

8th Annual BHHI Cardiovascular
Symposium for the Primary Care
Provider
Feb 28, 2020
Little Rock, Arkansas

Heart Surgery 101

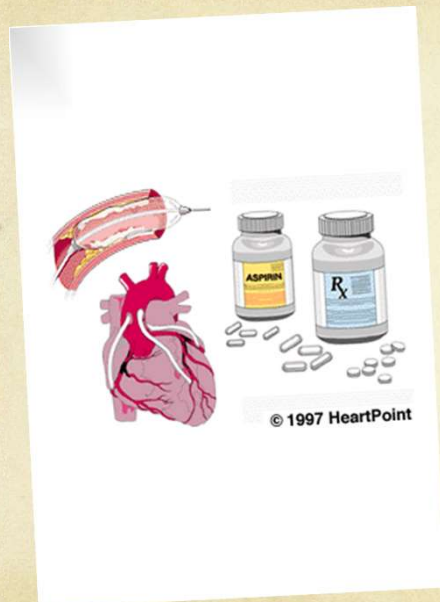
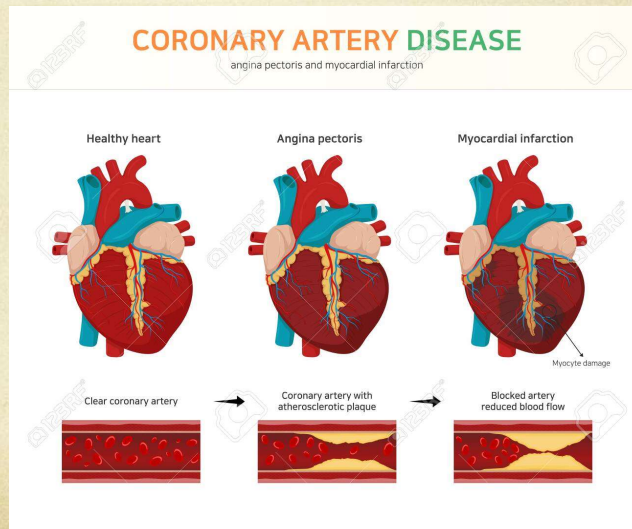
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Cardiothoracic Surgeon

General Topics

- Coronary artery disease
- Aortic valve disease
- Mitral valve disease
- Aortic disease
- Heart failure



Coronary Artery Disease



Treatment Options?

Medical therapy

- anti-anginal
- anti-thrombotic
- lifestyle modification

Percutaneous revascularization

- angioplasty
- stent

Surgical Revascularization

- CABG

CAD - One Vessel Disease

TABLE 1.1 One-Vessel Disease

Appropriate Use Score (1-9)

One-Vessel Disease

Indication	Asymptomatic		Ischemic Symptoms					
	Not on AA Therapy or With AA Therapy		Not on AA Therapy		On 1 AA Drug (BB Preferred)		On ≥2 AA Drugs	
	PCI	CABG	PCI	CABG	PCI	CABG	PCI	CABG
No Proximal LAD or Proximal Left Dominant LCK Involvement								
1. ■ Low-risk findings on noninvasive testing	R (2)	R (1)	R (3)	R (2)	M (4)	R (3)	A (7)	M (5)
2. ■ Intermediate- or high-risk findings on noninvasive testing	M (4)	R (3)	M (5)	M (4)	M (6)	M (4)	A (8)	M (6)
3. ■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80*	M (4)	R (2)	M (5)	R (3)	M (6)	M (4)	A (8)	M (6)
Proximal LAD or Proximal Left Dominant LCK Involvement Present								
4. ■ Low-risk findings on noninvasive testing	M (4)	R (3)	M (4)	M (4)	M (5)	M (5)	A (7)	A (7)
5. ■ Intermediate- or high-risk findings on noninvasive testing	M (5)	M (5)	M (6)	M (6)	A (7)	A (7)	A (8)	A (8)
6. ■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80	M (5)	M (5)	M (6)	M (6)	M (6)	M (6)	A (8)	A (7)

The number in parentheses next to the rating reflects the median score for that indication. *Substitution of a newer coronary pressure ratio that does not require hyperemia for FFR may be considered provided the appropriate reference values are used.

