

Open Management of Severe MAC: Pearls & Pitfalls

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Conflict of Interest Disclosures

PI/ Steering Committee Roles

- Abbott-Co-PI SUMMIT Trial, Steering Committee- Repair MR Trial
- Edwards- Executive Steering Committee CLASP TR Trial, PI- MOMENTIS Trial
- NIH CTSN- Co-PI Concomitant Tricuspid During Mitral Surgery Trial, Steering Committee, Primary Trial
- Atricure- DSMB
- CRF- DSMB

Consultant Roles

- Medtronic
- Abbott
- Edwards
- WL Gore
- Admedus
- Atricure
- Johnson & Johnson
- Philips
- CryoLife
- Arthrex

Background

- Highly variable pattern and severity
- MR: Can be incidental or cause of mitral disease
- MS: Severe MAC can make MVR risky for AV groove disruption

- 3 Cases with Increasing MAC Severity

MAC Classification

Diagnosis, Classification, and Management Strategies for Mitral Annular Calcification



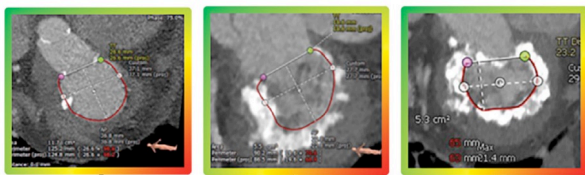



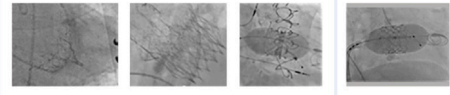
A Heart Valve Collaboratory Position Statement

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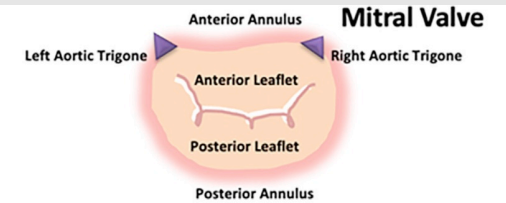
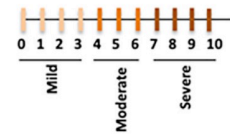
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MAC Classification

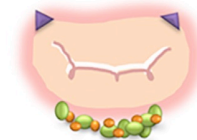
Diagnosis, Classification, and Management of Patients With MAC: Heart Valve Collaboratory Consensus Guidelines

Diagnosis and Classification	Treatment of Mitral Valve With MAC
Diagnosis <ul style="list-style-type: none"> • TEE • MDCT 	<p>Green MAC, Yellow MAC or Red MAC for Different Therapies</p> 
Classification and Anatomic Risk <ul style="list-style-type: none"> • Annular Size • MAC Score and Calcium Burden • LVOT Obstruction Risk • Sealing/PVL Risk 	<p>Surgical Replacement</p>  <p>TMVR in MAC</p>  <p>Transseptal or Transatrial ViMAC</p> 
Adjunctive Therapies <ul style="list-style-type: none"> • Septal Modification • Leaflet Modification • Surgical Myectomy 	
<ul style="list-style-type: none"> • Surgical risk and risk of LVOT obstruction are important considerations in device choice. • With acceptable anatomy, a 30-day mortality $\leq 10\%$ can be achieved. • Multiple clinical trials are available for patients with MAC, and results are forthcoming. 	

