Current Surgical Cardiac Procedures

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Note: In-hospital procedures only.
Less invasive techniques

• Endovascular aneurysm repair
• Minimally invasive open heart surgery or
• OPCAB (off-pump coronary artery bypass)
• Robotics
Endovascular Aneurysm Repair (EVAR)

• Evolved to avoid major surgery and related morbidity and mortality associated with standard surgical repair
• Goal is to provide durable repair maintaining prograde flow in graft while excluding flow within the aneurysm
• Eligibility determined by pre-procedure contrast enhanced spiral CT and abdominal aortography
• Complication unique to endovascular repair are endoleaks
  – Presence of flow outside of the lumen of the endograft but within the aneurysm sack
Thoracic Abdominal Aortic Aneurysm
• Potential complication from interrupted blood supply to the spinal cord are life-threatening
  – Result in lower extremity weakness
  – Paralysis 6%-40%

• Lumbar Drain placed to monitor CSF pressure
  – Pressures > 15 considered elevated
  – Increase may be corrected by drainage of CSF

• Keep SBP > 120 and < 160. Keep MAP > 90
  – Use Neosynephrine to prevent hypotension
  – Avoid HTN, which may increase bleeding
    • No NTG or Nipride
• Monitor neurological signs Q1hour
  – Report any neuro change, weakness, tingling, pain, loss of sensation in lower extremities or buttocks, or is bowel incontinence develops
• Minimally invasive heart surgery
  – Performed on beating heart
  – Referred to as MIDCAB (minimally invasive direct coronary artery bypass) or OPCAB (off-pump CABG)
  – Smaller incision
  – Faster recovery time
  – Use of heart-lung machine avoided
  – Decreased procedure costs
  – Reduced morbidity and mortality
• Which Patient?
  – High risk elderly
  – At risk for stroke
  – PVD
  – Renal disease
  – Poor lung function
  – Disease of LAD
• Complications:
  – MIDCAB
    • Restenosis – incidence decreasing with experience
    • Rib fracture
    • Pericarditis
    • Conversion to standard sternotomy
    • SVT arrhythmias and ST segment elevation may develop
  – OPCAB
    • Conversion to cardiopulmonary bypass for completion of anastomosis
    • Additional surgery to control bleeding r/t use of both internal mammary arteries
    • Cerebral complications and atrial fibrillation
Transcathether & Transapical Aortic Valve Replacement

• AVR is the most common valve operation
• Most performed to treat aortic stenosis
  – Affects from 2% - 7% of people > 65 yrs. Of age in the US
  – On-pump AVR has low risk with marked benefits with mortality <1% at larger, experienced centers
  – Less invasive techniques needed for higher risk pts. Such as the elderly with comorbidities
    • Lower complications: no cross-clamping of aorta risking stroke in pts. With severe aortic atherosclerosis or calcification
    • Off pump decreases bleeding, elevation of creatinine and impaired lung function
Transcatheter & transapical AVR

• In clinical trials
• Indications:
  – High risk pts. ( > 20% mortality)
  – Severe, symptomatic AS
  – Severe, ascending aortic calcification that prevents aortic cannulation or cross-clamping
  – Severe radiation damage to chest or other severe chest deformities that would preclude sternotomy
• Does not require removal of native valve
• Held in place by stent or frame
• Local or spinal anesthesia with sedation or general anesthesia in cath lab or OR equipped with fluoroscopy and TEE
• Two approaches for transcatheter AVR
  – Antegrade, transeptal
    • Access via femoral vein and pass catheter to right ventricle
    • Puncture septum
    • Technically difficult and can damage mitral valve
- Retrograde approach
  - Femoral artery accessed to reach aortic valve
  - Limitations:
    - Size of artery
    - Atherosclerotic material can be embolized from aorta into distal circulation
- Contrast medium used to verify position of catheter
- Rapid pacing (HR > 150-220/min) needed for Edwards valve to decrease C.O.
- Must be careful not to cover opening of coronary ostia
Transcatheter Valves

Balloon Aortic Valvuloplasty

- 2006 ACC/AHA guidelines recommend solely in adults as a bridge to surgery in pts. With AS who have unstable hemodynamic status and are at high risk but have significant co-morbidities.
• Transapical approach best
  – For pts. With tortuous or small femoral or iliac vessels
  – For pts. With severe PVD
  – For pts. With heavily calcified aorta
  – Quicker
• Access via a 5 to 8cm anterolateral left thoracotomy usually in the 6th ICS
• Pericardium opened and transapical stab incision made in left ventricle
• Balloon valvuloplasty performed to dilate native valve first
• High rate pacing done to decrease C.O.
• Complications
  – Vessel rupture
  – Dissection
  – Pseudoaneurysm
  – Bleeding and thrombus formation
  – Myocardial perforation
  – Cardiac tamponade
  – Embolization of calcified material
  – Perivalvular regurgitation
Surgical Procedures

• Maze Procedure
  – Indicated for pts. Who are intolerant of the arrhythmia, had failure of drug therapy, or had multiple embolic events
  – Incisions/lesions created in both atria and both atrial appendages removed
    • Theory is that A. fib results from multiple macro-reentry circuits
  – 98% successful
Candidates for procedure are:
- Have symptoms but medicines fail to control
- High risk for embolic events
- Atrial fibrillation longer than 6 mos. & have enlarged left atrium
- Already undergoing mitral valve or other cardiac surgery
Atrial appendages

- Blind pouches attached to each atria
- Contribute nothing to overall function
- In A. Fibrillation, because of no synchrony or uniform contraction of atrial muscle blood sits dormant in appendages
- Therefore, clots tend to occur and often progress and become larger
Cox-Maze III procedure

- Series of incision and cryolesions in right and left atria to interrupt multiple re-entrant circuits
- Treatment of LA includes isolation of pulmonary veins and excision of left atrial appendages
- “Gold standard” for surgical procedure of AF
Figure 1.
Valve sparing surgeries

Bentall Procedure

• Surgical procedure for:
  – Aortic dissection
  – Aneurysm of proximal ascending aorta

• Replacement of root and proximal ascending aorta with a tube graft containing a prosthetic valve and reimplantation of coronary arteries into the graft
Ross Procedure

- Patient’s diseased aortic valve is replaced with their own pulmonary valve
- Pulmonary valve replaced with cadaver pulmonary valve
- Anticoagulation not required
• Diseased aortic valve and proximal tissue removed
• Leaves right & left coronary arteries with only a button of tissue
- Pulmonary autograft placed in aortic position
- Buttons on right & left coronary arteries sewn into pulmonary segment
- Cadaver pulmonary valve & artery homograft placed in pulmonary position
CABG with EVH

• Now surgeons make small one-inch long incisions in the patient’s leg to use for grafts
• Results in less tissue damage and less pain
Left Ventricular Assist Device

- Profound failure
  - Mean blood pressure < 60 mmHg,
    Systolic blood pressure < 90 mmHg,
    Cardiac index < 2.0 L/min/m²
- Temporary replacement of
  pumping function of the left
  ventricle
- Blood diverted from LA and LV to
  the LVAD
- Blood returned to the aorta
- Continuous flow vs. pulsatile flow
- Portability