Complicated Percutaneous Repair of a Paravalvular Mitral Leak

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(Courtesy: Prof. PW Lee)
A new job for echo guy

• Interventional echocardiologist!

• As an interventional echocardiologist, my role is to make sure that the interventionist has a safe journey
  – Detect life threatening complication
  – Provide guidance to make the procedure a successful one
Role of Echocardiography in Percutaneous Mitral Valve Interventions

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**Recommendations**

EAE/ASE recommendations for the use of echocardiography in new transcatheter interventions for valvular heart disease

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3D TEE During Catheter-Based Interventions

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Presentation outline

- Overview of paravalvular leak
- Role of TEE in PVL
- To communicate in same language (echocardiologist, interventionist) : clock face view approach
- A case of severe paramitral leak
  - 3D TEE assessment of lesion geometry
  - TEE guided intervention which allow timely detection of complication
Paravalvular/periprosthetic leak

- PVL after surgical valve replacement is typically associated with dehiscence of sutures and may result from infection, annular calcification, friable/weak tissue at the site of suturing, or technical factors at the time of implantation.

- Most commonly encountered with mitral prostheses, paravalvular leaks may be associated with haemodynamically significant regurgitation causing heart failure and/or haemolysis.

- Reoperation for PVL is associated with an increased likelihood of a recurrent leak as well as surgical morbidity and mortality. Transcatheter closure of periprosthetic regurgitation (TPPR) is appealing.
EAE/ASE recommendation of for the use of echocardiography in the new transcatheter interventions for valvular heart disease

**Table 2** Role of peri-procedural transoesophageal echocardiography in device closure for paravalvular regurgitation

| 1. Confirm location(s) and severity of paravalvular regurgitation |
| 2. Exclude prosthetic and intracardiac thrombi or vegetations |
| 3. Facilitate guide wire and catheter placement |
| 4. Assess seating of the closure device |
| 5. Ensure proper functioning of the prosthetic valve |
| 6. Assess residual paravalvular regurgitation |
| 7. Detect complications such as air embolism or tamponade |
Surgeon's view: mitral valve “en face” with the aortic valve at 12 o'clock, view from LA perspective
Interventionist's view: fluoro image of mitral valve is actually the reversed (i.e. mirror image of TEE)
Background hx

- F/53, ADL I, non-smoker

- PMH:
  - CRHD with severe MS and moderate TR, MVR + TA was done 1984
  - Redo MVR was done in 1996 due to pannus overgrowth leading to high MVR gradient
  - Redo MVR + AVR + TA in 2009 because of mechanical valve failure, progressive symptomatic AS and TR
• c/o SOB on mild exertion for few months in 2013, not able to do daily household chores

• Clinically JVP up to earlobe, PSM at mitral area with radiation to precordium, PSM at LLSB, Lt parasternal heave

• Class III heart failure with haemolytic anaemia (Hb ~ 8 with high bilirubin, LDH and low haptoglobin), no def autoimmune cause

• TTE: normal aortic prosthesis, at least moderate mitral paravalvular leak, moderate TR/PR
  – Acoustic shadowing hinder the assessment of mitral valve
• TEE:
  – Severe paravalvular MR in crescentic formation starting from 2-3 o’clock (medial aspect), peak/mean gradient 7/2mmHg only
  – Moderate TR, PASP 65mmHg
  – Normal AVR functioning, no AR or high gradient

• Rt and Lt HC 11/2012:
  – Coro: minor CAD
  – Baseline CO 5.1L/min (normal)
  – PVR 5.5 Wu, TBG > 12, PCWP high
  – Post nipride, PVR 1.54 Wu, +ve vasoreactivity, reactive post-capillary PH
Confirm severe PVL from 2D and 3D TEE

2D TEE at 0 and 120 degrees demonstrated mechanical MVR with adjacent severe PVL (medial)
Where is the lesion exactly?

3D RT-TEE viewing MV in surgeon prospective, full volume mode with colour flow

Answer: severe PVL at 3 o’clock (no need to guess), regurgitation arc > 20% of total sewing ring circum
Estimated size of the defect

3D zoom mode: MVR opens well, a crescentic shaped defect measuring 2.23 x 0.92cm
Third re-do MVR ??

• Given multiple re-do surgery in the past, she was deemed not a surgical candidate
  – Reoperation is associated with high morbidity and mortality and is not always successful because of underlying tissue friability, inflammation, or calcification.

• Having discussed the pros and cons of percutaneous closure of paravalvular leak, she preferred for less invasive approach of percutaneous closure

• No definite contraindication for percutaneous closure such as endocarditis or significant dehiscence involving more than one-fourth of the valve ring
Proceed to percutaneous closure of paravalvular leak

- Managed by Heart Team – interventionist, echocardiologist, anaesthetist
- Patient was sedated under MAC
- An antegrade transseptal approach is used with guidance by biplane fluoroscopy, and real-time 3-dimensional transesophageal echocardiography (RT- 3D TEE)
- 6Fr sheath to RFV, 6Fr sheath to LFA
- Hydrophilic 0.035-inch wire
- Amplatzer vascular plug III (one or more depending on the shape)
Heart team

Left anterior oblique–caudal fluoroscopic projection shows an en face view of the prosthetic mitral valve
Transseptal puncture with 3D biplane echo as a guidance
RAO view, try probing the 0.035 hydrophilic wire through the defect

Creation of AV loop by snaring the wire thus providing a good support for device implantation
Suddenly BP dropped to 72/35, what actually happened?

Deep gastric view: no pericardial effusion

Transmitral gradient is not high
Wire induced severe AR leading to hypotension with wide pulse pressure
Cardiogenic shock resolved immediately by retrieving the wire back into LV

There is no more AR

Amplatzer Vascular Plug III measured 14 x 5mm was implanted at the defect of PVL
Still moderate PVL despite first vascular plug due to residual 1cm defect, decided to implant another plug (Amplatzer plug III 12 x 9mm)
Creation of loop in the LV to provide extra support
The septal leaflet was impinged by the 2nd vascular plug therefore it cannot be closed during systole leading to terrestrial MR.
Recapture the plug and implanted it in a new position in which the MVR no longer jeopardized, excellent echo and fluro results

Final outcome, everyone is happy!
Conclusion

- 3D TEE provides much better anatomical information than 2D TEE in assessment of paravalvular leak
  → crucial for the device selection and evaluation of geometry of lesion
- Monitoring of paravalvular leak closure with 3D TEE provides lot of soft tissue information
- Allow timely detection of complication during procedure (e.g. pericardial effusion, impingement of valve, wire complication)
- Good collaboration between echocardiologist and interventional team is essential