CARDIOLOGY GRAND ROUNDS

Presentation: Mitral Disease

Speakers: Robert S. Farivar, MD, PhD
Chief, Cardiothoracic Surgery, Abbott Northwestern Hospital
Chairman, Allina Cardiothoracic; Minneapolis Heart Institute® at Abbott Northwestern Hospital

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Director of the Center for Valve and Structural Heart Disease
Minneapolis Heart Institute® at Abbott Northwestern Hospital

Date: Monday, April 20, 2015, 7:00 – 8:00 AM

Location: ANW Education Building, Watson Room

OBJECTIVES
At the completion of this activity, the participants should be able to:
1. Recognize various quality metrics for mitral disease
2. Identify various minimally invasive incisions.
3. Identify what cases may be appropriate for referral for mitraclip.

ACCREDITATION
Physicians: This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of Allina Health and Minneapolis Heart Institute Foundation. Allina Health is accredited by the ACCME to provide continuing medical education for physicians.

Allina Health designates this live activity for a maximum of 1.0 AMA PRA Category 1 Credit™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Nurses: This activity has been designed to meet the Minnesota Board of Nursing continuing education requirements for 1.2 hours of credit. However, the nurse is responsible for determining whether this activity meets the requirements for acceptable continuing education.

Others: Individuals representing other professional disciplines may submit course materials to their respective professional associations for 1.0 hours of continuing education credit.

DISCLOSURE STATEMENTS
Speaker(s): Dr. Farivar declares the following relationship; Consultant: Edwards LifeSciences, LLC.
Dr. Sorraja declares the following relationships; Consultant & Speaker Bureau: Abbott Vascular; Consultant: Medtronic; Consultant: Lake Region Medical.

Planning Committee: Dr. Michael Miedema, and Eva Zewdie have declared that they do not have any conflicts of interest associated with the planning of this activity. Dr. Robert Schwartz declared the following relationships - stockholder: Cardiomind, Interface Biologics, Aritech, DSI/Transoma, InstyMeds, Intervalex, Medtronic, Osprey Medical, Stout Medical, Tricardia LLC, CoAptus Inc, Augustine Biomedical; scientific advisory board: Abbott Laboratories, Boston Scientific, MEDRAD Inc, Thomas, McNerney & Partners, Cardiomind, Interface Biologics; options: BackBeat Medical, BioHeart, CHF Solutions; speakers bureau: Vital Images; consultant: Edwards LifeSciences.
Mitral Regurgitation

Paul Sorajja, MD
Director, Center for Valve and Structural Heart Disease
Minneapolis Heart Institute at Abbott Northwestern Hospital

Robert S. Farivar, MD PhD
Chairman, Cardiac Surgery
Minneapolis Heart Institute at Abbott Northwestern Hospital
Chair, Allina Health Cardiac Surgical Services

62 year-old man, asymptomatic

a) Observe
b) Mitral valve replacement
c) Mitral valve repair
d) Transcatheter MitraClip
Key Points

- Highly prevalent disease that is under-treated
  *Excess mortality from treatment delays*

- Success of mini-MV repair is >90% with risk of <1% and minimal LOS

- MitraClip indicated for high-risk patients
  *Success >90% in selected patients*

Prevalence of Mitral Regurgitation

Age-dependent


6% for ≥65 year olds
**Classification of MR**

**Primary**

“The Valve”

- Usually myxomatous

**Secondary**

“The Ventricle”

- Ischemic or not

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**Key Prognostic Determinants**

- Severity
- Left Ventricular Function
- Symptoms
Asymptomatic Primary MR
Severity and Survival

Worse Survival

More CV Events

EF and Surgical Outcome

EF <60% is Abnormal in MR
LV Function in MR
Myocardial performance

EF usually drops after surgery

Symptoms and Surgery
Outcome with Primary MR

Survival %

Years

NYHA I-II
NYHA III-IV

90 ±2
76 ±5
73 ±3
48 ±4

P<0.0001

Tribouilley CM et al., Circulation 1999;99:400-5
**Flail Mitral Leaflet**

**Natural History**


- Survival %
  - 0 1 2 3 4 5 6 7 8 9 10
  - Years After Diagnosis

- Class I or II Mortality 4% per year
- Class III or IV 34% per year

- $P < 0.001$

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**Secondary Mitral Regurgitation**

**A Ventricular Problem**


- Ischemic MR

- Regional or Global Dysfunction
  - Papillary muscle displacement
  - Annular flattening
  - Leaflet tethering
MR and Heart Failure
Prevalence in CHF

Moderate or severe MR present in ~40%

~4 million people with heart failure and MR in U.S.


