Paravalvular Leaks; Techniques for Improving Outcomes

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Disclosures

• Consultant and Proctor
  – Medtronic, Edwards Lifesciences, St Jude

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  – Medtronic, Edwards Lifesciences, St Jude
Anesthesia: “I think there’s a perivalvular leak....”
Surgery is Glamorous; a Big Show

Someone has to clean up after the show
Background

- 2-10% AVR
- 7-17% MVR
- 1-5% of all leaks have serious clinical consequences
- REOP for PVL 12-37% mortality
- Risk Factors: Mechanical valve, Mitral position, annular calcification, infection, suturing technique, size and shape of prosthesis
Percutaneous Closure of Mitral Paravalvular Leaks: A Systematic Review and Meta-Analysis

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Meta Analysis Findings

- 15% 12 month Mortality (vs 12-37% with surgery - PERC patients tend to be higher risk)
- 18% deployment failure
- 31% persistent leak/hemolysis
- 52% clinical failure rate
Principles of Perivalvular Leak Repair

- Patient is inoperable or at substantial risk of redo by experienced surgeon (always get a surgical consult)
- Symptoms impact quality of life
- Reasonable expectation repair will improve QOL
- Refractory hemolysis - transfusion dependent
- Patient understands no surgical bailout
Planning Starts with Understanding the TEE
I’m not a surgeon - This is not a “Surgeon’s View”

Where do I aim?

AV  MV
Rosetta Stone
12 o’clock is where the aorta is
Orienting the Clock
Where is 12?
Bioprosthesis/Aorta #25 (metal)

ANTERIOR

Aortic Valve

LATERAL

2 chamber

3 chamber

25% circumference

3 chamber

Post.

Septal

TR
Pre Procedure

- HB, LDH, Haptoglobin, Bili
- TEE + 3D augmentation
  - precise location of leak in “surgeons view”
  - # number of leaks
  - angulation with respect to annulus
  - As much “quantitative” information as possible
  - Spend time on precise delineation of information required for procedure (TEE can’t go on forever)
Procedure - Mitral

- Arterial and venous access
- Left heart transeptal - St Jude SRO switch for St Jude deflectable Agilis sheath
- Fish for leak with shaped catheters and exchange straight 035 wire.
- Use 3d imaging and orthogonal Fluoro planes for targeting (Biplane is ideal)
- Snare Wire and create AV loop (only in very select cases)
- Deliver device sheath and device - 2 wire technique
- Echo Assessment - consider additional devices
Essential Equipment

- Transeptal System (needle +/- RF system)
- Septostomy balloon (6 mm X 20 mm) -014 or 035
- Deflectable Guide Catheter (I like the Agilis - ST Jude)
- 4F Terumo Glide Cath
- Extra Stiff angled Glide exchange length wire
Tent in Orthogonal Views

Check relationship to Aorta, and height above MV before Puncture
Stain Septum with Contrast
-RF Perforation needle facilitates puncture with difficult post op septa (also pulm htn)
Balloon Septostomy

Why?

1. Facilitates passage of large sheath especially via thick septum

2. When wire position across defect is marginal do not want to lose position getting across septum

3. Highly likely will be advancing 2 or more sheaths through the same hole
Deflectable Sheath

A deflectable sheath + a slippery angled 4 fr catheter = Heavenly Solution
4 F Glide cath will go anywhere a wire goes (no exceptions)
Wire through leak bounced into aorta

Snared and exteriorized

Not sure this necessary for most cases
Potential Issues

- If you advance stiff wire through 4f glide - you may lose position and prolapse out -- do it relatively quickly. Try to get 4fr into aorta with a glide wire!!

- If you did not dilate the septum - you may have some resistance pushing sheath through - if you prolapse may lose position - dilate after transeptal

- Guide catheter may get hung up at annulus if so, fix the dilator and spin the guide through- moving the dilator in and out a few times may help. Consider upsizing to a bigger dilator first
• When you get guide across - consider putting down 2 stiff wires

• You can then advance 2 sheaths into position

• If hole is big you will be ready to advance second device
<table>
<thead>
<tr>
<th>Amplatzer septal occluder (ASO)</th>
<th>Amplatzer muscular VSD occluder (mVSD)</th>
<th>Amplatzer duct occluder (ADO)</th>
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<td>Occlusive planes</td>
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<td>3</td>
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<td>Waist length</td>
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<td>Size difference</td>
<td>Proximal/distal disc: 8 mm/12 mm, (4–10 mm ASO), 10 mm/14 mm, (≥11 mm ASO)</td>
<td>5–8 mm 4 mm, (5/4–8/6 mm ADO), 6 mm, (10/8–16/14 mm ADO)</td>
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<tr>
<th>Amplatzer vascular plug II (AVP II)</th>
<th>Amplatzer vascular plug III (AVP III)</th>
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* Asterisks indicate key differences or notable features.
Procedural Failure secondary to device choice
Balloon sizing may help in difficult cases or when size is dynamic.
MV repair failure at reinforcement site around Simplici-T
Device Implanted with “safety wire technique”

Final release
Use of 2nd device for Non Geometric Defects
Aortic Interventions
• 86M
• AVR 1999
• COPD, PVD
• Progressive SOB due to failing bioprosthetic valve
  • Stenotic 23mm CE valve with moderate paravalvular leak
Planned strategy = transapical TAVI with 23mm Sapien valve +/- staged device closure of PV leak if clinically indicated.
23mm Sapien valve (TA) under GA with TEE
Trivial paravalvular leak post valve deployment
Mechanism?
Delivery retrograde = Easiest approach
tall patients redundant aortas are the enemy
Device closure of Aorta to Atrial communication after 3 double valve replacements
Referred back 6 years later
Paravalvular Leak Secondary to Endocarditis

- 70 yo male (all operations at another teaching hospital)
- 1988 BIO AVR for BAV root dilation
- 2007 REDO AVR
- JAN 2008 REDO AVR (SBE and dehiscence)
- CX need for hemodialysis (gentamycin)/aorto-atrial fistula, GI bleeding to HB 65
TEE

EF 45%
Mildly dilated LV
MILD TR
Hemodynamics

PA 53/23/36

PCWP mean 26 v 51

Redundant Aorta required extra long catheters (125cm)
balloon size
10.5 mm
Residual shunting but not too bad
Follow up 6 months

- Walks 2 miles briskly per day (NYHA 1-2)
- Off dialysis
- Weight 200 -- 146 -- 172
- EF 40% AVA 1.94cm² pg 31 mg 17 trace Al
- 100 mmhg across residual leak
- RVSP 48
Follow up 5 yrs

- can walk 1/2 a block
- major deterioration in last 6 months
- echo LV function unchanged, mod MR, RVSP 79
- BNP 1477
Patient

- 83 male
- CABG X2 1980
- CABG + AVR (Hancock-2) April 2010
  - perivalvular leak noted in operating room
  - treated medically concerned about requiring Bentall
- Post op 3 admissions for CHF
- Creat 130
- CATH
  - PAP 32/10/20 -
  - Grafts patent - 70% aorto-ostial lesion SVG-RCA
  - Severe AI
- Turned down for REDO surgery
Beware Tall Men!
Feels much better
no hospital admissions
“His usual self”
ECHO - mild AI
Summary

• TEE and 3D Echo Provide Critical Support for Perivalvular interventions

• Optimizing a procedure requires preplanning, excellent communication and a dedicated team

• Patient selection remains a critical element as does operator experience

• Little tricks help - Sometimes you can save the day with the right suggestion