

CLINICAL COLUMN

Late Erosion of an Atrial Septal Occluder Device Presenting as Cardiac Tamponade

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A 41-year-old female presented to a community hospital emergency department after a sudden collapse at home. As per the patient's spouse, the paramedics reported the patient complained of left chest pain immediately before collapsing. There was a history of cardiac surgery for an atrial septal defect (ASD) with the surgical date not known at the time of presentation.

On arrival to the emergency department, the patient was lethargic and unable to provide a history. Her blood pressure was 70 systolic and she was tachycardic with a heart rate of 120 beats per minute with no murmurs. On physical examination, the patient was restless and moaning. The chest was clear. Palpation of the abdomen appeared to initiate a pain response; bowel sounds were present. Extremities were cold to touch. Volume resuscitation was initiated with normal saline and pentaspan. The 12-lead ECG showed sinus tachycardia with a rate of 120 BPM, a right axis deviation and diffuse non-specific T wave changes. Laboratory findings including a CBC, urea, creatinine, electrolytes, INR and troponin were within normal limits. A quantitative BHCG was zero. A stat portable abdominal ultrasound was done to assess for abdominal pathology. The ultrasound showed a trace of ascites and a dilated inferior vena cava with limited flow within the inferior vena cava and femoral veins. Chest x-ray showed possible left lower lobe pneumonia. There were no sternal wires to suggest previous cardiac surgery. A stat portable echocardiogram was done to assess the right ventricle due to concerns regarding a possible large pulmonary embolus. The echocardiogram revealed a large, circumferential pericardial effusion with a compressed right ventricle. The effusion measured four centimetres in its largest diameter anterior to the right ventricle. Left ventricular function was normal. An occluder device was seen straddling the interatrial septum. A bedside pericardiocentesis was performed with bright red hemorrhagic fluid returned. With the initial aspiration of 120 mls of fluid, the systolic blood pressure improved to 130 and the heart rate decreased to the 80s. Under echocardiographic guidance, a pericardial drain was inserted and approximately 800 mls of fluid was drained. Drain placement was confirmed by echocardiogram and agitated saline bubble test.

The case was reviewed with the congenital cardiac physician at the tertiary care facility where the ASD repair had been done. Further information was obtained. The patient had undergone an ASD device closure approximately 16

months previously. A follow-up echocardiogram three months post procedure showed normal left ventricular and right ventricular function with a trivial pericardial effusion. No further follow-up was planned.

Based on clinical findings and case review, the concern was that the device may have caused erosion resulting in a slow pericardial bleed. Arrangements were made to transfer the patient to the tertiary facility for an urgent cardiovascular surgical consult. The patient underwent a successful surgical repair and was discharged home without physical or neurological deficits.

Discussion

Atrial septal occluder devices allow for closure of ASDs without an open, more invasive cardiac procedure. Due to the relatively simple technique involved, percutaneous closure of ASDs and patent foramen ovals have become the preferred treatment strategy (Yared et al., 2009). The AMPLATZER™ Atrial Septal Occluder (ASO) device consists of two retention discs and is available in a number of sizes to account for the variability in the anatomy of the defects (See Figure 1). Correct sizing is essential to optimize procedural results. The device is implanted by interventional cardiologists with fluoroscopic and echocardiographic imaging guidance. The size of the defect is determined by the insertion of a sizing balloon. After the defect size has been determined, the sizing balloon is removed and an appropriately sized occluder device is chosen. If an exact sizing match is not possible, a device one size



Figure 1: AMPLATZER™ Septal Occluder
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greater than the defect is used. The device is screwed onto a delivery cable and then loaded into a specialized delivery system. The delivery system is advanced into the left atrium where the distal disc is deployed and positioned against the left side of the atrial septum. The delivery system is then retracted and positioned in the right atrium for deployment of the proximal disc. Correct positioning of the device will demonstrate that the two discs are positioned together on opposing sides of the ASD. If adjustments are required, this can be accomplished through retraction and repositioning of the device. Once optimal positioning has been achieved, the device is released from the delivery cable (St. Jude Medical, 2012).

Erosion is an infrequent, yet serious complication of ASD closures with percutaneous occluder devices. The rate of erosion is estimated at approximately 0.1% (Amin et al., 2008, Taggart, Dearani, & Hagler, 2011). It is most common for erosions to occur within three months of device placement. However, there have been documented cases occurring out to three years post-procedure (Amin et al., 2004). In the case of the AMPLATZER™ Septal Occluder device, the roof of the left atrium is the most common site of erosion, which results in hemorrhagic pericardial effusion and frequently cardiac tamponade. The fact that the left atrial disk is larger than the right may explain the left atrium's vulnerability (Yared et al., 2009). ASD closure is associated with return to normal cardiac chamber dimensions, which may bring the free walls of the atria in closer proximity to occluder disks (Knott-Craig & Goldberg, 2008). The incidence of hemodynamic compromise from ASD occluder device erosion is reported at 0.11% (Hanzel, 2006).

ASDs that are located high on the septum, with insufficient antero-superior rims are associated with increased risk of erosion. This is believed to be due to increased mobility of the occluder device, with subsequent opportunity for friction with the atrial wall (Amin et al., 2004; Yared et al., 2009). Oversizing of an ASD device also increases the risk of erosion, as does excessive movement of the device before release from the delivery cable (Amin et al., 2004).

As transcatheter closure of ASD increases in popularity, physicians need to remain alert to the small, but not negligible

risk of life-threatening complications. In cases of late erosion, such as in our patient, symptoms may be completely absent until a sudden catastrophic presentation.

Health care providers need to take a thorough history and clearly document the assessment within the patient record. All patient care team members should be advised of the presence of the occluder device. This information is vital to guiding investigations and treatment in the event of respiratory or cardiac symptoms or a sudden deterioration in the patient's status.

Nursing interventions are many and are aimed at minimizing the patient's distress and supporting hemodynamic stability. Assistance with an emergency pericardiocentesis may be required and the nurse should be aware of the availability and location of the required equipment. Close monitoring of vital signs and clinical status are essential and significant changes should be reported immediately to the attending physician. Nurses must be prepared to respond quickly to requests for medication administration and IV fluids and possibly blood products. Providing support and information to the distressed patient and family is an important intervention.

While percutaneous device closure is safe and effective in the vast majority of cases, physicians (particularly cardiologists and emergency medicine specialists) and nurses need to have a high index of suspicion for structural complications when a patient with a history of ASD device closure presents with dyspnea, chest pain, or hemodynamic compromise. Early recognition and prompt interventions and treatments are critical. Rapid echocardiographic assessment and referral to cardiothoracic surgery were lifesaving in this case. ♥

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