A indicates appropriate; AA, antianginal; BB, beta blockers; CABG, coronary artery bypass graft; FFR, fractional flow reserve; LAD, left anterior descending coronary artery; LCK, left circumflex artery; M, may be appropriate; PCI, percutaneous coronary intervention; and R, rarely appropriate.

CAD - Two Vessel Disease

TABLE 1.2 Two-Vessel Disease

Appropriate Use Score (1-9)

Two-Vessel Disease

Indication	Asymptomatic		Ischemic Symptoms					
	Not on AA Therapy or With AA Therapy		Not on AA Therapy		On 1 AA Drug (BB Preferred)		On ≥2 AA Drugs	
	PCI	CABG	PCI	CABG	PCI	CABG	PCI	CABG
No Proximal LAD Involvement								
7. ■ Low-risk findings on noninvasive testing	R (3)	R (2)	M (4)	R (3)	M (5)	M (4)	A (7)	M (6)
8. ■ Intermediate- or high-risk findings on noninvasive testing	M (5)	M (4)	M (6)	M (5)	A (7)	M (6)	A (8)	A (7)
9. ■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80* in both vessels	M (5)	M (4)	M (6)	M (4)	A (7)	M (5)	A (8)	A (7)
Proximal LAD Involvement and No Diabetes Present								
10. ■ Low-risk findings on noninvasive testing	M (4)	M (4)	M (5)	M (5)	M (6)	M (6)	A (7)	A (7)
11. ■ Intermediate- or high-risk findings on noninvasive testing	M (6)	M (6)	A (7)	A (7)	A (7)	A (7)	A (8)	A (8)
12. ■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80 in both vessels	M (6)	M (6)	M (6)	M (6)	A (7)	A (7)	A (8)	A (8)
Proximal LAD Involvement With Diabetes Present								
13. ■ Low-risk findings on noninvasive testing	M (4)	M (5)	M (4)	M (6)	M (6)	A (7)	A (7)	A (8)
14. ■ Intermediate- or high-risk findings on noninvasive testing	M (5)	A (7)	M (6)	A (7)	A (7)	A (8)	A (8)	A (9)
15. ■ No stress test performed or, if performed, results are indeterminate ■ FFR ≤0.80 in both vessels*	M (5)	M (6)	M (6)	A (7)	A (7)	A (8)	A (7)	A (8)

The number in parentheses next to the rating reflects the median score for that indication. *Substitution of a newer coronary pressure ratio that does not require hyperemia for FFR may be considered provided the appropriate reference values are used.

A indicates appropriate; AA, antianginal; BB, beta blockers; CABG, coronary artery bypass graft; FFR, fractional flow reserve; LAD, left anterior descending coronary artery; M, may be appropriate; PCI, percutaneous coronary intervention; and R, rarely appropriate.

CAD - Three Vessel Disease

TABLE 1.3 Three-Vessel Disease

Appropriate Use Score (1-9)

Three-Vessel Disease

Indication	Asymptomatic				Ischemic Symptoms			
	Not on AA Therapy or With AA Therapy		Not on AA Therapy		On 1 AA Drug (BB Preferred)		On ≥2 AA Drugs	
	PCI	CABG	PCI	CABG	PCI	CABG	PCI	CABG
Low Disease Complexity (e.g., Focal Stenoses, SYNTAX ≤22)								
16. ■ Low-risk findings on noninvasive testing ■ No diabetes	M (4)	M (5)	M (5)	M (5)	M (6)	M (6)	A (7)	A (7)
17. ■ Intermediate- or high-risk findings on noninvasive testing ■ No diabetes	M (6)	A (7)	A (7)	A (7)	A (7)	A (8)	A (8)	A (8)
18. ■ Low-risk findings on noninvasive testing ■ Diabetes present	M (4)	M (6)	M (5)	M (6)	M (6)	A (7)	A (7)	A (8)
19. ■ Intermediate- or high-risk findings on noninvasive testing ■ Diabetes present	M (6)	A (7)	M (6)	A (8)	A (7)	A (8)	A (7)	A (9)
Intermediate or High Disease Complexity (e.g., Multiple Features of Complexity as Noted Previously, SYNTAX >22)								
20. ■ Low-risk findings on noninvasive testing ■ No diabetes	M (4)	M (6)	M (4)	A (7)	M (5)	A (7)	M (6)	A (8)
21. ■ Intermediate- or high-risk findings on noninvasive testing ■ No diabetes	M (5)	A (7)	M (6)	A (7)	M (6)	A (8)	M (6)	A (9)
22. ■ Low-risk findings on noninvasive testing ■ Diabetes present	M (4)	A (7)	M (4)	A (7)	M (5)	A (8)	M (6)	A (9)
23. ■ Intermediate- or high-risk findings on noninvasive testing ■ Diabetes present	M (4)	A (8)	M (5)	A (8)	M (5)	A (8)	M (6)	A (9)

The number in parentheses next to the rating reflects the median score for that indication.

