State of the Heart: Current therapy for Mitral valve insufficiency

Emmanuel Daon, MD
Normal Mitral Valve
Diseased Mitral Valve

Annulus Deformation in Mitral Valve Insufficiency
1-Year Mortality Up To 57%
History of Mitral Valve Repair

1968 – Carpentier introduced first rigid prosthetic annuloplasty ring

– Carpentier developed valvuloplasty techniques that are considered state of the art for mitral valve repair

– These techniques have made the procedure reproducible and predictable
Leaflet Resection

- Indicated for ruptured chordae and areas of leaflet calcification or healed infective lesions
- Anterior leaflet, triangular shape and involve no more than 1/5 of free edge
- Posterior leaflet, rectangular shape up to 1/3 of total length
Reconstruction of Ruptured Chordae

- Artificial chordae (Dacron, Teflon, pericardium, etc.) stiffen and calcify causing stenosis or regurgitation

- “Chordal transposition” involves transposing posterior leaflet chordae to replace ruptured anterior leaflet chordae
Ring Annuloplasty

- Corrects the dilatation of the annulus
- Increases leaflet coaptation
- Supports the leaflet repair
- Prevents future annular dilatation
Ring Annuloplasty

- The last step in a valvuloplasty
- Returns annulus to normal size/shape; stabilizes repairs (leaflet/annular resection)
- Two sutures placed at commissures, 4 additional through anterior annulus, 5 - 7 posterior annulus
- Match position and distance of sutures in annulus and ring
- Remodeling of annulus is fixed and avoids recurrent dilation
Test Valve Competence

• Using bulb syringe, check valve competency after removal of implant holder
“Minimally invasive [valve] surgery is a lot like operating with knitting needles on the last potato chip at the bottom of a Pringles can.”
da Vinci™ Provides True 3-D Vision

InSite™ 3-D Vision System

- Superior 3-D image
- Stereoscopic design with two 3-chip cameras
- 75% better resolution than any imaging system

‘Open’ surgery orientation
EndoWrist™ Instruments

- Modeled after the human wrist
- 6 Degrees of freedom
- Natural control without buttons or knobs
- Surgical hand movements are transposed to the instrument tips
The da Vinci Surgical System
Port Access MV repair
Mitral Valve Repair

• 112 Case Multicenter Clinical Study

• 10 Study Centers
  - East Carolina University, NC
  - Baylor Healthcare, Dallas
  - NY Columbia Presbyterian, NYC
  - Brigham & Women’s, Boston
  - University of Southern California Medical Center, L.A.
  - Advocate Christ Chicago, IL
  - Ohio State Medical Center, OH
  - Providence St. Vincent’s Hospital, Portland, OR
  - Inova Fairfax Hospital, VA
  - Carilion Hospital, Roanoke, VA

• Study Overview
  - Reduce MR Grade 3 / 4 To MR Grade 1 Or Less
  - Posterior Leaflet Repair

• Study Submitted To FDA
  - Submission July 31st
Lateral Endoscopic Robotic Cardiac Approach

- Aortic Occlusion and Cardioplegia
- Peripheral CPB
- TEE Expertise
- Anesthesia Skills
- Patient Referrals
- Cardiac Surgery Techniques
- Robotic Console Skills
- Patient-Side Assistant Skills
- OR Equipment and set up
- Robot Troubleshooter
- Committed OR Staffing
- Da Vinci Robot
Endoscopic Robotic Cardiac Approach

Conventional Median Sternotomy Approach

Endoscopic Robotic Cardiac Approach
Goals:

- To not repeat dead ends
- Accelerate the evolution of the technique
“Next, an example of the very same procedure when done correctly.”
Nifong, Chitwood, Starnes, et al 2005
Multicenter prospective phase II trial
112 pts
92% no or trace MR at 1 month
No deaths
6 reops (5.4%), 11 MAE (bleeding, peric effusion)
RESULTS

- Cheng, G. Fontana, A. Trento 2010
- 74(std)+46 (Si) repairs
- Neochords, quad rsxn, transpo, Alfieri
- 0.8 mortality
- No or mild residual MR in 89%
- All MR complications in first 74 pts
What does this mean for our patients?

- Same result
- Less pain
- Less risk of complications
- Less disfiguring
- Shorter recovery period
- Earlier return to “normal life”
What does it mean for us?

- More complicated
- More expensive
- More learning
- Pain is shifting (from the patient to the surgeon and hospital).
A Cost-Effective Approach to Robotic Mitral Valve Repair
Casey P. Hertzenberg, MD, Maureen McKiernan, MD, Emmanuel Daon, MD

- **Objective**: Robotic mitral valve repair (rMVR) has been previously criticized for its increased costs and questionable reduction in hospital length of stay. We aim to evaluate our cost-effective technique of robotic mitral valve repair and compare its overall hospital cost and length of stay to traditional open mitral valve repair (tMVR).

- **Methods**: All patients who underwent isolated mitral valve repair at the University of Kansas Hospital in 2013 and 2014 were identified. Forty-six patients underwent rMVR performed by one surgeon and eighteen patients underwent isolated tMVR with no other major. Data analyzed included total hospital cost and length of stay.

- **Results**: Hospital length of stay was reduced to 5.88 days in the rMVR compared to 7.87 days in tMVR leading to an average cost-savings of $11,727 per patient.

- **Conclusion**: Our technique for robotic mitral valve repair leads to further cost savings in addition to a reduction in hospital length. It appears to be a safe and more cost-effective approach than traditional open mitral valve repair.
YES!!! Cost reduction!

- KU Hospital data
- 2013-2014
- $11,000 cost reduction per patient compared to open mitral valve repair
Patient #1: Dr. Mc Dreamy

- 45 year old male
- Works out 4 times per week
- (running, swimming)
- No past med history, no meds except for baby aspirin daily
- Non smoker
- No previous operation
Doc, when I push it, my heart feels like it’s pounding in there..

