Why?

• TAVI vs traditional AVR—no need to cross-clamp the aorta.

• However, TAVI is only FDA approved for pts with extremely high operative risk

Indications:

• Severe, symptomatic AS

• STS Surgical risk score of 8% or higher
  – On a scale of 0% or 100%, with higher scores indicating greater surgical risk
  – Predicted risk of death by 30 days after surgery of 15% or higher

• Severe ascending aortic calcification (such as porcelain aorta) that prevents aortic cannulation or cross-clamping

• Severe radiation damage to chest or chest deformity that prevents sternotomy
These pts are frail, many elderly, some morbidly obese

TAVI outcomes do not approach AVR results because AVR surgical results reflect a lower-risk population overall

Contraindications:

- Untreated CAD
- Infective endocarditis, cardiac tumor
- Estimated life span of < 1 year
- Recent active GI bleeding that would prevent use of anticoagulants
- Pt with contraindication to TEE
- Renal failure with creat clearance < 20mL/min (contrast is used)

Contraindications:

- Bicuspid or non-calcified aortic valve
- Diameter of the aortic annulus of less than 18 mm or more than 25 mm
- Anomalous coronary ostia or unusually bulky coronary leaflet
- Severe (>3+) MR or AI
- TIA or CVA within 6 months
Contraindications:

• For transcatheter approach only:
  – severe calcified, diseased, small tortuous iliac vessels
  – Aortic aneurysm

• For transapical approach only:
  – left apical clot, aneurysm or scar

• Pt qualifies for but refuses traditional surgery

Pre-procedure:

• Ileal conduit may be done pre-procedure for vascular disease with tortuosities

• Pre-procedure testing will include:
  – Heart cath to confirm CAD (IVUS can be used to decrease dye load)
  – Echo to size valve, note calcification, EF%(sizing of valve is important)
  – CT of chest, abd, pelvis to check blood vessels for toruosity and calcifications
  – Carotid ultrasound
  – PFT's

Pre-op Apical TAVR

• ASA & clopidogrel are loaded pre-procedure and pt will continue these 6 months post.

• dabigatran should be held pre-procedure

• chlorhexidine showers

• If on bronchodilators, treat at 0500 and 0900 day of surgery
Transapical Pre-op additions:

- gabapentin 300mg po 1 hour prior to procedure
- acetaminophen 975mg po 1 hour prior to procedure

Medtronic Core Valve

- Porcine pericardial valve
- Mounted in an hourglass shaped self-expanding nitinol frame
- Secured in situ without sutures

Edwards Sapien Valve

- Does not require removal of native valve- balloon valvuloplasty is done prior to deploying new valve
- Valve is implanted sutureless-held in place by stent/frame
- Bovine pericardial tissue valve, treated, 3 leaflet, loaded onto a stent frame to hold the valve in place. It is crimped to be placed in a catheter for delivery/placement.
- 2 sizes of valves are currently available:
  - 23mm (for annulus 18-23mm) and
  - 25 mm (for annulus 23-26mm)
  - Anticipate more sizes will be available in the future.
Procedure:

- Right or left femoral approach is used - both groins will be accessed (1 side will be the cut down, the other will be a percutaneous access for other catheters, such as pacing wire)
- The introducer is 25 Fr. (about the size of the average surgeon's thumb)
- 18F-24F size sheaths difficult with PVD risk of embolizing atherosclerotic material

TEE with valve on catheter

- Rapid pacing is used during the implantation to stop cardiac output
- Concerns are that the valve be placed too high and block the coronary ostia or slip too low and end up in the ventricle which will then require an open heart surgery retrieval
- Brief fem-fem cardiopulmonary bypass can be used (femoral vessels may be cannulated as a precaution)
- Transfemoral video
Transapical approach

Post procedural TEE

- Check for paravalvular leaks, AI, & cardiac function. If a paravalvular leak is seen, balloon may have to be re-inserted into the valve and re-expanded to seal off the leak.
- Valve-in-valve
- Possible D/C transvenous pacer Check to see if the patient is at risk for AV block. May be transferred to ICU with pacemaker intact.