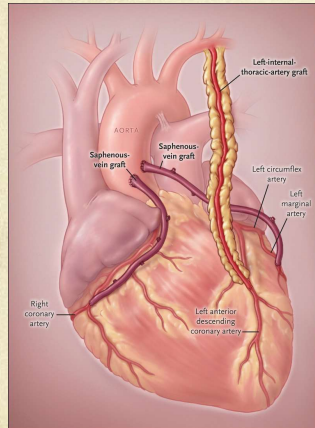
A indicates appropriate; AA, antianginal; BB, beta blockers; CABG, coronary artery bypass graft; M, may be appropriate; PCI, percutaneous coronary intervention; and SYNTAX, Synergy between PCI with Taxus and Cardiac Surgery trial.

Surgical Approach for CABG Many Options...maybe too many!

- On-pump vs. Off-pump
- All arterial vs. artery/vein
- Single vs. Bilateral IMA
- Beating heart pump assist
- Mid-CABG
- Robotic CABG
- etc., etc....

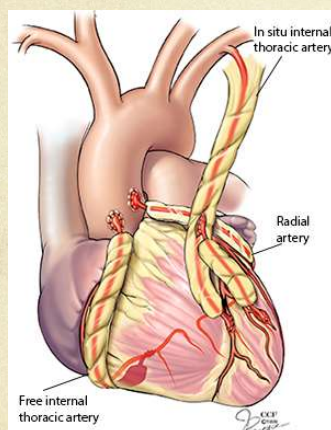


Blue plate special...



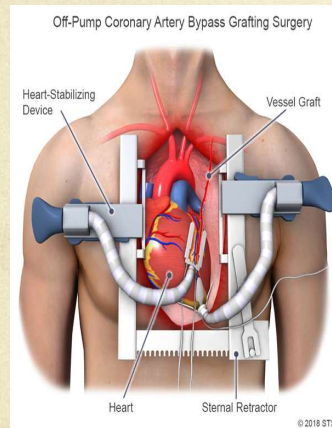
- 3-vessel CABG with in-situ LIMA to LAD and SVG to RCA and OM
- Superior to medical management and PCI
 - Multi-vessel
 - Diabetics
 - Low EF
 - Anti-platelet intolerance

Total Arterial CABG



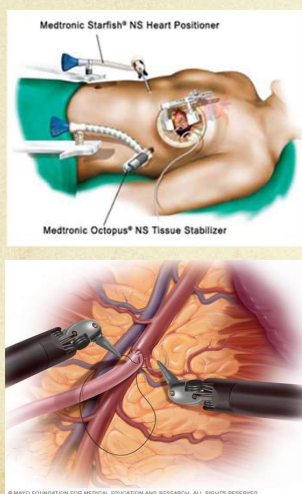
- Use of arterial conduits for all bypass grafts
 - Radial artery
 - RIMA/LIMA
 - Gastroepiploic
- Superior long-term (7-10 yr) survival in selected populations

Off-Pump CABG (OP-CAB)