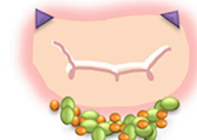
CT-Based MAC Score



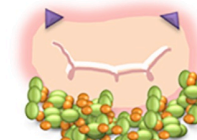
I. Calcium Thickness



<5mm=1

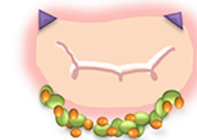


5-9.99mm=2

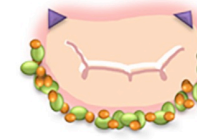


≥ 10mm=3

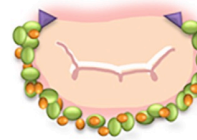
II. Calcium Distribution



<180°=1

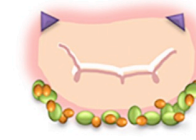


180-270°=2

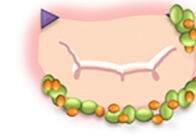


>270°=3

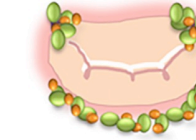
III. Trigone Involvement



None=0

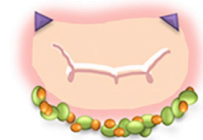


One=1

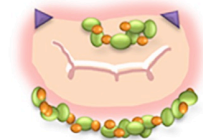


Both=2

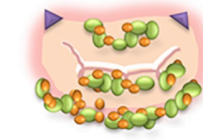
IV. Leaflet Involvement



None=0



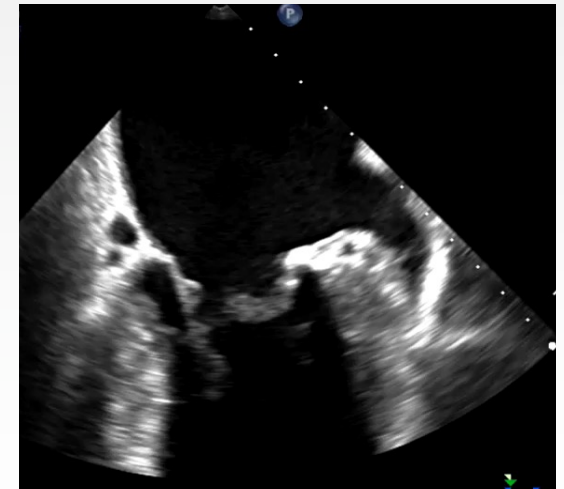
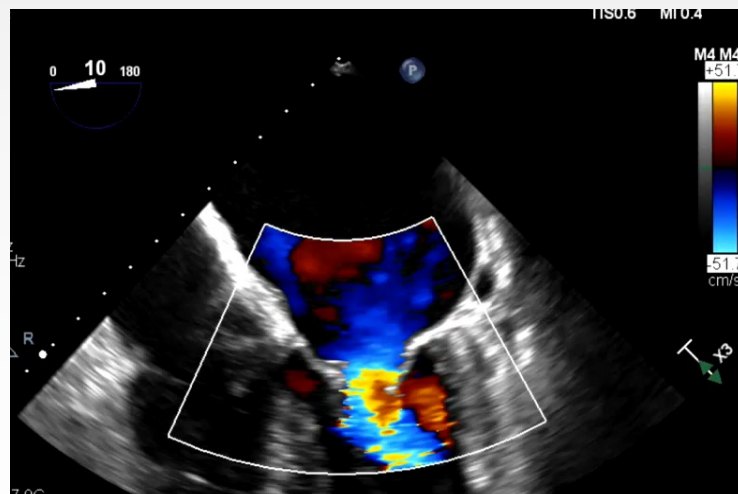
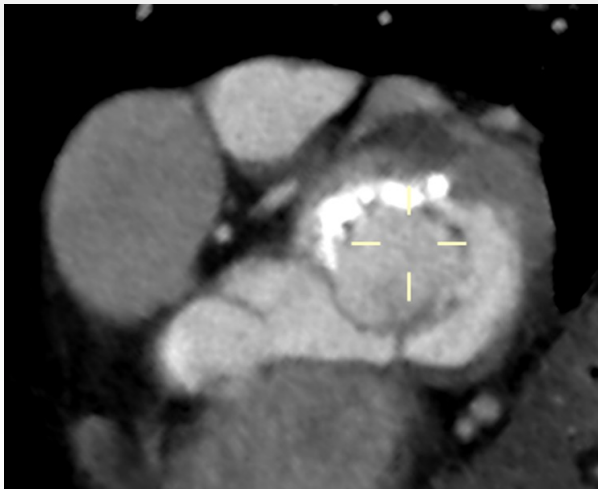
One Leaflet=1



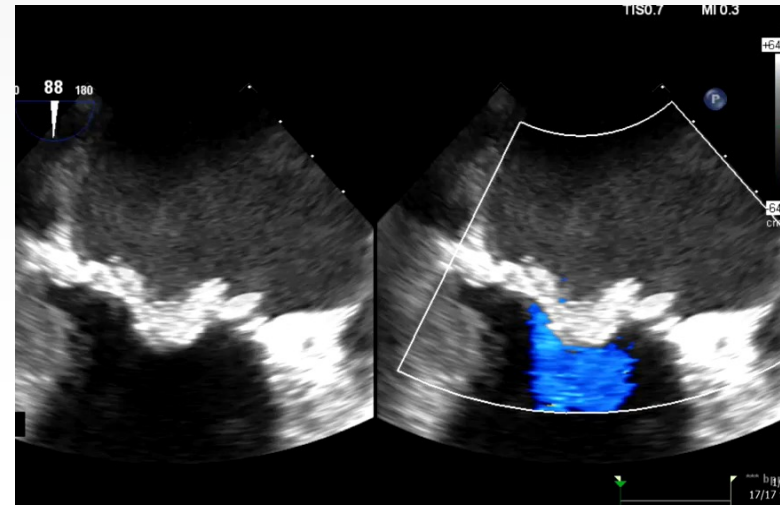
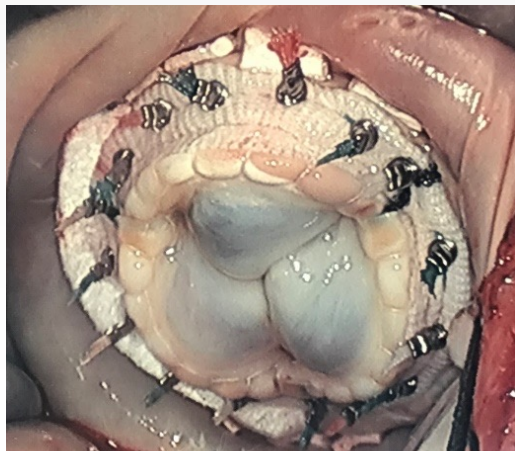
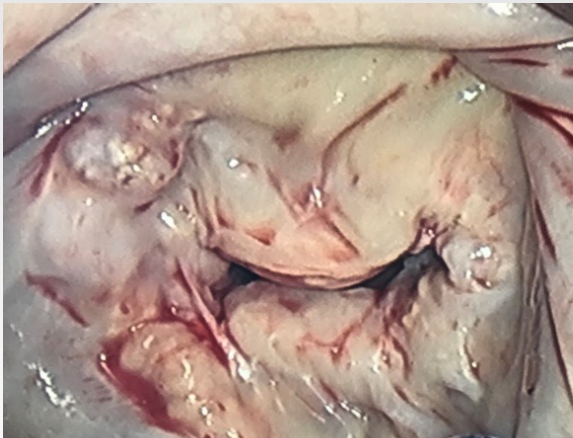
Both Leaflets=2

