

Trans-aortic TAVI: A viable Alternative

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Why trans-aortic route?

- 🌐 30% of patients have unfavourable femoral anatomy in one of the early study
 - 🌐 Henretta JP, Karch LA, Hodgson KJ, Mattos MA, Ramsey DE, McLafferty R, et al. Special iliac artery considerations during aneurysm endografting. *Am J Surg.* 1999;178:212–218. [10.1016/S0002-9610\(99\)00156-7](https://doi.org/10.1016/S0002-9610(99)00156-7)
- 🌐 ~ 17 % TAVI requires alternative routes
 - 🌐 Colin Baker, Michael Reardon. Alternative Access and Closure Options for TAVR. *Cardiac Interventions Today* Sep/Oct 2015

**Our journey started
from a challenging case**

CL, F/82

Height 154cm, Weight 45kg

Past health:

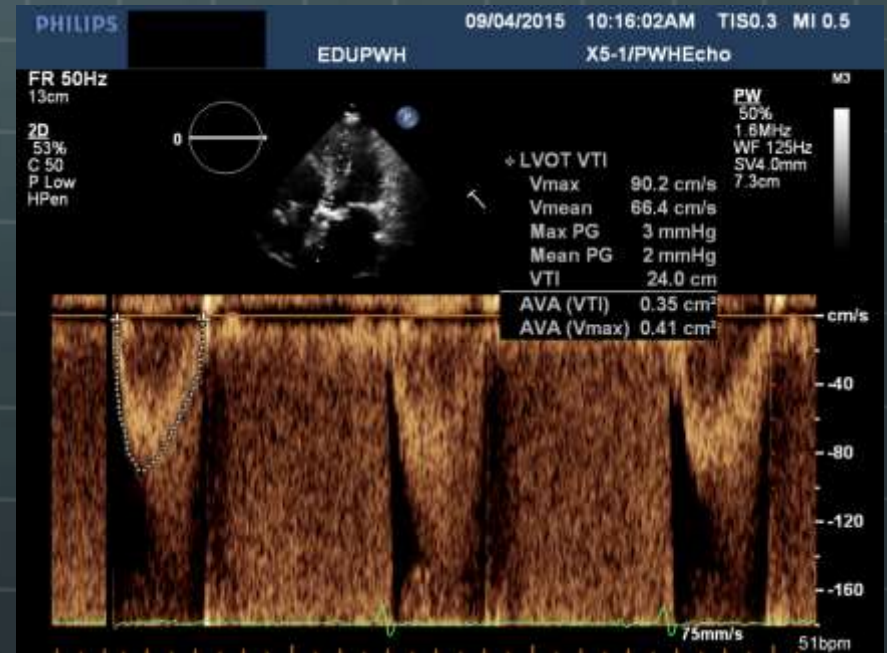
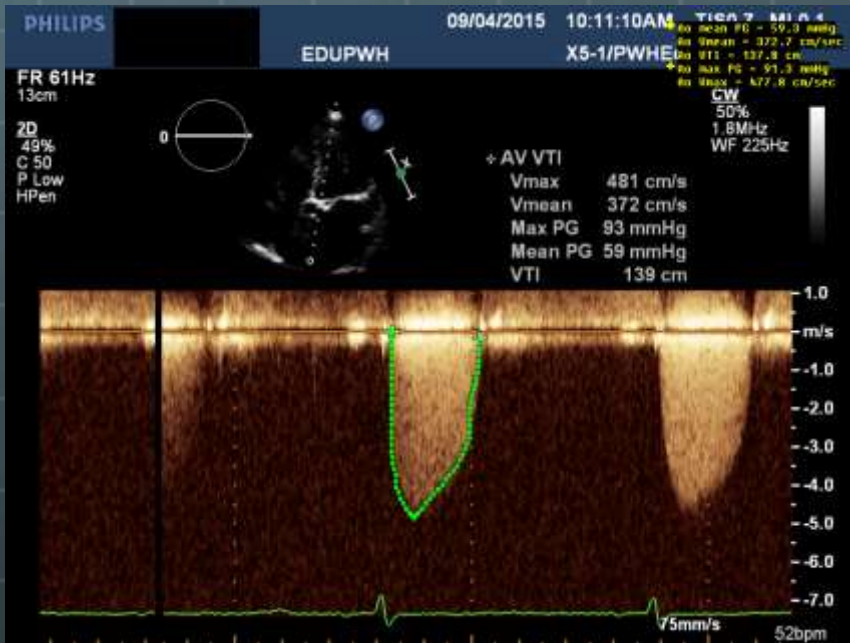
- 🌐 DM, HT
- 🌐 End stage renal failure, on peritoneal dialysis
- 🌐 AF on warfarin
- 🌐 IHD; PCI to dRCA in 2002, PCI to mLAD in 2010

History of present illness:

- 🌐 APO in 02/15, presented with progressive increase in SOB for few weeks.

Echo

- Echo in 04/15: heavily calcified AV with severe AS (mean PG 60mmHg, AVA 0.4cm²), mild AR, moderate MR, mild TR; LVH with preserved LV systolic function, dilated LA





TEE



CT Aortogram

MEDTRONIC ANALYSIS

Max Ascending Aorta Diameter (mm) **26,4**

Sinotubular Junction Diameter (mm) **20,6** x **22,4**
Min Max

ANNULUS

Diameter (mm) **14,1** x **18,6** · **16,4 mm**

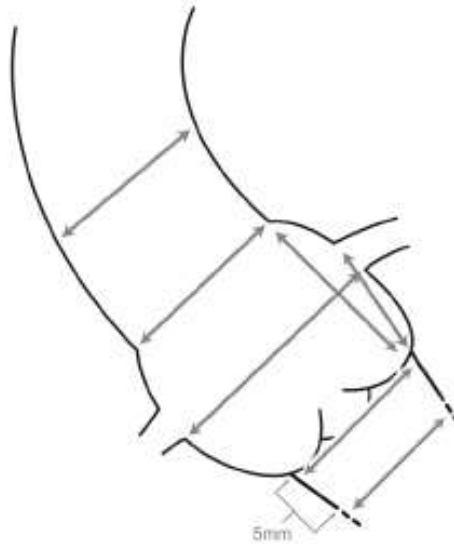
Min Max Mean

Perimeter (mm) **53,0** · **16,9**

Derived Diameter

Area mm², mm

Derived Diameter



Sinus of Valsalva Diameter (mm) **24,5** **23,2** **22,7**
LCC RCC NCC

Sinus of Valsalva Height (mm) **18,8** **17,6** **13,8**
LCC RCC NCC

Coronary Ostia Height (mm) **9,2** **8,8**
Left Right

LVOT Diameter (mm) **13,4** x **20,2**
Min Max

RIGHT

CIA Min Diameter (mm)

5,6 x **5,9**

EIA Min Diameter (mm)

4,6 x **4,8**

Femoral Min Diameter (mm)

1,8 x **2,4**



LEFT

CIA Min Diameter (mm)

4,9 x **6,6**

EIA Min Diameter (mm)

5,6 x **5,7**

Femoral Min Diameter (mm)

4,3 x **5,2**

RIGHT

Subclavian Min Diameter (mm)

4,1 x **5,4**

Annular Angulation

33 °

LEFT

Subclavian Min Diameter (mm)

3,7 x **4,9**

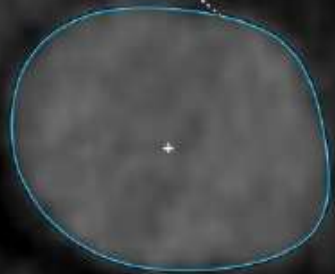
Please review images for direct aortic evaluation.