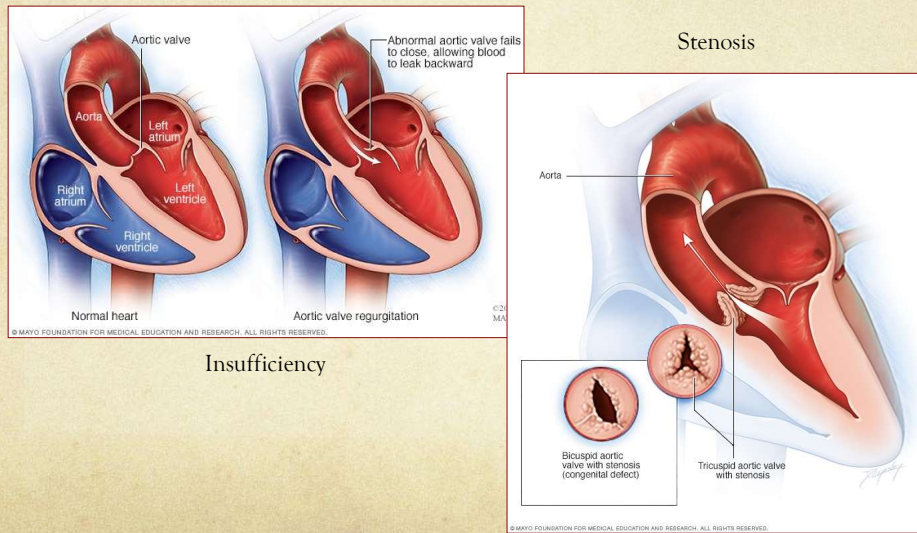
- CABG without use of the heart-lung machine (CPB)
- Potential benefit in certain patient populations:
 - Renal failure
 - Advanced lung disease
 - Calcified aorta
- No studies have definitively demonstrated clear benefit over on-pump CABG in general population

Minimally Invasive CABG

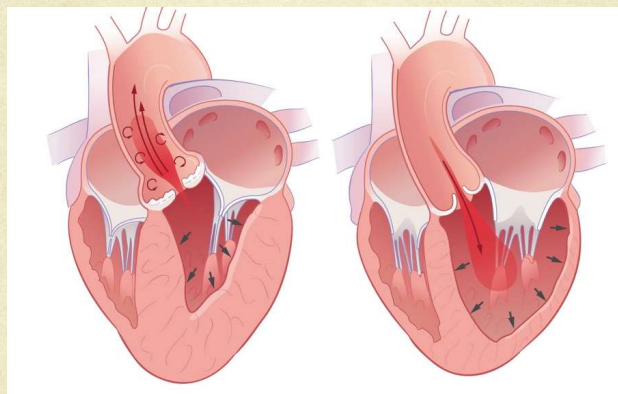


- Mini-left thoracotomy vs. total endoscopic LIMA to LAD
 - +/- robotic LIMA harvest
 - +/- robotic LIMA to LAD anastomosis
- Potential benefit in certain patient populations where sternotomy is not tolerable
- Often performed as part of hybrid approach with PCI of other vessels

Aortic Valve Disease

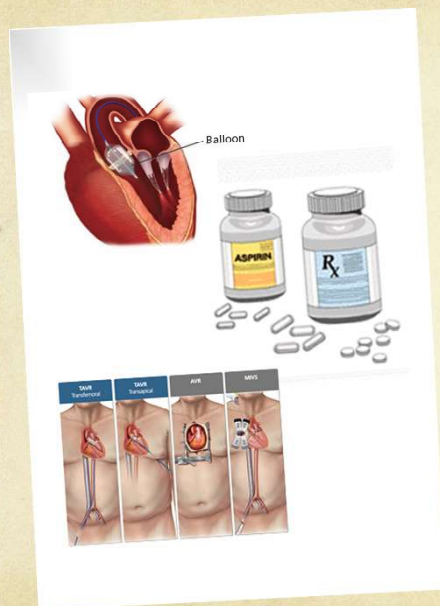


Aortic Valve Disease



Concentric
Remodeling

Eccentric
Remodeling



Treatment Options?

Medical therapy depending on pathology

Diuretics

Afterload reduction

Percutaneous valve therapy
(aortic stenosis ONLY)

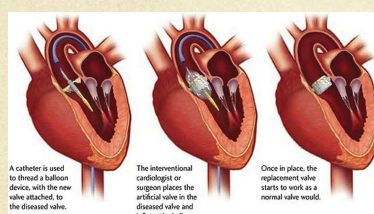
Balloon valvuloplasty

Transcatheter AVR (TAVR)

Surgical Valve Therapy

Aortic valve replacement

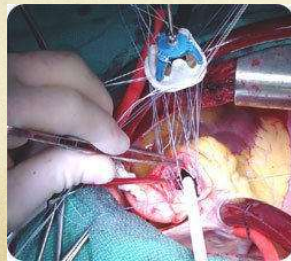
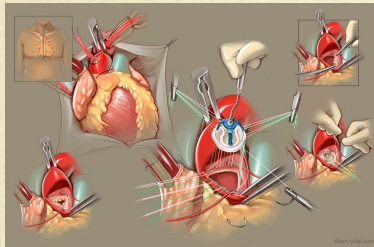
Transcatheter AVR (TAVR)