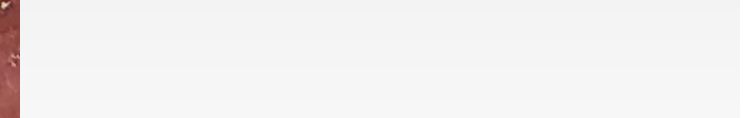
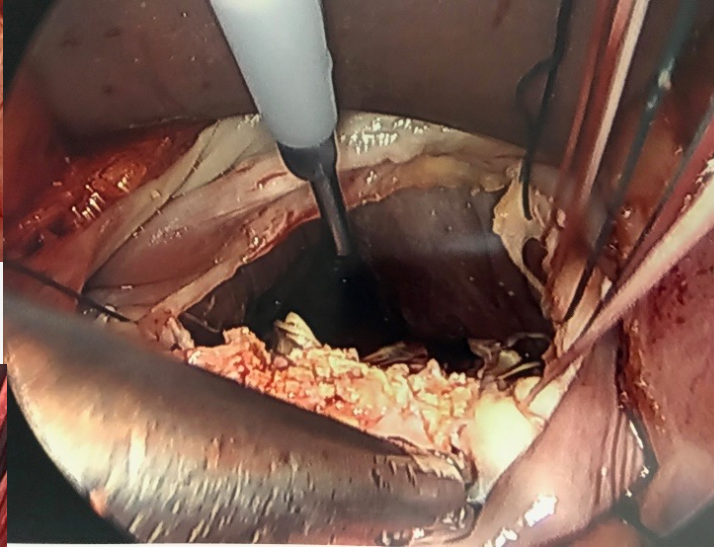
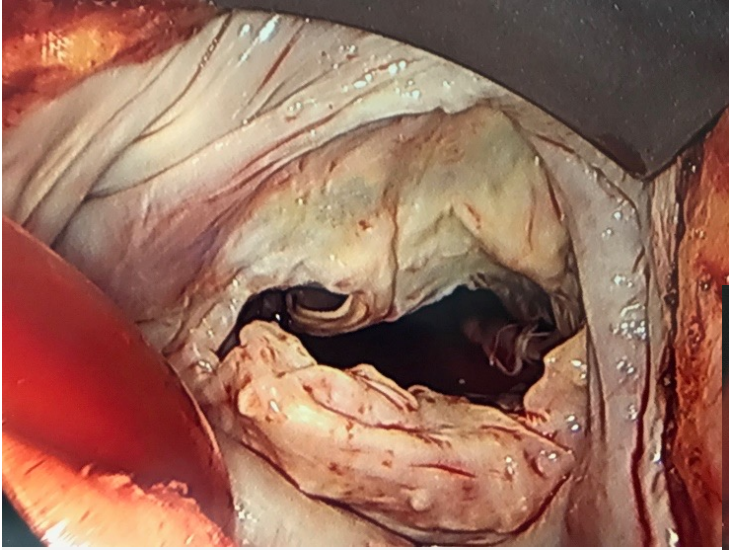
Case 1

- 71yo F w Rheumatic MR/ MS, NYHA Class III, Stage 3 bleeding Cervical Cancer



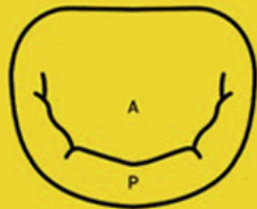
Case 1: Mini MVR, Debridement of Focal Calcium, 29mm Epic Valve





Ultrasonic Emulsification of Severe Mitral Annular Calcification During Mitral Valve Replacement

Sonopet ultrasonic aspirator (Stryker, Kalamazoo, MI)



15 patients
27mm median valve size
11.1 ± 2.6 preop gradient
4.9 ± 1.2 postop gradient
0% operative mortality
0% early stroke
7% reoperation