Calcium: Mild Moderate Severe

Aorta

ANNULUS

Perimeter derived \O : 16,9 mm
Perimeter: 53,0 mm



SOV DIAMETER

\O 23,2 mm



AORTIC ROOT

17-4-2015
Phase: 75,0%



IMPLANTER'S VIEW



LVOT

Min. \O : 13,4 mm
Max. \O : 20,2 mm

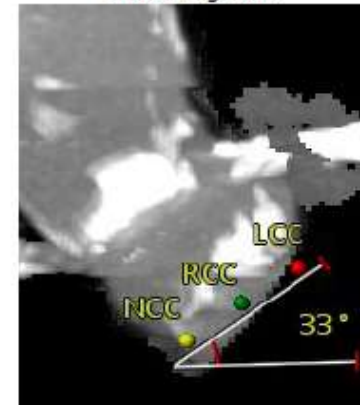


ASCENDING AORTA

Min. \O : 26,2 mm
Max. \O : 26,4 mm

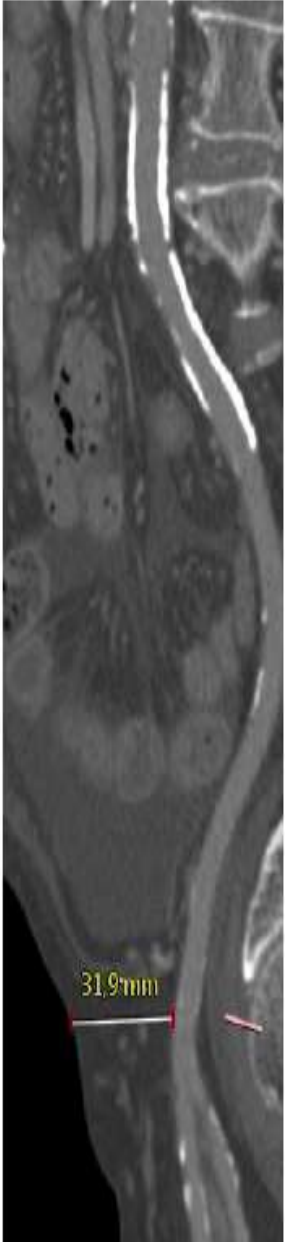
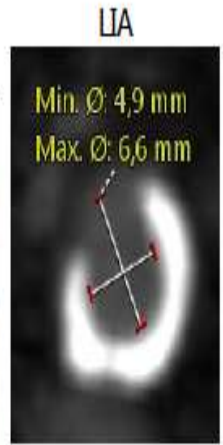
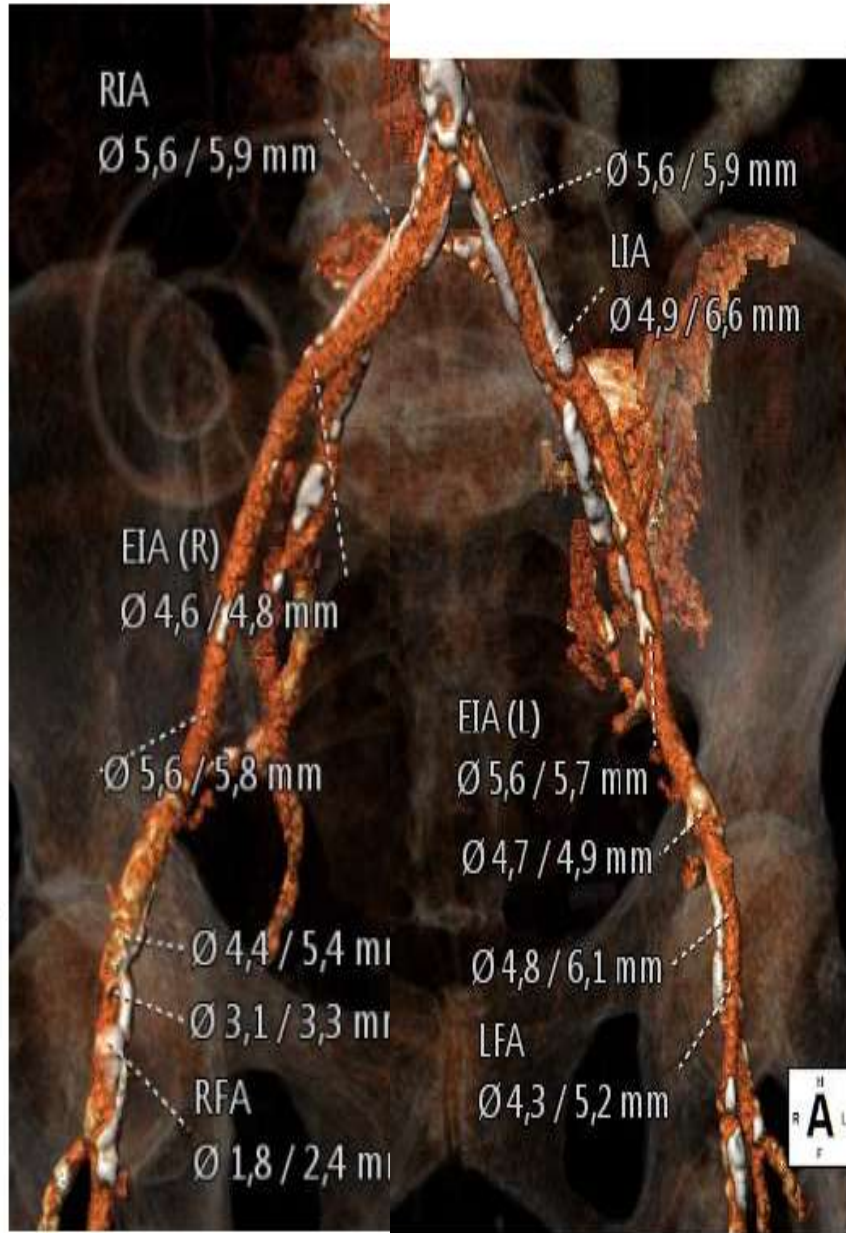
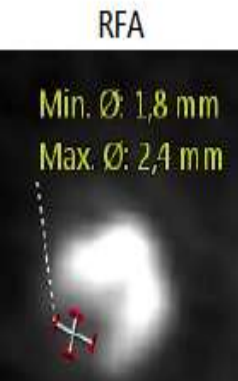
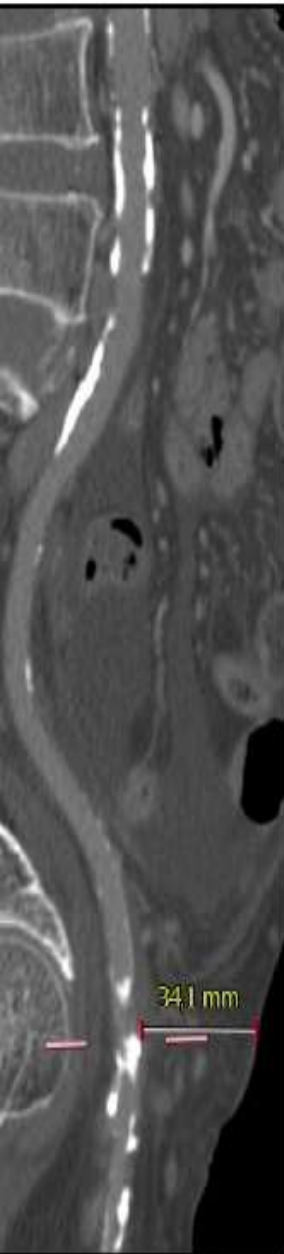