Balloon-expandable devices			
Sapien XT	Sapien 3		
Self-expanding devices			
Evoque II	Acurate Neo	Portico	Allegro
Mechanically-expandable devices			
Lotus			

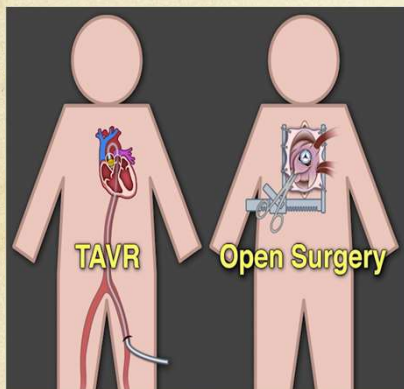
- Percutaneous approach via 14F sheath
- Indicated and approved for aortic stenosis and prosthetic valve failure across low – high risk categories
- Several expansion mechanisms
 - Balloon expandable
 - Self-expanding (nitinol)
 - Mechanically expandable

Surgical AVR



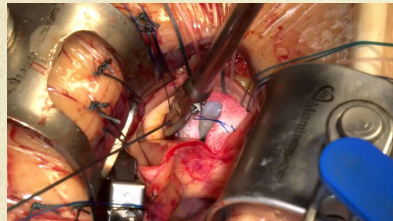
- Sternotomy approach
- Cardiopulmonary bypass and cardiac arrest
- Resection of native valve via aortotomy
- Placement of prosthetic valve
 - Mechanical vs Bioprosthetic
 - Mechanical favored in younger patients <50 yrs
 - Bioprosthetic favored in older patients >60 yrs or those intolerant of anticoagulation

TAVR vs. Surgery



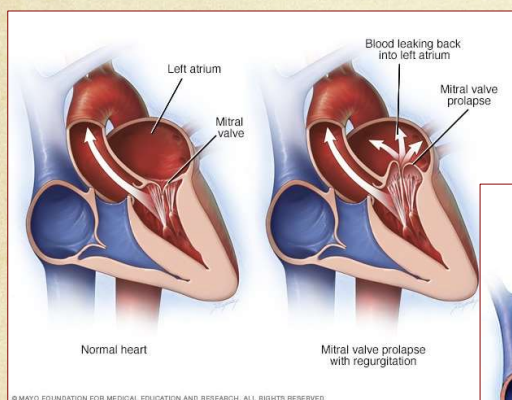
- Heart-team based decision with multi-disciplinary input
 - Cardiology
 - Cardiac surgery
 - Palliative care
- Significant improvement in outcomes with modern generation devices
 - Mortality
 - Stroke
 - Pacemaker
- Outcome comparable to SAVR for low risk patients...however TAVR is favored for
 - Older
 - Prior cardiac surgery
 - Multiple co-morbidities
 - Not requiring concomitant coronary revascularization
 - Not likely to need another valve replacement in their lifetime

Minimally Invasive Surgical AVR



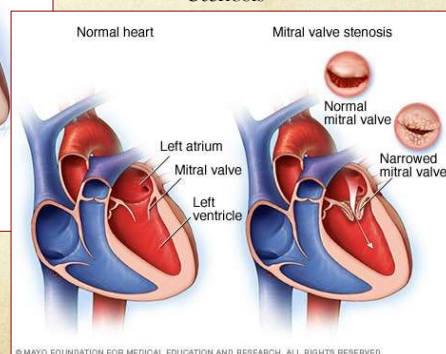
- Right mini-thoracotomy access (Miami Method)
- Femoral cardiopulmonary bypass with cardiac arrest
- Standard valve replacement technique
- Limited to those with primary valve disease without co-existing coronary or other valve lesions

