Anesthesia For TAVR

Lundy J. Campbell, MD
Professor of Clinical Anesthesia
Chief, Division of Adult Cardiothoracic Anesthesia

Disclosures

I have nothing to disclose
Why is TAVR Important to You?

Ability to treat high-risk patients not amenable to SAVR
Will see these post-TAVR patients back in the community for other procedures
New indications for moderate risk patients soon
Changes “calculus” of how to deal with congenital or early-onset valvular disease
Need for new hybrid OR and anesthesia role in designing these workspaces (need a seat at the table)
Changing Practice: This procedure will not always be relegated to the cardiac anesthesiologist.

A Brief History of PCI

1st CABG 1968
1st PCI Sept 1977 Andreas Gruentzig

Early PCI: Large catheters, large balloon with low burst pressures, no guidewires
Limited to pts with: refractory angina, good LVEF, discrete proximal concentric non-calcific lesion in major vessel with no branches or angulations
Improved delivery systems, drills, cutters, lasers
Bare metal stents
Drug Eluting stents
Decreased surgeon involvement
**Surgeon Involvement in PCI**

2002 C-PORT trial: Primary PCI safe in hospitals without cardiac surgery on site

2012 C-PORT E: Safe to provide ELECTIVE PCI at hospitals without cardiac surgery on site under controlled circumstances

---

**A Brief History of TAVR/TAVI**

1965 Davies described catheter-mounted parachute valve for AR

1985 Cribier performed 1st balloon aortic valvuloplasty on 77yo female with inoperable severe AS

Anderson 1st artificial valve suitable for percutaneous implantation

2000 Cribier introduced 3 leaflet percutaneous heart valve via 24F sheath in sheep

2002 Cribier 1st TAVR in human for severe AS

2005 Paniagua 1st retrograde TAVR
**TAVR Data**

RECAST/I-REVIVE studies examined TAVR: 75% success rate, 22% complication rate  
PARTNER Cohort B: Showed inoperable patients treated with TAVR had lower mortality compared to medical management or medical management plus balloon valvuloplasty  
PARTNER Cohort A: Compared safety/efficacy of TAVR and SAVR in high-risk patients: No difference mortality at 1 and 2 years. TAVR more neurologic and major vascular events, SAVR more major bleeding events

---

**Where Are TAVI Valves Placed?**

Positions:  
Aortic  
Mitral  
Ticuspid  
Pulmonic  

Valve-in-valve vs valve in native valve (bio-prosthetic)
Approaches to Placing TAVI Valves

Transfemoral
Preferred if possible
Femoral/iliac vessels large enough, free of atherosclerotic disease, not overly tortuous

Transaortic
If femoral vessels are unfavorable

Transapical
Can’t do other 2 approaches
Femoral not an option
Porcelain aorta
Severe ascending aortic plaques
Prior CABG vessels in way
Approach to mitral valve

How TAVR is Changing the Landscape

Sick patients unable to tolerate SAVR
New indications for moderate risk population
Changing approach to congenital or early onset valve disease
May not place mechanical valve that lasts forever but needs lifelong anticoagulation in young patient.
Significant morbidity associated with anticoagulation
May place initial bio-prosthetic valve then do transcatheter valve-in-valve. Then?
**Steps in TAVI Placement**

Induction of anesthesia, lines, etc
TEE placement and groin access (pre-close devices)
Pacing wire placed from groin, rapid pacing checked
Angiography performed: Size, position of valve, coronary anatomy, hemodynamics across valve
Heparinization, valve pre-dilated and sized with balloon if needed (rapid pacing)
Valve loaded on sheath, placed into position, triple checked
Valve deployed
Post deployment TEE check for leaks etc
Angiography to assess valve competency, etc
Heparin reversed, catheters removed
Patient awakened, extubated, taken to ICU

**Steps in TAVR Placement**

For trans-aortic / trans-apical: Surgeon performs mini-sternotomy or small chamberlain incisions
   Possible ECMO cannulae placed in L groin as needed for procedure
   Would then wean off ECMO after valve deployed and checked

Increasing role of MAC anesthesia for “straightforward” trans-femoral cases
**Role of Anesthesiologist in TAVI**

**Hemodynamics:**
Induction: Maintain adequate afterload (resistors in series), perfusing rhythm
Deployment: Pressure down during deployment, balloon inflation to decrease stress on wall and valve migrations
Immediate post deployment: May need BP and contractility support with Ca, Norepi, Epi
   Note:
   - Severe hypotension with rapid pacing
   - No cardiac output during time when balloon inflated, valve deployed
Late deployment: May need to control hypertension (NTG, nicardipine, clevidipine)

**Rhythm:**
High probability of arrhythmia d/t catheters, wires, patient’s own intrinsic disease
May require defibrillation during case
May require pacing post-procedure
Rapid pacing (to significantly decrease BP) at time of balloon inflation/valve deployment
   Note: Watch S-T segments and conduction post-procedure as can occlude a coronary artery with the valve or a native valve leaflet
**Echocardiography**

Used to measure valve size pre-procedure  
Assess LV function throughout procedure  
Check wire, catheter, balloon, valve position prior to deployment of valve  
Need valve to go through center of valve orifice  
Measure/quantify any peri-valvular leaks post-procedure

**Patient Issues Post-TAVI**

Rhythm issues  
Pain control  
AR: Peri-valvular or central  
Valve misplacement: Embolize forwards backwards, valve placed upside-down  
Occlusion of coronary arteries  
Bleeding  
Infection  
Stroke  
Damage to native vessels
Compare to Surgical Problems

Bleeding
Infection
Neurologic
Wound dehiscence
Valve dysfunction
Myocardial dysfunction, infarction
Rhythm disturbance
Pain
Aortic dissection