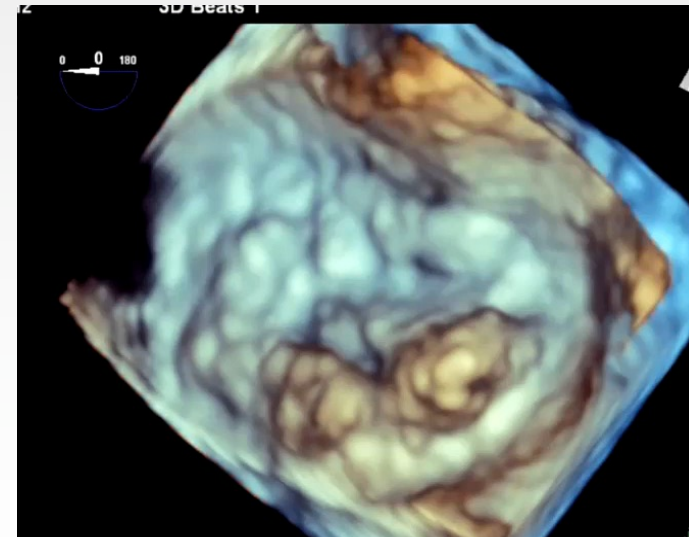
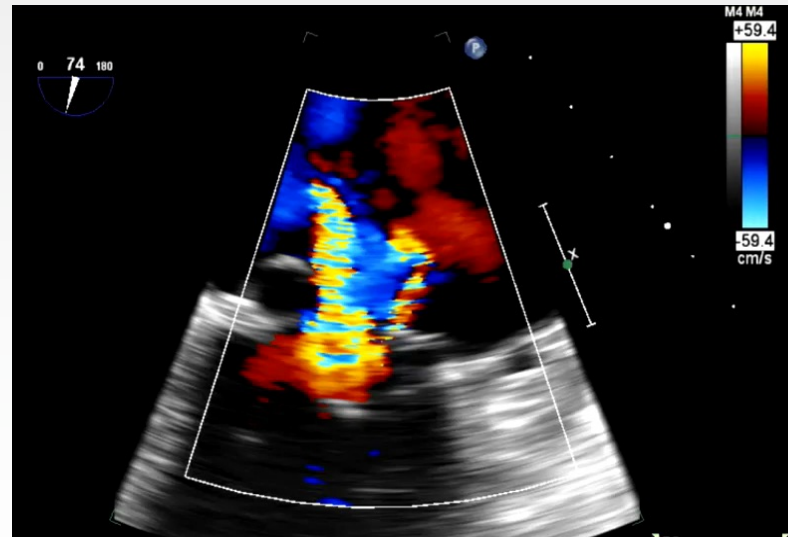
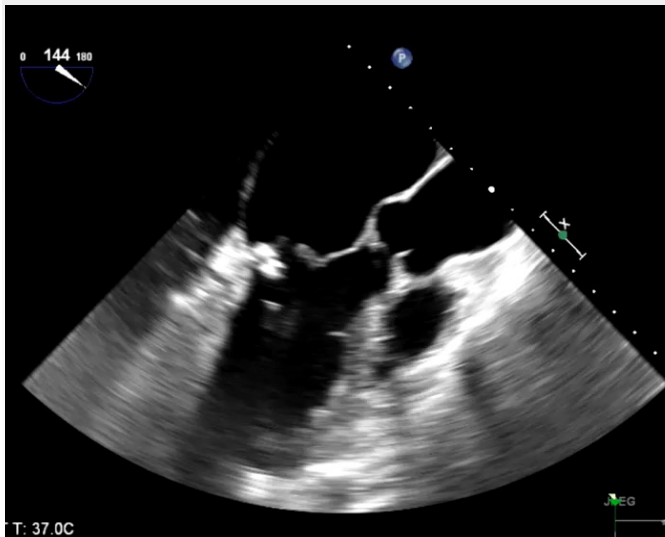
Operative Principles

1. “Remodel” calcification through partial resection and limited operative manipulation of MAC
2. Avoid excessive torque on the annulus to minimize risk of AV groove disruption
3. Distribute force of sutures equally, often requiring unconventional suture placement in the left atrium

Conclusion: Ultrasonic emulsification and aspiration of mitral annular calcification (MAC) during mitral valve replacement is a safe method of purposeful debridement