Post-procedure Care

Systolic Blood Pressure Control

110 – 130 mm HG for first 24 hours

Where the valve stent was seated into the annulus, tiny micro-emboli of the jagged calcium could have invaded into the tissue. During the first 24 hours, controlled blood pressure will help tissue integrity of the aortic annulus where the valve is seated.
Post-procedure nursing considerations:

- Pt’s hemodynamic status pre-op may be very unstable
- Need to be volume loaded, will have a PA cath, and anticipate will be in OHICU for 1 day, hospitalized 5-7 days
- Neuro assess- embolization risk
- Peripheral vascular assess- large catheters & embolization risk
- Groin site- very large catheters or cut down

30 day mortality

- Independent predictors of 30 day mortality are:
  - Pulmonary Hypertension
  - Severe MR
  - Need for hemodynamic support
- Predictors of late mortality:
  - COPD
  - Chronic Kidney disease
  - Need for hemodynamic support
  - Post-procedural sepsis

Potential Problems:

- Paravalvular Leak
  - Oversize valve
  - Occurs in 3-4% of procedures. If noted during the procedure-this may require a second valve to be deployed inside the first.
  - TEE during procedure
  - TTE several days post-op
  - If leak > mild- need HGB, LDH, haptoglobin, bilirubin to detect hemolysis
  - If hemolysis is significant may transfuse
Potential Problems:

- Mitral valve damage
  - from wire that has crossed valve trying to position the TAV in place.
  - May indicate a need for mitral valve replacement to repair.

- Stunned myocardium – from long multiple pacing runs during procedure

Potential Problems:

- Heart block post-op
  - due to position of valve & valvuloplasty/implantation
  - can occur early or several days after procedure
  - If pacing is needed, TCP or a paceport S/G cath will be used

  (Vfib during rapid pacing for valve implantation has been seen in several cases)

- Should be a low threshold for inserting in a PPM.

- During the Partner trial, ~ 4% of patients need PPM – both TAVR & open AVR
New LBBB

- 15-18% incidence with Sapien Valve
- 40% incidence with CoreValve
- New LBBB after AVR is rarely reported

Strategies for Rhythm Management
- Tele 4-7 days postprocedure
- Epicardial wires for several days after TA implant (infection risk)
- Cautiously administer Beta blockers

Potential Problems

- Post-op Left Pleural Effusion incidence of 30.5% was noted in a 2007 study

Measures to treat:
- Auscultate for decreased air entry in LLL
- CXR surveillance
- Treat with diuretics, pleurocentesis or CT

Potential Problems:

- Acute Kidney Injury
  - Compromised preprocedural CO
  - Chronic diuretic use
  - Age induced decreased GFR
  - Contrast use
  - Potential atheroembolism
  - Brief episodes of hypotension with valvuloplasty and valve placement
Measures to prevent AKI

- Administer prehydration
  - If tolerated
  - If not in HF
- Administer renal protective agents
  - Sodium bicarb drip
- Prevent hypotension during and after
- Monitor creat daily
- CRRT when AKI is severe

Potential Problems:

Vascular Access Complications:
- Partner B & A trials reported 16-17% incidence of vascular complications
- 3.8% incidence with AVR

Managing/Preventing:
- Careful BP control will minimize bleeding and apical pseudoaneurysm
- Remove catheters with manual pressure or femostop

Potential Problems

- Bleeding
  - ASA & clopidigrel Pre and then 6 months post to ensure implanted valve is endothelialized
  - VTE prophylaxis with Heparin/Lovenox may begin 12 hours post-procedure
Potential Problems

- **Stroke risk** of 2.5-6.7% PARTNER Trial cohort TAVI patients.
- Rate of major strokes at 30 days was not significantly different than SAVR (3.8% vs 2.1% p=0.20) [Sinning et al, 2012]
- Often due to embolization of calcified material during valvuloplasty or from aorta
- Atrial Fibrillation is another risk factor

Atrial Fibrillation

- Occurs in up to 32% of pts
- Associated with a higher rate of late cardioembolic events
- 1 year stroke rate of 14% vs. 3% (p=0.02) [Amot-Santos, 2012]

Neurological Nursing Considerations

- Thorough pre-procedure baseline assessment
- Consult family members to decipher potential cognitive changes
- Consider hypoactive form of delirium
- A specific intervention to decrease delirium is an intercostal nerve block at chest closure and chest tube removal to decrease narcotic use
Potential Problems

- Acute Pulmonary Edema
  - Most often seen the first 24 hours.
  - Watch volume status closely
  - If high risk, Swan may be left in until POD #1
  - Assessment LVEDP after the procedure may warn of pulmonary edema – due to lack of diastolic compliance

Potential Problems

- More than 50% of pts undergoing TAVI have CAD (McRae et al, 2012)
- Partner A trial reported 0% MI with TAVI vs 0.4% MI with AVR
- Risk for:
  - Transcatheter stent blocking coronary ostium
  - Large coronary leaflet pushed against ostium by the valve
  - Calcium embolization during valvuloplasty or deployment of transcatheter valve
- Monitor for acute ST-segment changes or any sign of hemodynamic compromise

Potential Problems

- Pain
- Atelectasis
- ↓ Peripheral perfusion
- vessel rupture/dissection
- pseudoaneurysm
- myocardial perforation
- Tamponade
- infection
Average LOS

- 10-15 days for TF
- 10-19 days for TA
- 10-17 days for 80 yr olds with AVR

References