Secondary Mitral Regurgitation
A Harbinger of Poor Outcome

Two-fold Increase Risk of Death

Basket JF, et al. Can J Cardiol 2007;23:797-800
Mitral Regurgitation

What about therapy?

General Principles of Therapy

Primary
- No medical option
- Surgery for symptoms or LV dysfunction
- Try to repair
- Consider prophylactic repair

Secondary
- Medical therapy first
- Consider CRT
- Surgery only in highly selected patients with HF
Timing of Surgical Intervention

ACC/AHA Guidelines – Primary MR

Consider surgery *when*

- Symptoms
- or
- LV dysfunction (EF < 60%, ESD ≥ 40 mm)

Try to repair in a experienced center

Nishimura R, et al., J Am Coll Cardiol 2014;63:2438-88

Early Surgery Is Better

Patients without Class I Indications

![Graph showing survival percentages over time for early surgery vs. medical management. The graph indicates a significant survival advantage for early surgery with a Log-rank P < .001.](image)

Suri R et al., JAMA 2013;310:699-16
What Therapy for Primary MR?
Based on Patient Risk

- Not High: Surgery
- High: MitraClip

Mitral Regurgitation

Mitral Valve Surgery
Minneapolis Heart Institute
Abbott Northwestern Hospital
2014 Valve Guidelines
Valve Center of Excellence

- Multidisciplinary
- Guideline adherence
- All therapy options
- Quality improvement
- Public reporting

Nishimura RA, et al. JACC 2014

Carpentier Principles of MVP
(How we do mitral repair)

- 1. Smooth Coaptation surface
- 2. Reduced height of posterior leaflet
- 3. Annuloplasty reinforcement
Why we do mini mitral repair

Mini Mitral Incisions

- Paramedian
- Lower hemi
- Mini thoracotomy
- Full sternotomy (small incision)
Port access mitral

Port Access Video
Port Access Pictures

SINGLE SURGEON EXPERIENCE
Mitral Valve Cases performed by Dr Farivar over initial 10 months

41

Demographics

- Average age
- Average XC
- Average CPB
- Male:Female

- 64 yo
- 66 min
- 92 min
- 22:19
Deaths = 0 (zero)

Permanent Strokes = 0 (zero)
MI/Reop for Bleed/Infections = 1
reop bleed (2.6%)

Mitral Valve Repair
(Intention to Treat)

27/28
(96% intention to treat)
Mitral Valve Replacement = 13
(mechanical 4)
(tissue 7)

Mean Diastolic Gradient (repairs) on pre-discharge echo

4 mm Hg
Concomitant Cases

• Double valves (5/41) = 12%
  Aortic 1/41 (2.4%)
  Tricuspid 4/41 (9.8%)
• Ascending aortic replacement 2/41 (4.9%)
• Left atrial appendage ligation 8/41 (19.5%)
• PFO closure 3/41 (7%)
• CABG 3/41 (7%)

Minis

• For single valve cases 13/24 are minimally invasive (54%) [over half minis]
  Port are over half (8/13)
  Lead up time for ports, since team needed to be trained
### Complexity/Comorbidity

- Extreme Kyphoscoliosis 2/39 (5%)
- Reoperations 4/39 (10%)
- Re-repair failed repairs 2+ (5%)
- IABP (low EF) 3/39 (8%)
- Barlowe (bileaflet)/anterior leaflet prolapse 8/30 (27%), functional 3/39 (8%), posterior 22/30 (73%)
- HIV/HepC/renal insufficiency/stoma 5/39 (13%)
- Combined HOCM patients 2/39 (5%)
- Endocarditis 2/39 (5%)
- > 75 yo 10/39 (26%)

### LOS

- Overall LOS = 7d (all comers)
- Lower Hemi = 6d
- Port Access = 5d
Complexity: Extreme Kyphoscoliosis Mitral Repair
Mitral valve injury after radiofrequency ablation for Wolff-Parkinson-White syndrome

Paracanga, Cavall JG²; Ciriaco, Sarago M; Atunbohum S; Murgen, TM; Funchens, P; Syri, R
Results:
Mitral Regurg on Postop Echo

