



## Transcatheter Aortic Valve Replacement Complications

### Key Article

Rouleau SG, et al. Transcatheter aortic valve replacement complications: a narrative review for emergency clinicians. *AJEM*. 2022; 56:77-86.

### Background

- Aortic stenosis (AS) is the second most prevalent valve disorder in the US.
- In Europe and North America, calcific degeneration is the most common etiology for AS.
- Severity of AS is determined by the aortic valve area and mean gradient across the valve.
  - Severe AS: valve area 0.7-1.0; mean gradient > 40 mm Hg
  - Critical AS: valve area < 0.7
- Traditionally, AS has been treated with surgical aortic valve replacement.
- The first transcatheter aortic valve replacement (TAVR) in a human occurred in 2002. In 2011, the FDA approved TAVR for high-risk surgical patients. Given improved technology, improved operator experience, and expansion of eligible patients beyond high-risk category, TAVR is now more common than surgical repair.
- TAVR appears to be superior to surgical repair in terms of mortality, stroke, and readmissions at 1 year.
- With the increase in TAVR procedures, it is imperative for the emergency clinician to be knowledgeable on complications that may result in patients presenting to the ED.

### Peri-Procedural Complications

- Will occur during the initial hospitalization but are worth knowing
- Most stem from intra-operative valve issues
- *Complications*
  - Obstruction of the coronary arteries
    - < 1% with native valve replacement
    - Can lead to cardiogenic shock
    - Requires emergent surgery and possibly ECMO or IABP
  - Tamponade
    - Incidence up to 4%
    - Usually identified intraoperatively
    - Treated with pericardiocentesis
  - Valve embolization
    - Incidence < 0.3%
    - Marked increase in mortality
    - Has been reported in a case report to occur up to 1 year after TAVR

### Post-Procedural Complications

- *Vascular Access Site Complications*
  - Arterial Bleeding

- Access sites for TAVR include the radial artery, femoral artery, and subclavian artery through the deltopectoral groove
    - Incidence of access site bleeding now around 6-8%
    - Risk factors for arterial bleeding include sharp artery angulation, peripheral arterial disease, and ESRD with uremic platelets. Patients with TAVR also placed on dual antiplatelet therapy.
    - Be sure to check wrist, groin, and axilla on exam.
    - Treat by controlling the bleeding, resuscitate as needed, and consult vascular surgery. Patients may require a procedural intervention to stop hemorrhage.
  - Pseudoaneurysm
    - Incidence < 1%
    - Can be differentiated from a hematoma as they are pulsatile and often have a systolic bruit on auscultation
    - Obtain a Doppler ultrasound.
    - Pseudoaneurysms < 3 cm typically resolve spontaneously; those > 3 cm have a higher risk of rupture and require consultation/repair by vascular surgery.
- *Prosthetic Valve Complications*
  - Paravalvular Leak
    - One of the most common complications of TAVR
    - Occurs when blood leaks between the outer aspect of the prosthetic valve and native cardiac tissue
    - Incidence:
      - Mild: 8-41%
      - Moderate: 8-12%
      - Severe: 3-12%
    - Can present to the ED as new onset heart failure or hemolysis
      - Pearl is new onset anemia without signs of bleeding
      - Check peripheral smear, haptoglobin, LDH and look for indirect hyperbilirubinemia and hemosiderin in UA.
    - Perform POCUS in the ED, with the short-axis view offering the best visualization of leak and estimation of regurgitation.
    - Order a formal TTE, though CT, TEE, and possibly cardiac MRI may be needed.
    - Consult cardiac surgery and/or cardiology
  - Valve Thrombosis
    - Incidence up to 3%
    - Patients present with prosthetic valve dysfunction and signs/symptoms of left-sided heart failure. SOB is the most common presenting symptom.
    - Associated with an increased risk of embolic stroke. Patients with TAVR and embolic stroke should be evaluated for valve thrombus.
    - An ED POCUS or TTE may demonstrate a mobile mass or thrombus, though TEE or CT may be needed in cases of new onset cardiopulmonary symptoms and negative TTE.
    - Patients with valve thrombus are treated with anticoagulation
  - Prosthetic Valve Endocarditis
    - Incidence approximately 2%
    - Usually presents several months after the procedure
    - Most commonly caused by *Strep*, *Enterococcus*, or MRSA.

- Often difficult to diagnose, as TTE may be negative in up to 32%.
    - Have a low suspicion for endocarditis in TAVR patients presenting with signs of sepsis but no obvious source (PNA, UTI, etc).
    - Obtain blood cultures and initiate ABX.
  - Delayed Coronary Obstruction
    - A very rare complication
    - More likely to occur after a “valve-in-valve” procedure (TAVR is replacing a prior prosthetic valve)
    - Can present as a STEMI or even cardiac arrest
- *Cardiac Arrhythmias*
  - Atrial Fibrillation
    - Patients who undergo TAVR are predisposed to afib.
    - Occurs in up to 20% of patients
    - New onset afib may be a risk factor for mortality and CVA, but data is conflicting
    - ED management of afib in TAVR patients is the same as for non-TAVR patients: cardioversion for unstable patients, rate or rhythm control, and anticoagulation.
  - Left Bundle Branch Block
    - Typically develops within 24 hours of TAVR
    - May resolve spontaneously in up to 50%
    - Associated with higher CV mortality
    - Management of new LBBB post-TAVR is uncertain
    - Obtain cardiology consultation
  - High-grade AVB
    - Usually occurs shortly after TAVR procedure; most within 24 hours and up to 7 days after procedure. However, delayed presentation is possible.
    - Most common indication for pacemaker placement after TAVR
    - Be sure to look for high-grade AVB in TAVR patients presenting with syncope or symptomatic bradycardia.
- *End-Organ Dysfunction*
  - Stroke
    - Overall incidence post-TAVR estimated to be 2-5%.
    - Presents in a bimodal distribution; 50% occur in the first 24 hours and the remaining occur beyond 10 days after the procedure.
    - Risk factors for CVA post-TAVR include PAD, prior TIA, low BMI, prior falls, and angina.
    - Any patient with neuro symptoms after TAVR should be evaluated for CVA.
    - TAVR valves are compatible with MRI
    - TAVR is not an absolute contraindication to thrombolytic or mechanical thrombectomy therapies
  - CAD and MI
    - Many patients who undergo TAVR have pre-existing CAD
    - Up to 10% of patients may experience an ACS after TAVR.
    - The mechanism is uncertain but believed to be primarily related to atheroembolic events.
    - Treatment of MI in post-TAVR patients can be difficult, as the prosthetic valve can block access to the coronary artery system.
    - Typical ED treatment for ACS/MI does not differ in TAVR patients – antiplatelets, anticoagulants, etc.