Wasn’t like that even 3 months ago

No other symptoms
Loud holosystolic murmur
CT: Normal coronaries
Echo: severe mitral insufficiency with prolapse P2 and large anteriorly direct jet
EF normal, heart chambers normal size
Risk vs Benefit and obtaining consent

"It's simple. My nurse blindfolds me, I spin around a few times, and then I try to reattach your tail."
Next Patient: Grampa Virgil

- 84 year old male
- Lives by himself and visits his 83 year old wife every day at nursing home
- Pretty active, drives, cooks
- Last few months with progressive dyspnea
- Has murmur
Cardiology consultation

- Cardiology visit reveals severe mitral insufficiency
- Treated with medication for 6 months, without any improvement of symptoms
- Now has some ankle edema
- Well he’s no spring chicken, but “looks good for his age”
I forgot to mention….

- Coronary artery bypass x 4 in 1999
- Aortic valve replacement with a tissue valve in 2005
- COPD (FEV 1=40%)
- Creatinine 1.9 baseline
- Stroke 2 years ago with almost no residual deficit after prolonged rehab
WHAT NOW ????
“I’m stumped. We’ll have to wait for the autopsy.”
EDGE TO EDGE

THE UNIVERSITY OF KANSAS HOSPITAL
PURPOSE OF MITRACLIP

• Correct leaflet redundancy
• Force coaptation
• Restrict leaflet motion
• Prevent SAM
WHO IS A GOOD CANDIDATE??

- History and physical exam
- TEE
- Coronary angiogram
GENERALIZATIONS

• Symptomatic MR
• Adequate treatment for CHF
• Not candidate for surgical correction
• Transeptal and femoral vein access
COAPT INCLUSION CRITERIA

• Candidates must meet all of the following criteria:
  • Symptomatic functional MR (≥3+) of either ischemic or nonischemic etiology
  • Adequately treated per applicable standards in the judgment of the heart failure specialist investigator
  • Not a suitable candidate for open mitral valve surgery in the judgment of the CT surgeon investigator
  • NYHA functional class II, III, or ambulatory IV
COAPT INCLUSION CRITERIA

• At least 1 hospitalization for heart failure in the 12 months prior to enrollment and/or BNP = 400 pg/mL
• NT-proBNP = 1600 pg/mL measured within 90 days prior to enrollment
• Primary regurgitant jet from the A2 and P2 scallops (and if secondary jet exists, is clinically insignificant)
• Transseptal catheterization and femoral vein access is feasible
Percutaneous Repair or Surgery for Mitral Regurgitation

Ted Feldman, M.D., Elyse Foster, M.D., Don Glower, M.D., Saibal Kar, M.D., Michael J. Rinaldi, M.D., Peter S. Fail, M.D., Richard W. Smalling, M.D., Ph.D., Robert Siegel, M.D., Geoffrey A. Rose, M.D., Eric Engeron, M.D., Catalin Loghin, M.D., Alfredo Trento, M.D., Eric R. Skipper, M.D., Tommy Fudge, M.D., George V. Letsou, M.D., Joseph M. Massaro, Ph.D., and Laura Mauri, M.D., M.Sc., for the EVEREST II Investigators*

www.nejm.org
Mitral Regurgitation Grade
Baseline, 1 and 2 Years (matched)
Intention to Treat

* Within group difference (p<0.05)
LV Volumes
Baseline, 1 and 2 Years (matched)
Intention to Treat

* Within group difference (p<0.05)
† Between group difference at 1 year (p<0.05)
‡ Between group difference at 2 year (p<0.05)

LV End Diastolic Volume

LV End Systolic Volume

LVEDV (mL)
BL 1 Yr 2 Yrs BL 1 Yr 2 Yrs
Percutaneous N=117 Surgery N=55

LVESV (mL)
BL 1 Yr 2 Yrs BL 1 Yr 2 Yrs
Percutaneous N=117 Surgery N=55

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NYHA Functional Class
At Baseline, 1 and 2 Years (matched)
Intention to Treat

* Within group difference (p<0.05)
† Between group difference at 1 year (p<0.05)
‡ Between group difference at 2 year (p<0.05)

Percutaneous

Baseline (N=127) 1 Year (N=127) 2 Years (N=127)

Surgery

Baseline (N=56) 1 Year (N=56) 2 Years (N=56)

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Who is NOT a good candidate??

- Mitral valve stenosis
- Not a candidate for general anesthesia
COAPT EXCLUSION CRITERIA

• Severe LV dysfunction
• Acute MI within 30 days prior to enrollment
• Untreated clinically significant CAD requiring revascularization, or tricuspid or aortic valve disease requiring surgery
• Cerebrovascular accident within 6 months, modified Rankin Scale ≥4 disability, or severe symptomatic carotid stenosis (>70% by ultrasound)
• ACC/AHA Stage D heart failure
COAPT EXCLUSION CRITERIA

- Severe RV failure or tricuspid regurgitation
- PCI or carotid surgery within 30 days prior to randomization
- Any cardiac surgery within 6 months prior to randomization
- CRM device implanted or revised within last 90 days
- Mitral valve orifice area < 4.0 cm², vertical coaptation length < 2 mm, or leaflet anatomy that might preclude MitraClip implantation
COAPT EXCLUSION CRITERIA

• Life expectancy <12 months due to noncardiac conditions
• Hemodynamic instability requiring inotropic support or other hemodynamic support device
• Need for emergent or urgent surgery for any reason or any planned cardiac surgery within next 12 months
• Prior mitral valve leaflet surgery or any currently implanted prosthetic mitral valve, or any prior transcatheter mitral valve procedure