Number pts

- None: 20
- 1+: 5
- 2+: 0
- 3 or 4+: 0
Financials at ANW

Mitral Repair

|   | Cases | CME | LOS | PostProc LOS | Year %352 | Any 30/Days Complications | % CLE to Hosp Mort | Readmits 30 Days | Variable Cost | Contribution Profit
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<td>Avg</td>
<td>47</td>
<td>5.92</td>
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<td>003%</td>
<td>6.3</td>
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<td>47</td>
<td>5.92</td>
<td>5.3</td>
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<td>15.3%</td>
<td>0.0</td>
<td>$10,948</td>
<td>$17,419</td>
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Mitral Replacement

|   | Cases | CME | LOS | PostProc LOS | % in 30/2 | Any 30/Days Complications | % CLE to Hosp Mort | Readmits 30 Days | Variable Cost | Contribution Profit
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Summary Data Insights

• Selection of cases is appropriate
• Intraop decision making and clinical support is good
• Postoperative Care is appropriate
• Financial aspects extremely favorable

Goals/Vision/Future

• Reference Center ELS
• Mini growth
• Help for other surgical programs in system
• Gets us the latest equipment & Trials
  (Advantages of a reference center)
Mitral Regurgitation

Catheter-based Therapy for Mitral Regurgitation

MitraClip® System
Suitable Anatomy?

Clip open

Closed to 60

Space

Thick leaflets, no Ca\(^{2+}\) helpful

4 mm long ≥2 mm tip coaptation

Echocardiography

Bi-com (~60°) and LVOT (~150°)

150 Grasping view

M vs L 60

Tells You Where and How Many Clips
Clip Like Alfieri Stitch
Less risk of chord entrapment

Surgery
MitraClip

MitraClip Case
Post-Superior Transseptal

Avoiding ASD

Loosen

Torque
Commissures Can Be Done

MAC is not an contraindication
An Important Tidbit

Remember how dynamic MR is

LAP = 13 with SBP at 150 mmHg
Outcomes of the Initial Experience with Commercial Transcatheter Mitral Valve Repair in the U.S.

A report from the STS/ACC TVT Registry

Paul Sorajja, MD, Saibal Kar, MD, Amanda Stebbins, Sreekanth Vemulapalli, MD, D. Scott Lim, MD, Vinod Thourani, MD, Michael Mack, MD, David R. Holmes, Jr., MD, Wesley A. Pedersen, MD, and Gorav Ailawadi, MD

Study Population 564 Patients

- Median age (% men)........................ 83 yrs (56%)
- NYHA III/IV................................ 83.9%
- HF hospitalization prior yr................. 51.8%
- Atrial fibrillation.......................... 62.6%
- Prior CVA.................................. 8.7%
- Diabetes.................................... 25.0%
- Prior CABG................................ 32.4%
- Prior MI.................................... 24.6%
- Creatinine ≥2 g/dl.......................... 16.7%
- O2-dependency............................ 14.7%
- Median STS-PROM MV repair............ 7.9% (4.7, 12.2)
- Median STS-PROM MV replacement..... 10.0% (6.3, 14.5)
Change in Mitral Regurgitation

Clip implantation occurred in 94%

- 93% MR ≤2
- 63.7% MR ≤1
  p < 0.001

Clinical Outcomes

- In-hospital mortality… 2.3%
- Procedure success…. 91.8%
- Complications.......... 7.8%
- Length-of-stay……….. 3 d (1,6 d)
- Home discharge………. 81.9%
## U.S. vs. Other Registries

<table>
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<tr>
<th>Registries</th>
<th>Age (yrs)</th>
<th>DMR</th>
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<th>In-hospital death</th>
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<td>86%</td>
<td>93%</td>
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<tr>
<td>SENTINEL (EU)</td>
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<td>28%</td>
<td>95%</td>
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<td>ACCESS (EU)</td>
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<td>85%</td>
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<td>74%</td>
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<td>EVEREST II RCT</td>
<td>67</td>
<td>51%</td>
<td>77%</td>
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<tr>
<td>EVEREST II HRS</td>
<td>76</td>
<td>30%</td>
<td>86%</td>
<td>2.6%</td>
</tr>
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### A New Mitral Therapy

**Tendyne**
Key Points

• Highly prevalent disease that is under-treated
  *Excess mortality from treatment delays*

• Success of mini-MV repair is >90% with risk of <1% and minimal scars and LOS

• MitraClip indicated for high-risk patients
  *Success >90% in selected patients*