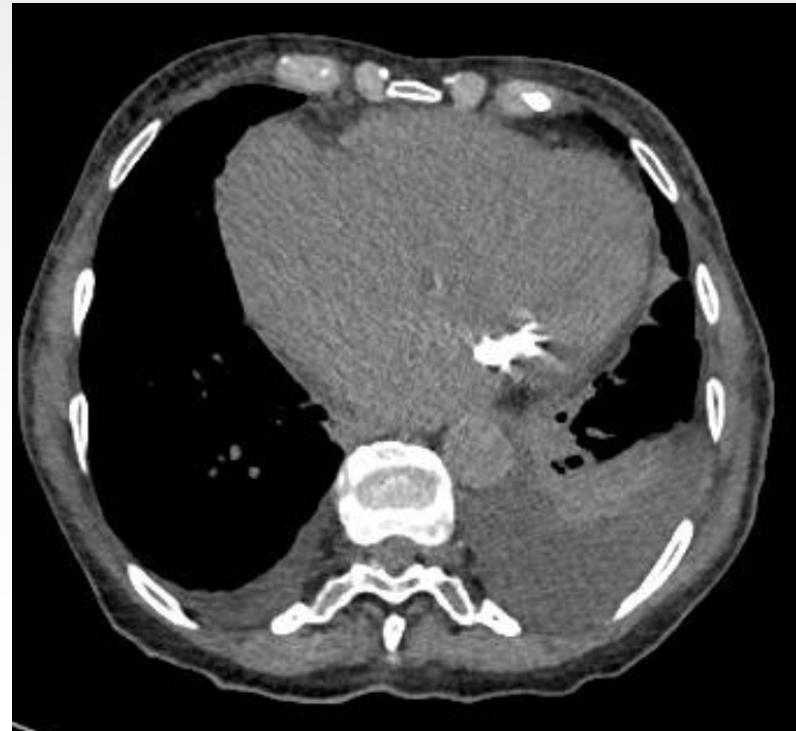
Case 2

- 78yo F, NYHA Class IV, Severe MR, flail, Mod-Severe AI, Severe TR

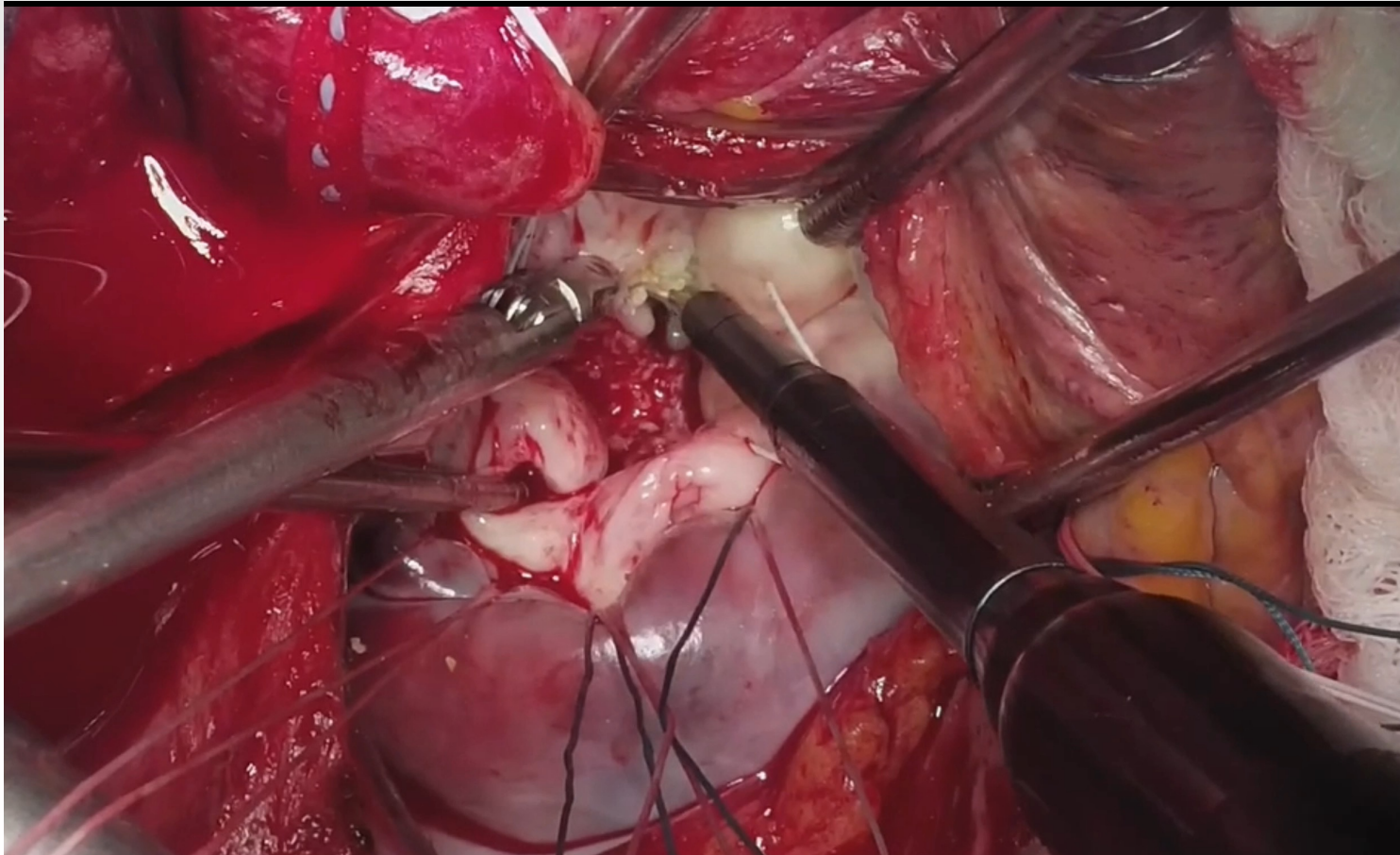


- MAC limiting mobility of Post Leaflet, Caused Flail

Case 2

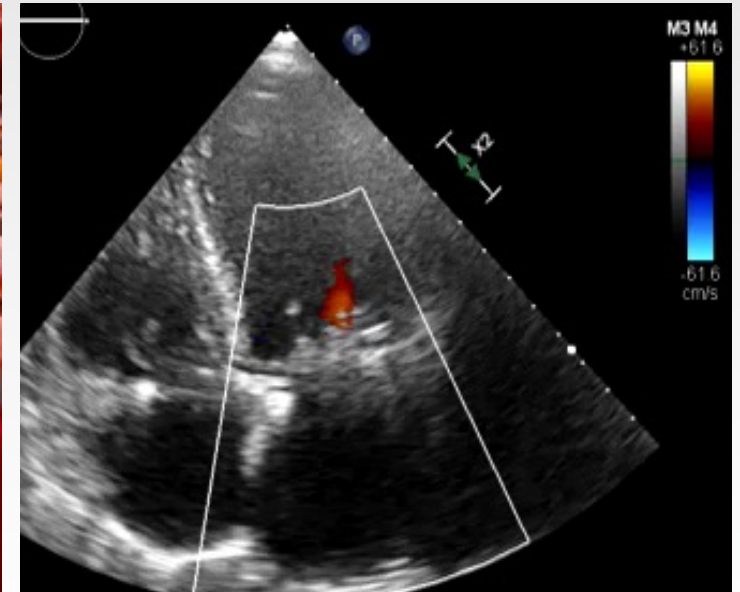
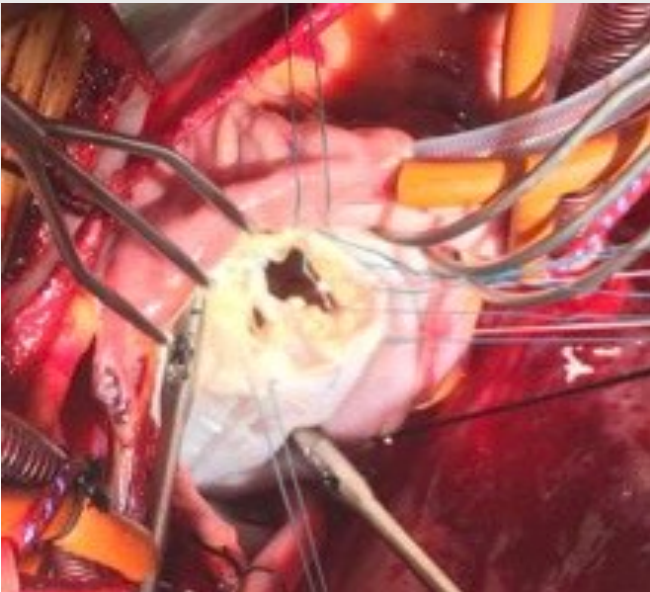


Ultrasonic Emulsification: Sonopet