Annular Angulation



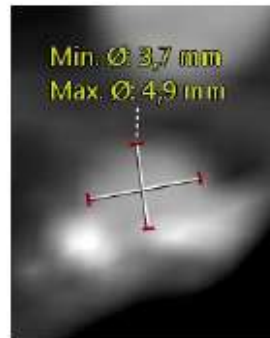
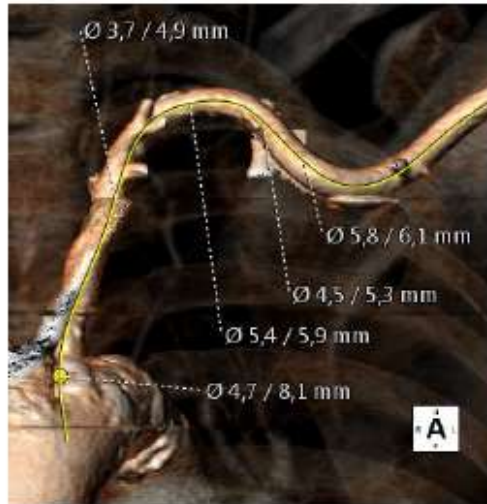
Femoral Access - Right

Femoral Access - Left

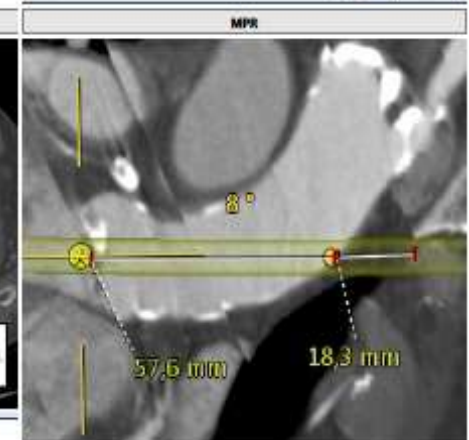
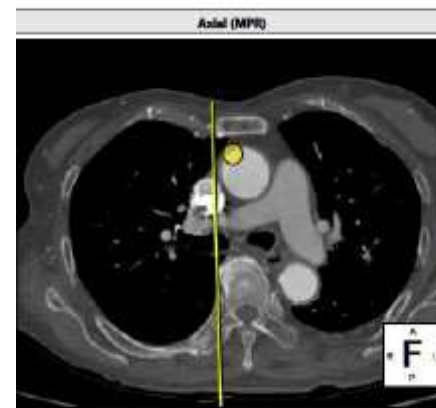
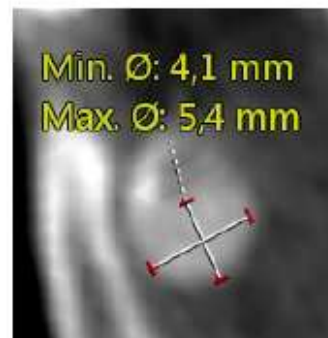
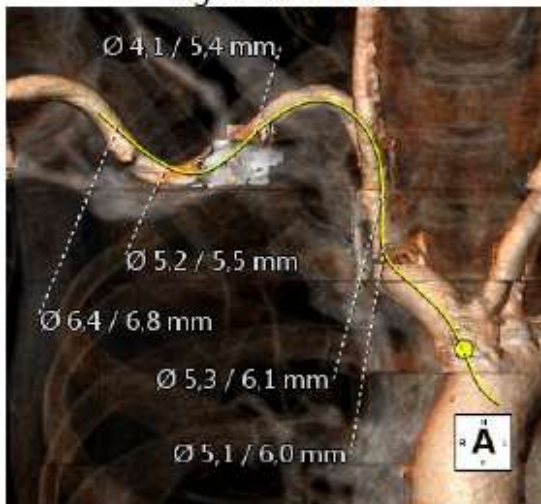



Subclavian Access

Left Subclavian



Right Subclavian



 **Coronary angiogram in 04/15: distal LM 50%, pLAD 80% proximal to mLAD stent, patent RCA stent**

 **STS score 13.22%**

 **Logistic EuroScore 24.61%**

Challenges

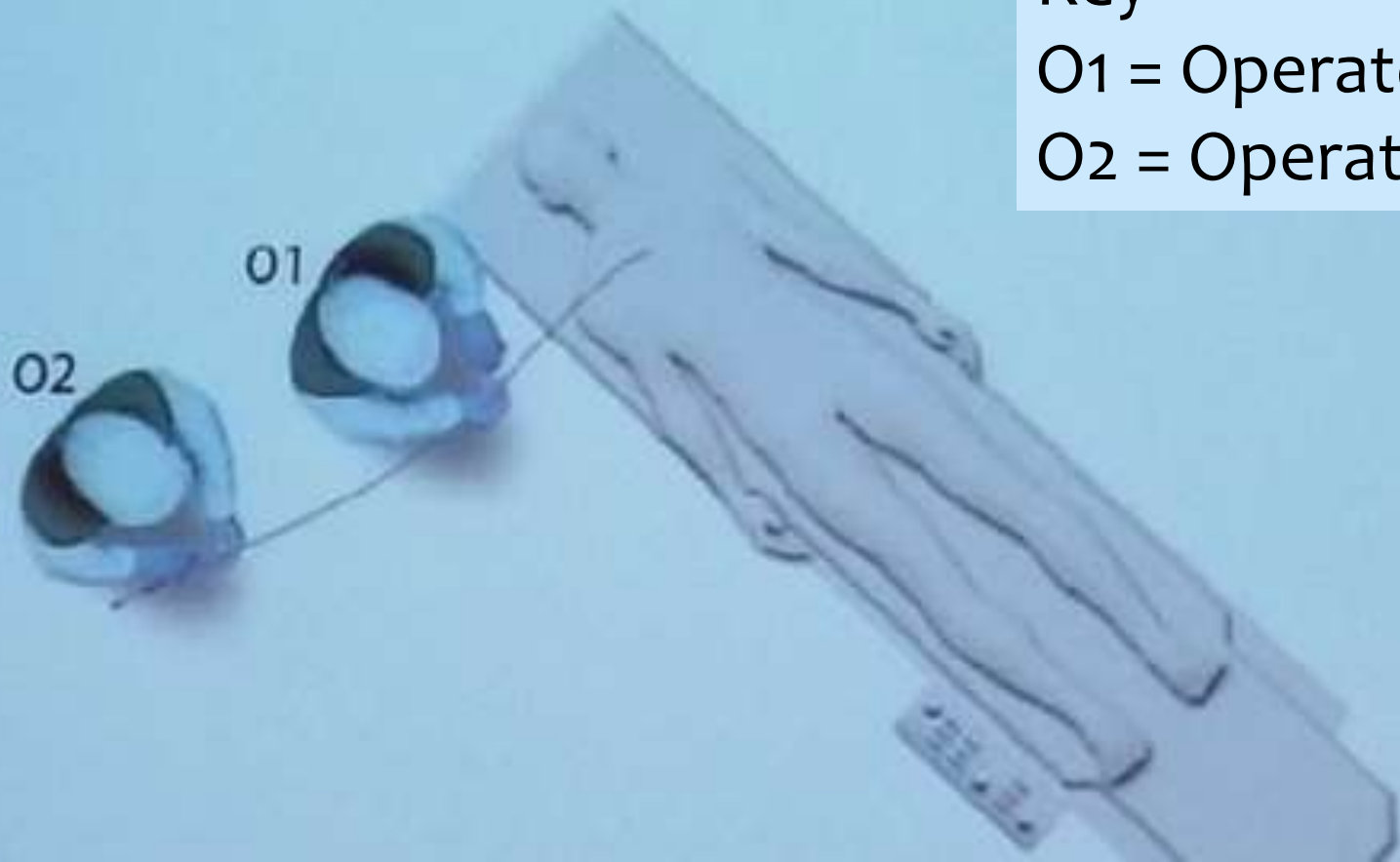
1. Both femorals are very calcified and not suitable in size for TF access. Same as both subclavian arteries.
2. The aortic root is very small and out of the recommended range for even the smallest 23mm CoreValve/Evolut R.
3. The coronary take-off is on the lower end for both left and right. Sinus of valsalva is small as well. Leaflet calcification is mainly on the LCC.