Mitral Valve Disease

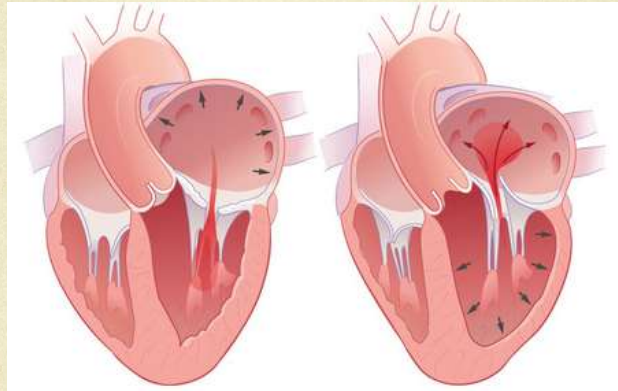


Insufficiency

Stenosis



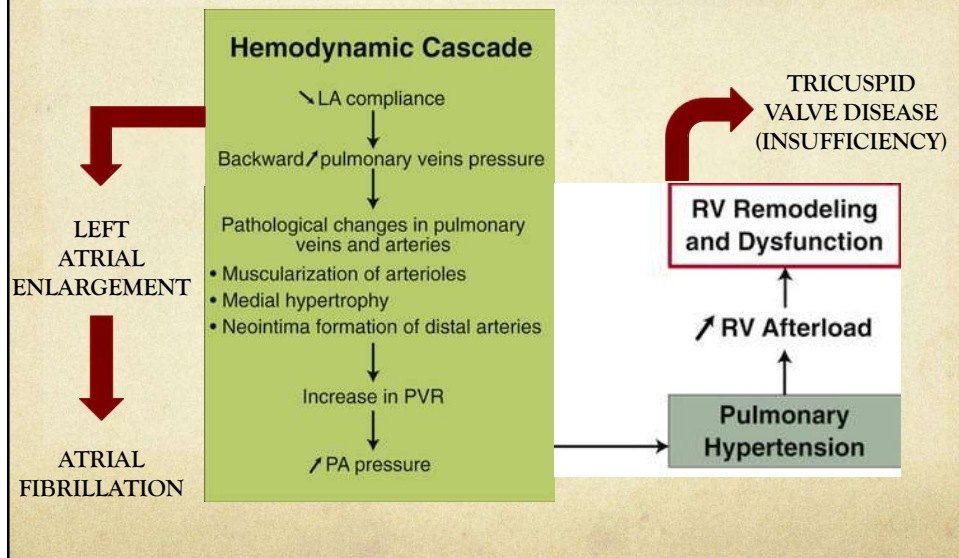
Mitral Valve Disease



LA Pressure
Overload

LA/LV Volume
Overload

Mitral Valve Disease



Treatment Options?

Medical therapy depending on pathology

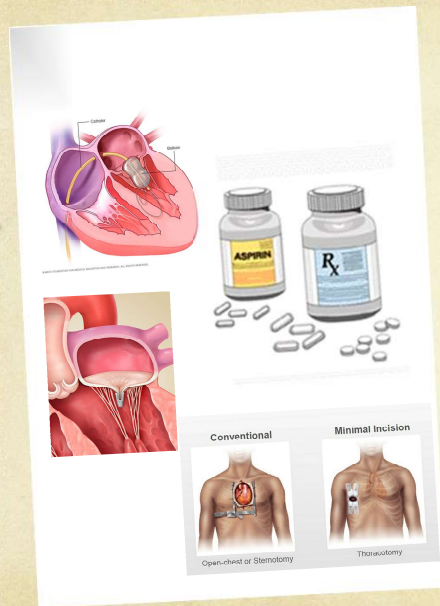
- Diuretics
- Afterload reduction

Percutaneous valve therapy

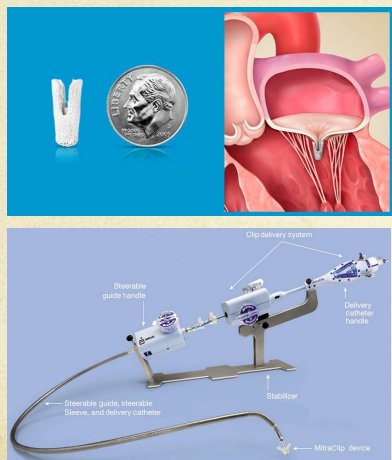
- Balloon valvuloplasty
- Mitra-Clip

Surgical Valve Therapy

- Mitral valve repair
- Mitral valve replacement
- Tricuspid valve repair
- Maze Procedure