Courtesy of M Chu

Case 2: Open MVr, TVr, AVR, Maze



- Detach P2/P3 at Annulus, Debride MAC with Sonopet, Reattach leaflet, Chordal Repair
- ***Complex MVr, TVr, AVR, LAA, MAZE***

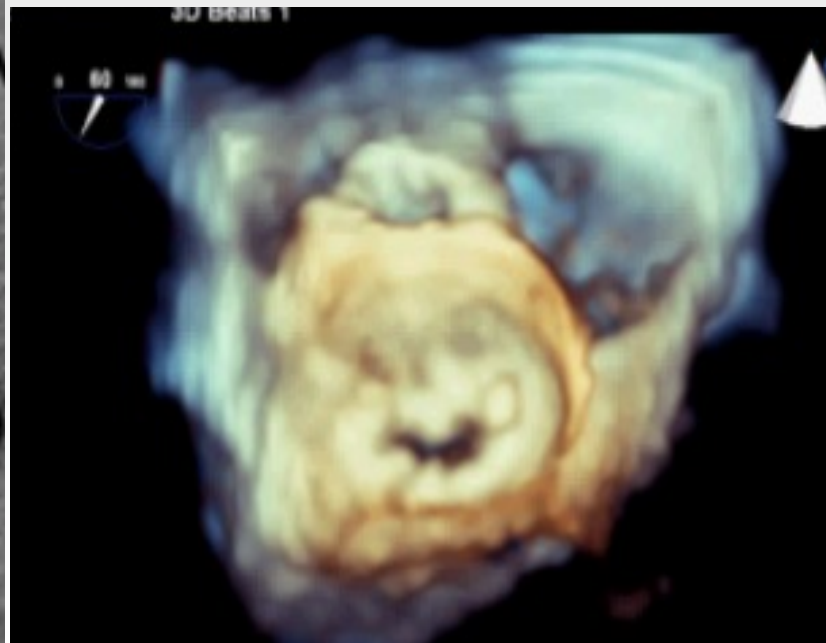
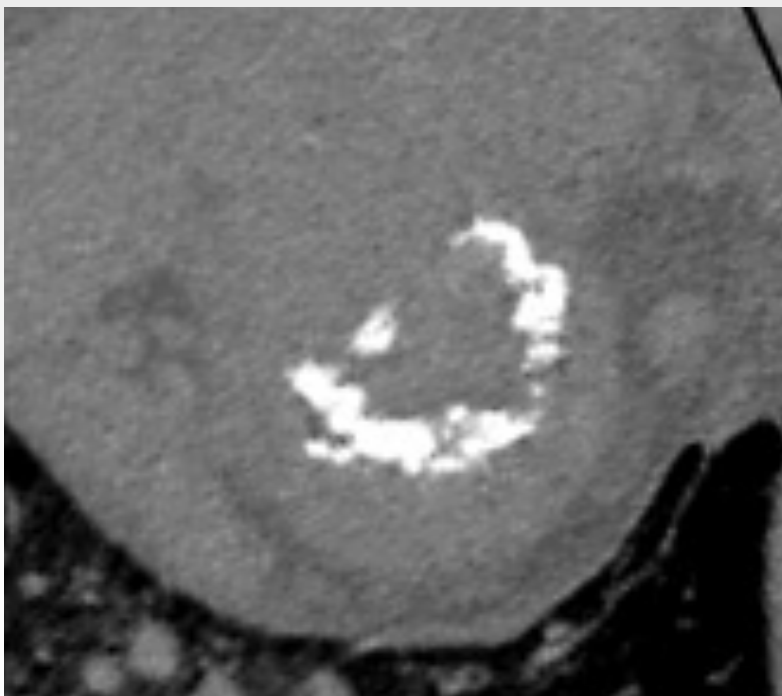
Where Does TEER (MitraClip) Fit in for MAC?