Heart team meeting

Suggestion:

- high risk candidate for SAVR and CABG
- Recommend PCI to LM and LAD, then TAVI by direct aortic approach, as not suitable femoral or subclavian access.

Set up for direct aortic TAVI



Key

O1 = Operator 1

O2 = Operator 2

Positioning

Operators

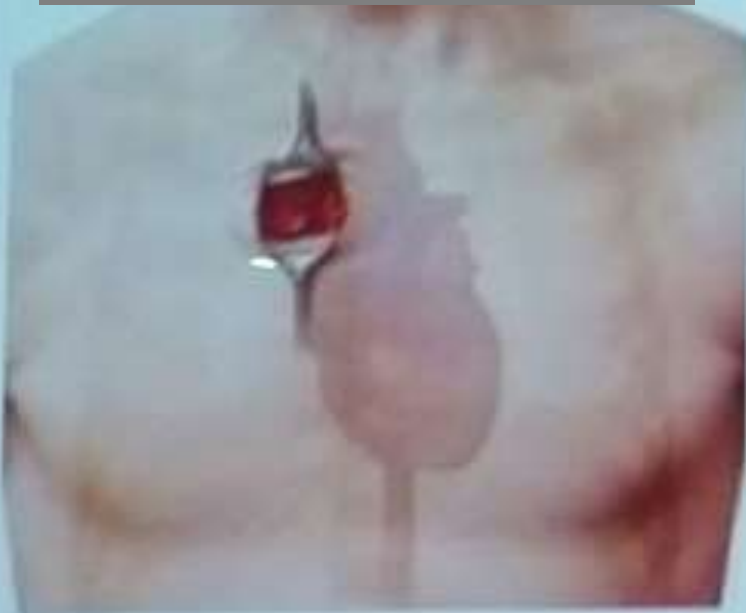
TEE

Monitor



Surgical access

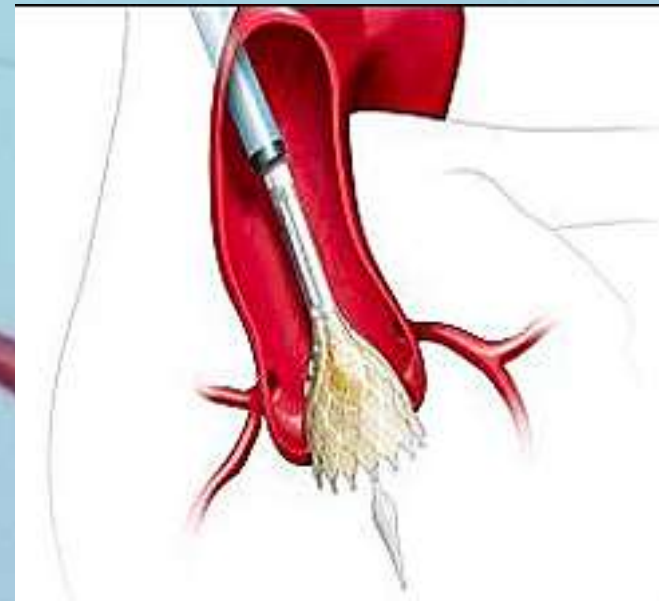
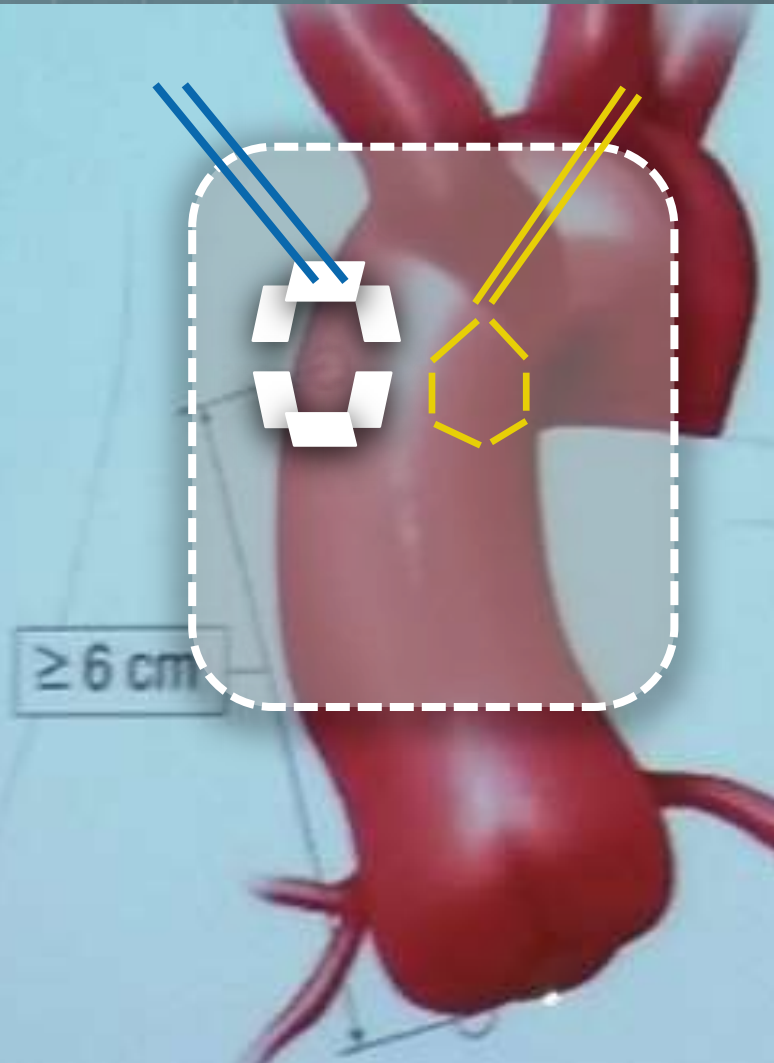
Parasternal incision



