cardiopulmonary bypass.
3. Right atriotomy for evaluation and repair of the ASD.
4. Direct pulmonary arteriotomy over the palpable or localized device.
5. Careful extraction of the occluder.
6. Primary closure of the pulmonary arteriotomy.
7. Direct closure of the ASD, according to defect size and tissue quality.
8. Postoperative echocardiographic assessment. [3,4,8]

CONCLUSION

Acute displacement of an ASD occluder into the main pulmonary artery is a rare but potentially serious complication of transcatheter ASD closure. A high index of suspicion and immediate echocardiographic confirmation are essential, even when the patient is hemodynamically stable. For large or firmly lodged devices in the pulmonary artery, emergency surgical retrieval with simultaneous ASD closure is a well-described management strategy. Careful patient selection, accurate rim assessment, appropriate device sizing, and close monitoring immediately after implantation may reduce the risk of device embolization. [1-10]

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