- Valve area $>4\text{cm}^2$
- Leaflet grasping zone free of calcium/ Calcium does not protrude into LV affecting opening of clip
- MAC not the cause of MR (restricted leaflet)
- Mild or Moderate MAC

Case 3

- 81yo F Class IV CHF, DM, currently wheelchair bound
- Hospitalized 2x in 3 months
- h/o CABG x 4, AVR 2011
- c/b deep sternal infection → sternectomy
- Severe Mitral Stenosis from MAC (mean Gradient= 14mmHg)
- RHC: PA 68/18, PCWP 20
- STS 9.9%

Case 4: Severe MAC



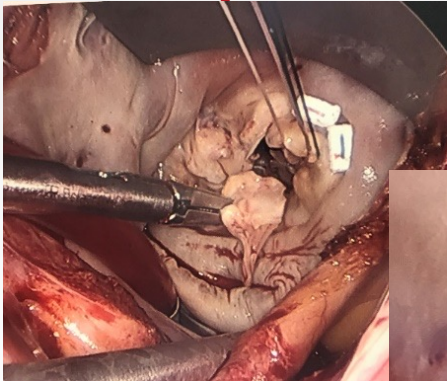
Case 3: Minimally Invasive Surgical S3

- Right Thoracotomy, Axillary Cannulation
- Fibrillatory Arrest
- Remove A2 segment, Septal Myomectomy
- Place 3-6 Pledged sutures circumferentially
- Tack Felt strip circumferentially in landing zone

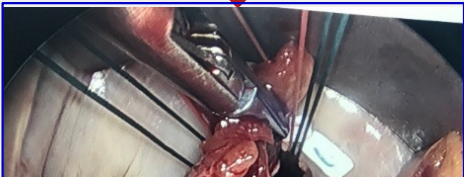
- Deploy Sapien 3 valve 60-70% in LV
- Test for leak by filling LV

Case 4: Minimally Invasive Septal Resection Surgical Sapien 3

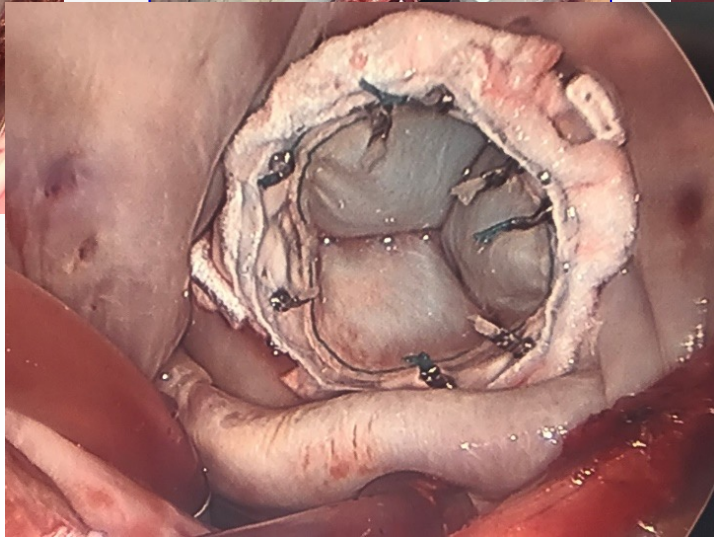
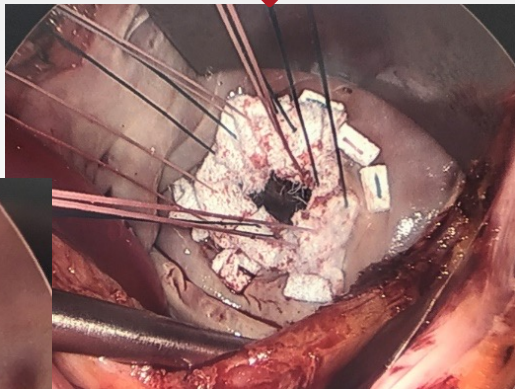
Remove A2