Partial sternotomy



Surgical exposure



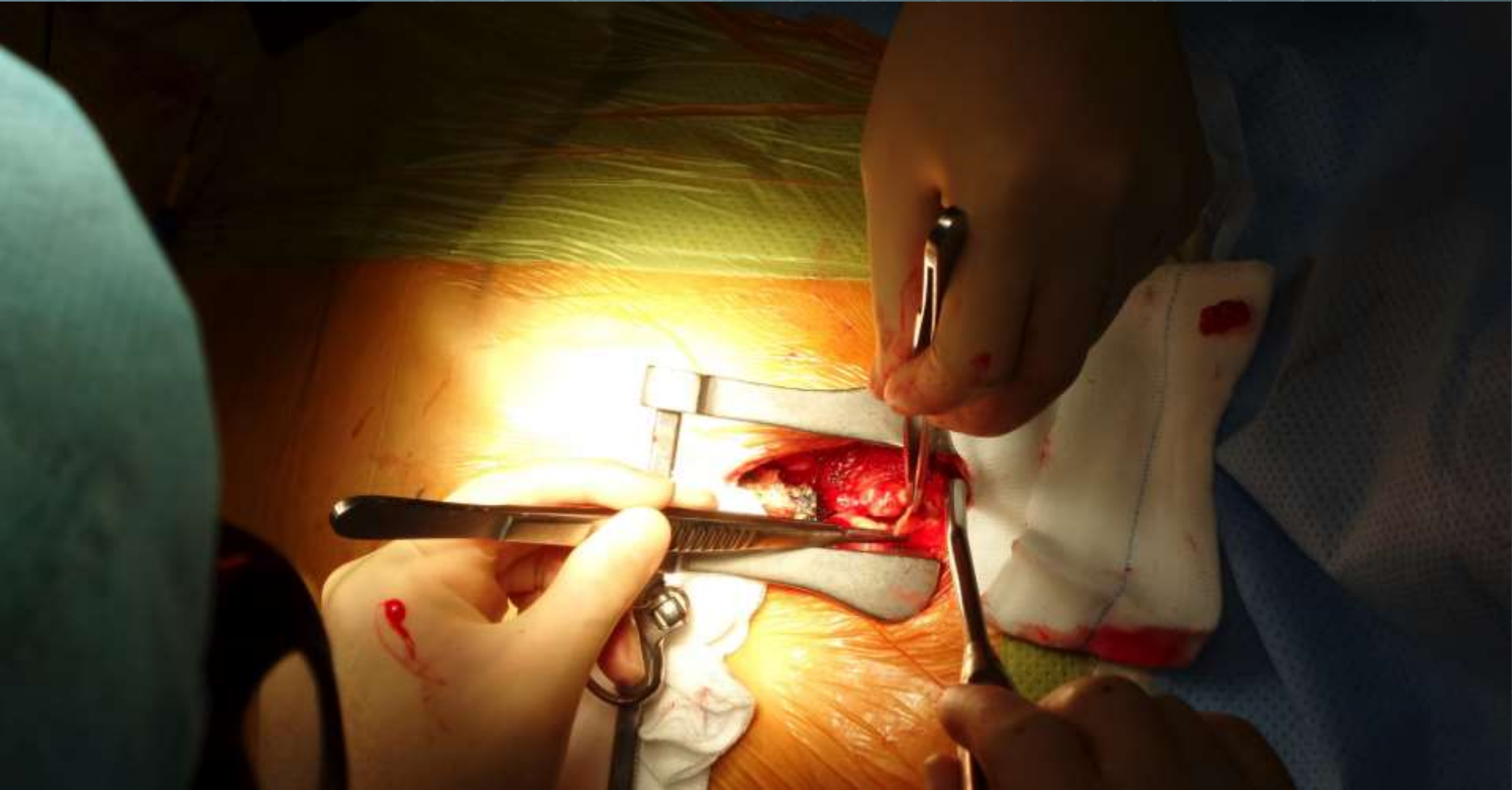
J sternotomy



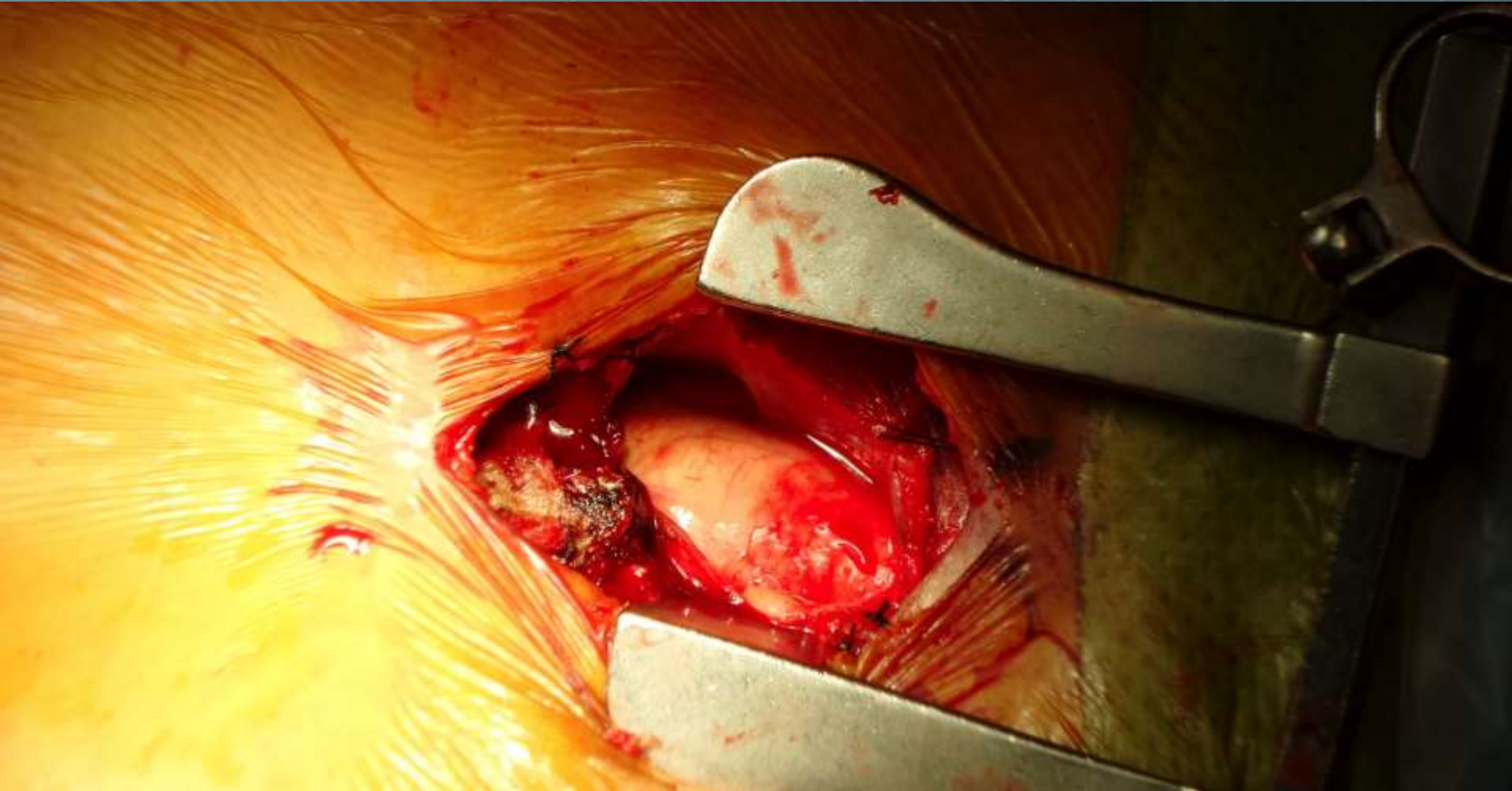
J sternotomy



Open and pericardium



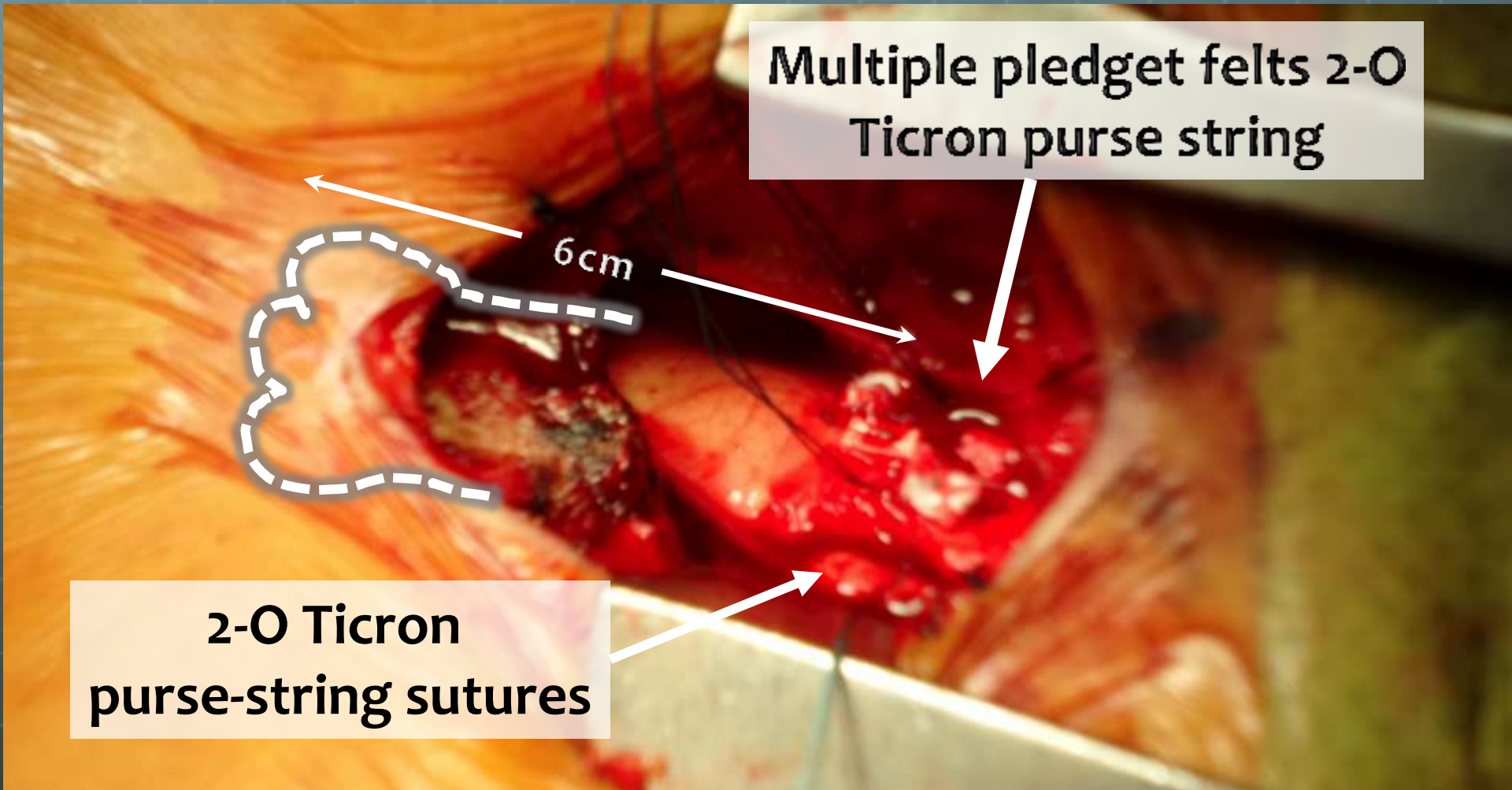
Pericardial stay stitches