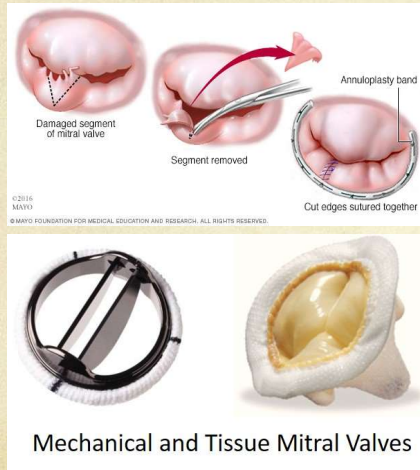


Transcatheter – MitraClip



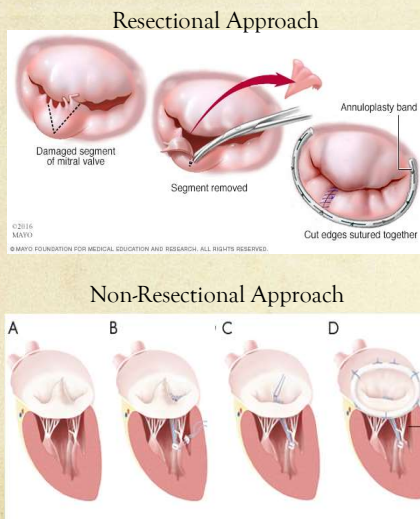
- Percutaneous approach via right femoral vein
- Trans-septal puncture for access to left atrium and MV
- Approved for degenerative (i.e. prolapse) and functional (i.e. heart failure) etiologies
 - moderate to severe or severe mitral regurgitation
 - prohibitive surgical risk for mitral surgery
- Two sizes... NT and larger XT
- Typically 1 – 2 clips to achieve a 2+ to 3+ reduction in MR grade

Mitral Valve Surgery



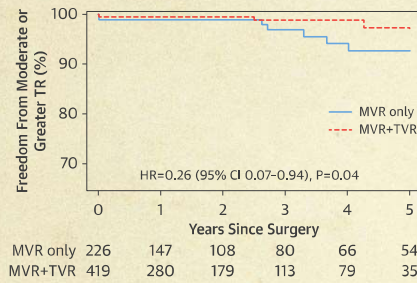
- Degenerative disease (i.e prolapse, chordal rupture, annular dilatation) typically treated with valve REPAIR
- Stenotic disease (i.e. rheumatic) typically treated with REPLACEMENT
- Infection (endocarditis) typically treated with REPAIR if feasible but most commonly REPLACEMENT
- Placement of prosthetic valve
 - Mechanical vs Bioprosthetic
 - Mechanical favored in younger patients <60 yrs
 - Bioprosthetic favored in older patients >60 yrs or those intolerant of anticoagulation

Mitral Valve Repair



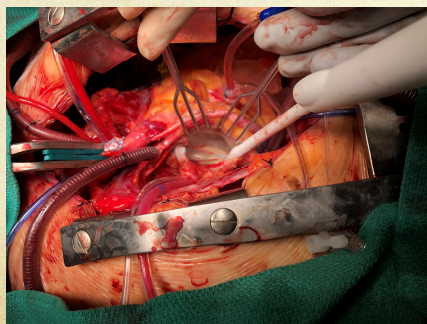
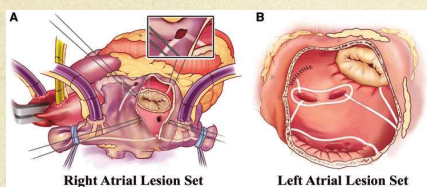
- Right brain activity...
 - requires some creativity, intuition, and 3D/spatial awareness
- Also requires experience to anticipate a high (>90%) repair rate
- There are lots of techniques, but most rely on:
 - annular remodeling with ring or band annuloplasty
 - recreation of normal leaflet movement, coaptation zone, and dimensions
 - re-creation of chordal support

Tricuspid Valve Repair



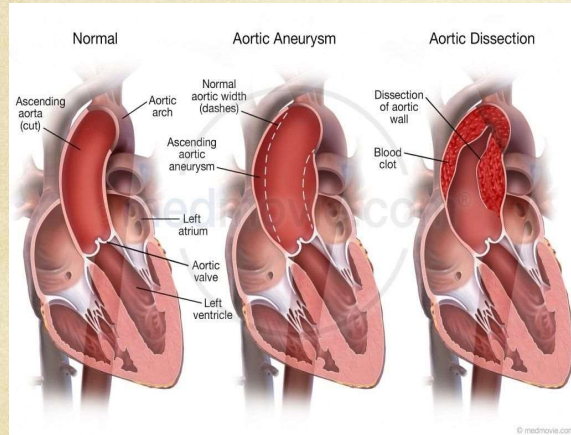
- Current American and European guidelines support tricuspid valve repair if there is annular dilatation(> 40 mm) regardless of severity of regurgitation
- Chikwe et. al. JACC 2015;65:1931-38
- Typical treatment is concomitant tricuspid ring annuloplasty at time of mitral repair or replacement