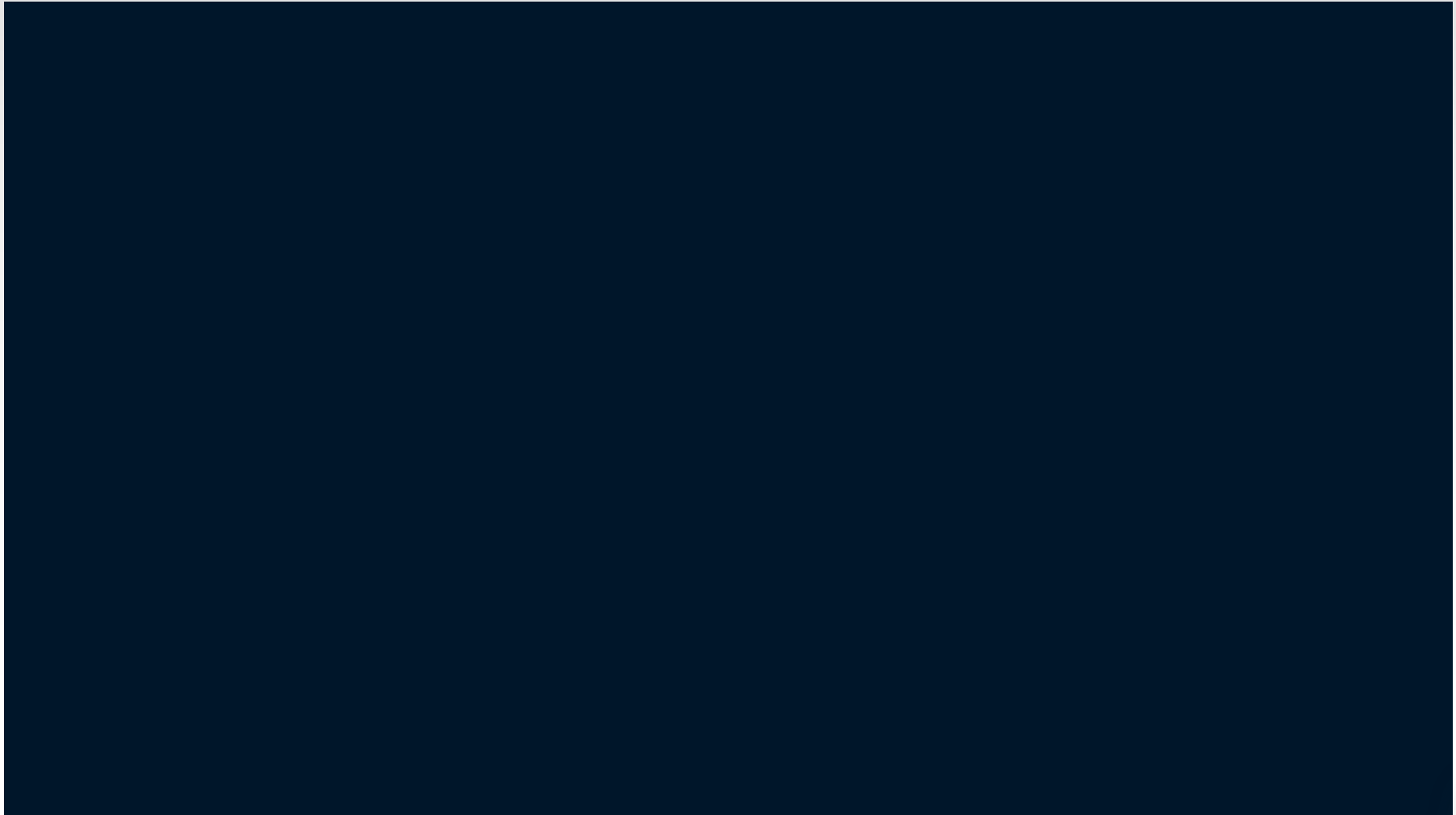


Septal Resection



Felt Strip





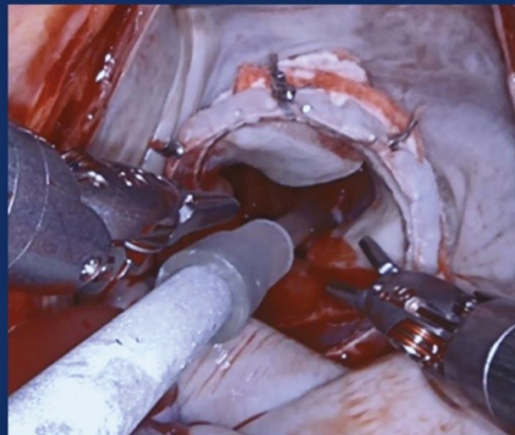
Minimally Invasive Surgical S3

Summary of study findings of balloon-expandable valve implantation in 51 patients with mitral valve disease complicated by mitral annular calcification (MAC)



51 Patients

Mitral Valve Disease with MAC
Treated with Transatrial
Balloon-Expandable valve



Technical Success
94%

30-day Mortality
13.7%

1-year Mortality
33.3%

Implications

1. Transatrial BEV in MAC is feasible in select patients.
2. Next steps: improve patient selection and outcomes.

BEV, balloon-expandable valve; MAC, mitral annular calcification.

Conclusions

My Approach:

1. US aspirator can be used to focally debride calcium – conventional repair/ replacement feasible (<2/3 valve)
2. Severe MAC (>2/3 around circumference) + MR or MS: Sitral
3. Severe MAC + Large LVOT: Transcatheter MVR trials (Tendyne, Intrepid)

Will Discuss more specific Pearls About this Approach in Session 23 (Saturday 10am)