Purse-string sutures over distal ascending aorta



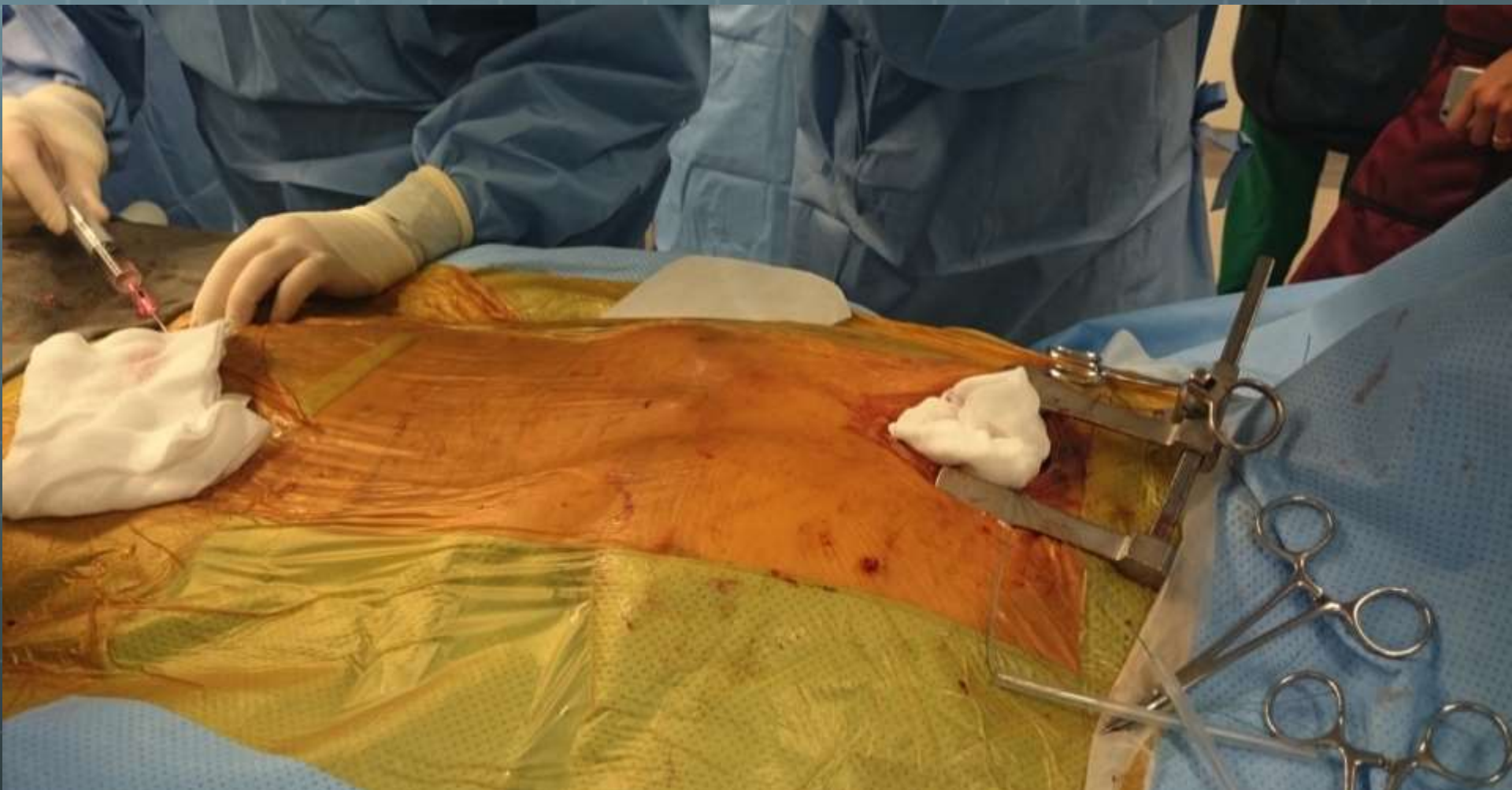
Purse string sutures



Multiple pledget felts 2-0
Ticron purse string

2-0 Ticron
purse-string sutures

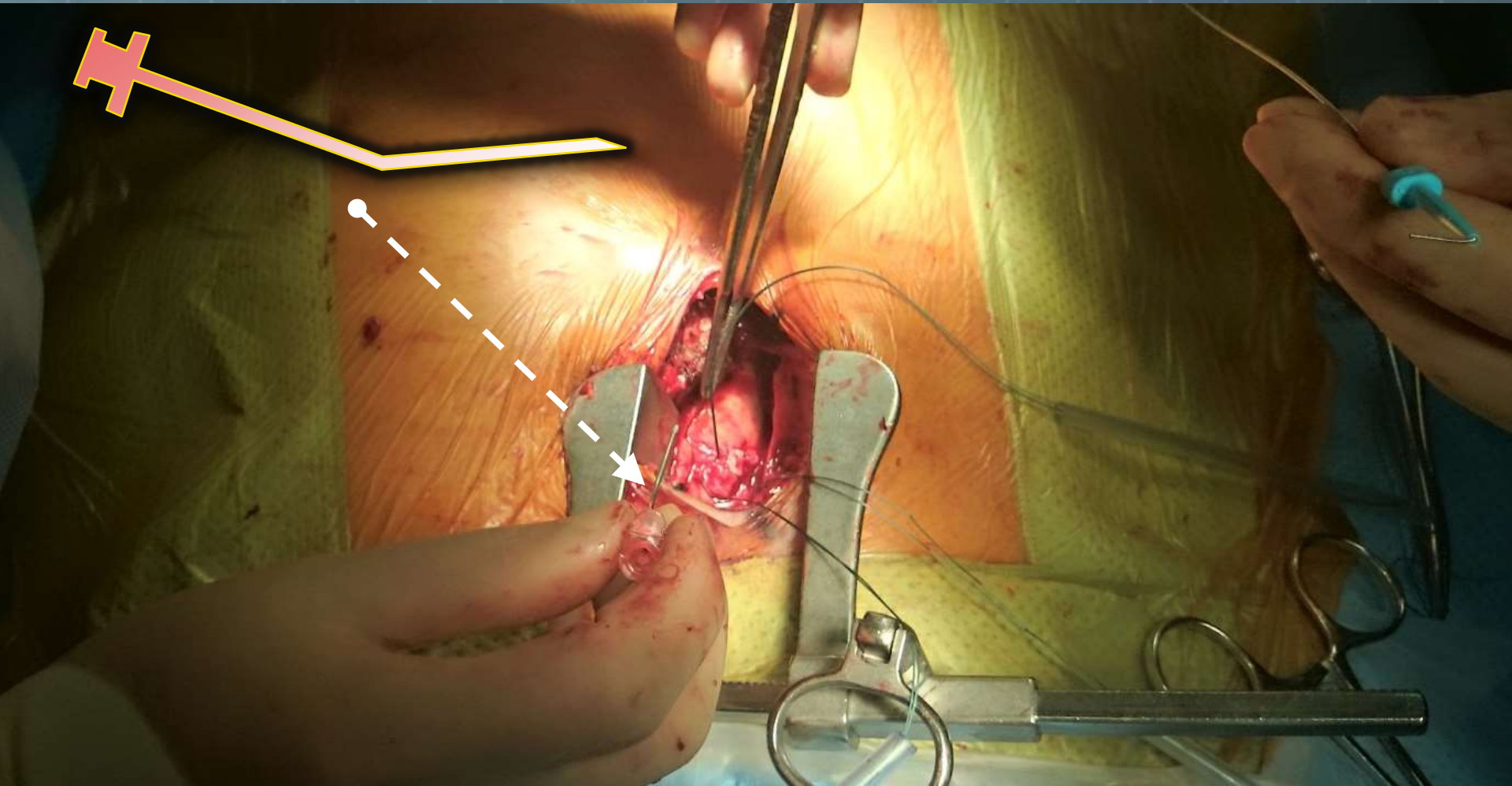
Femoral vein puncture