Maze for Atrial Fibrillation



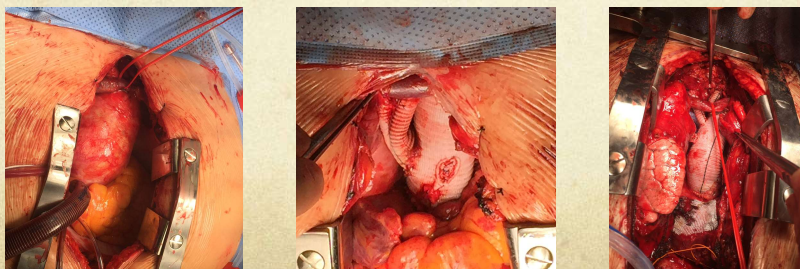
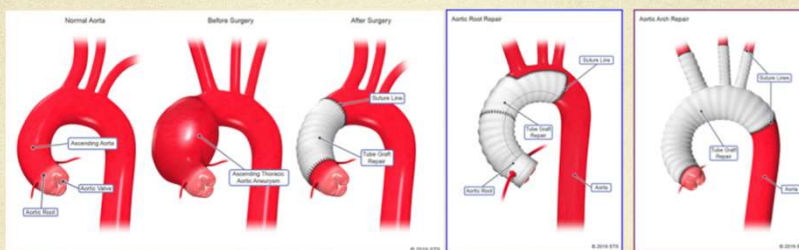
- Left atrial or bi-atrial Cox-Maze IV lesion sets may be performed at the time of mitral valve surgery for patients with atrial fibrillation to restore sinus rhythm
 - cryo- or radiofrequency ablation energy source
 - left atrial appendage ligation
- Consideration may also be given to patients at high risk for developing AF
 - large left atrium
 - long standing MV disease

Aortic Disease



- Indication for repair based upon size, presence of other risk factors, and surgical risk
 - connective tissue disorder
 - family history
 - recent growth
- Typical indication for considering surgery:
 - >5 cm in transverse diameter

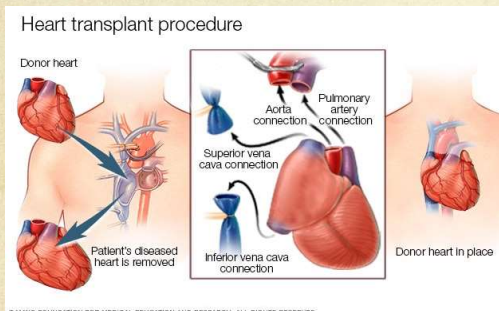
Aortic Aneurysm Repair



Surgery for Heart Failure

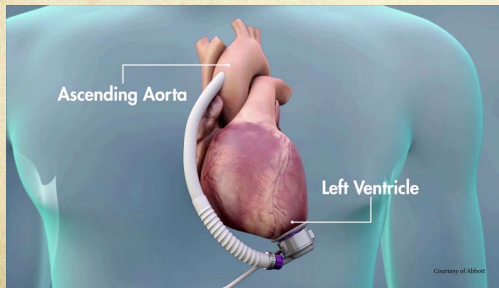


Heart Transplant



- "Gold Standard" for chronic heart failure
- Limited by organ availability
 - approx. 2500 organs/yr
- Strict selection criteria
 - <65 years old
 - strong social support
 - non-obese, non-smoking
 - normal kidney function

Left Ventricular Assist Device (LVAD)



- Survival now approaching that of heart transplant with modern device technology
 - mag-lev technology
 - large blood paths for improved hemocompatibility
 - smaller footprint with intrapericardial placement
- Limited by device expense, need for extensive follow up care, and insurance access
 - 80-90K per device
 - not covered by AR Medicaid
- Less strict selection criteria compared to transplant
 - can consider older patients
 - bridge to candidacy for heart transplant