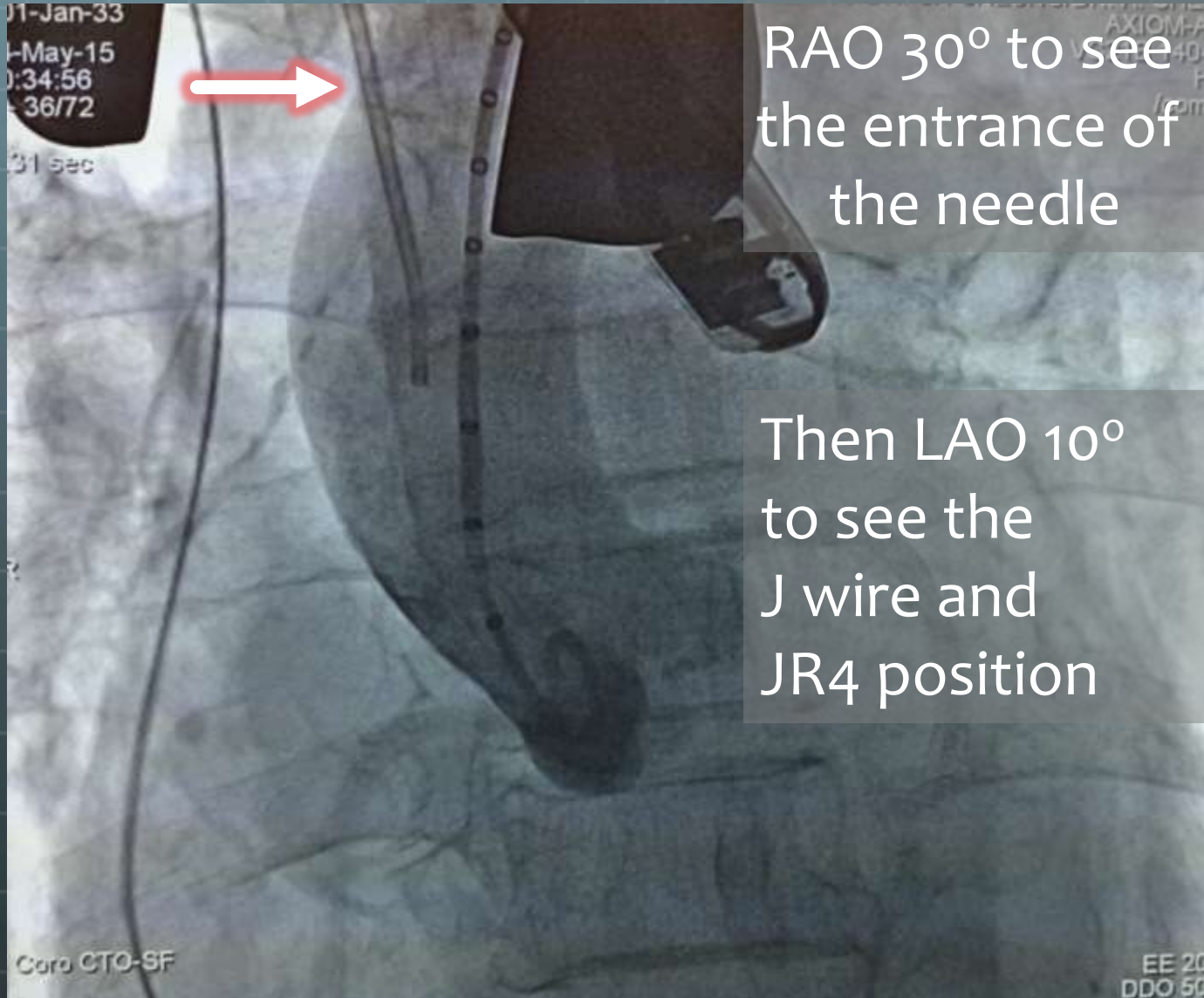
Procedure

- After purse-strings and guarding wire to femoral vein (prepared for CPB)
- Give systemic heparin
- Aim ACT >250
- Cell saver to the surgical field to reduce blood loss

Bend the needle to facilitate the insertion angle



Check the distance between the puncture site from aortic root

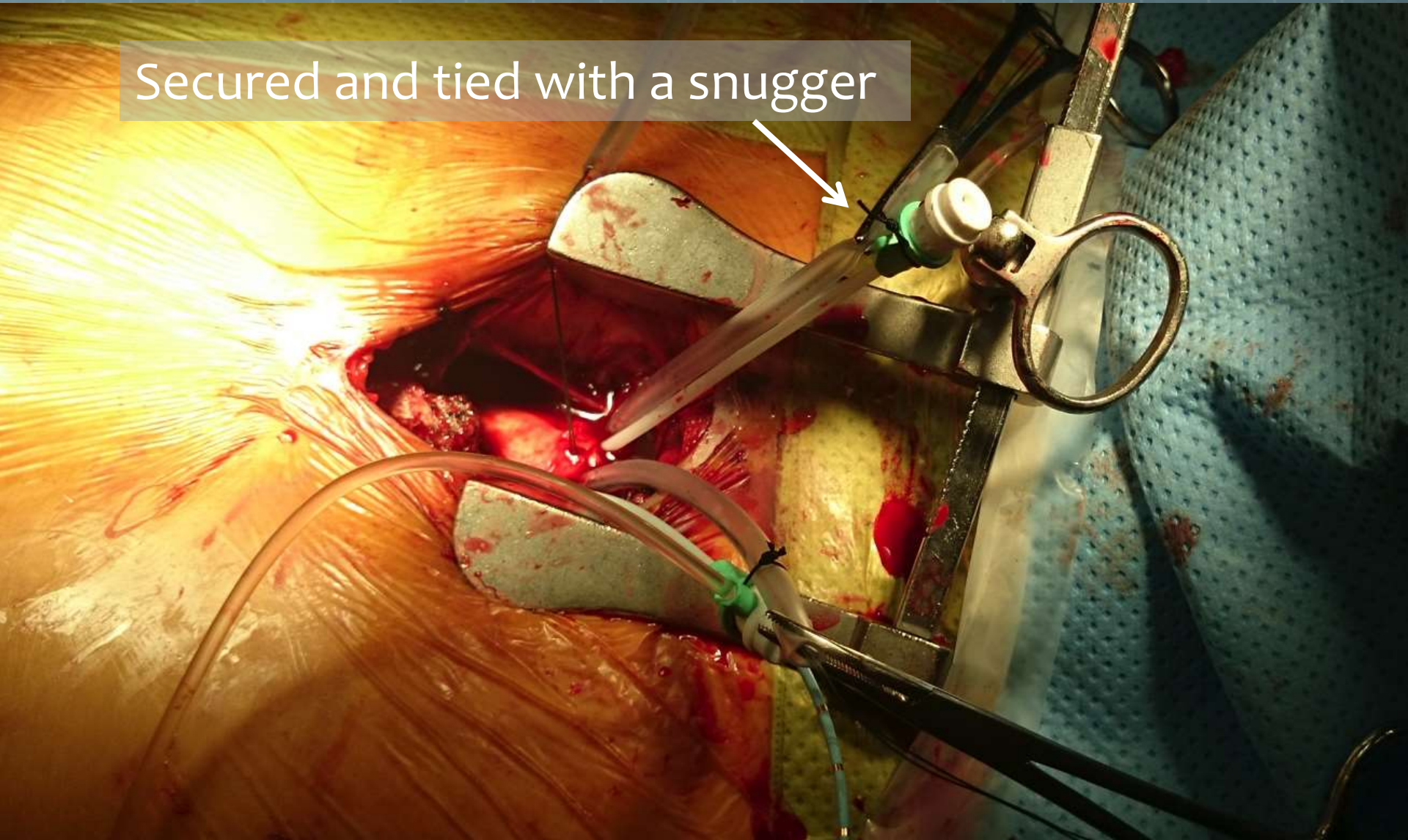


RAO 30° to see the entrance of the needle

Then LAO 10° to see the J wire and JR4 position

2 x 6 Fr Sheaths placed

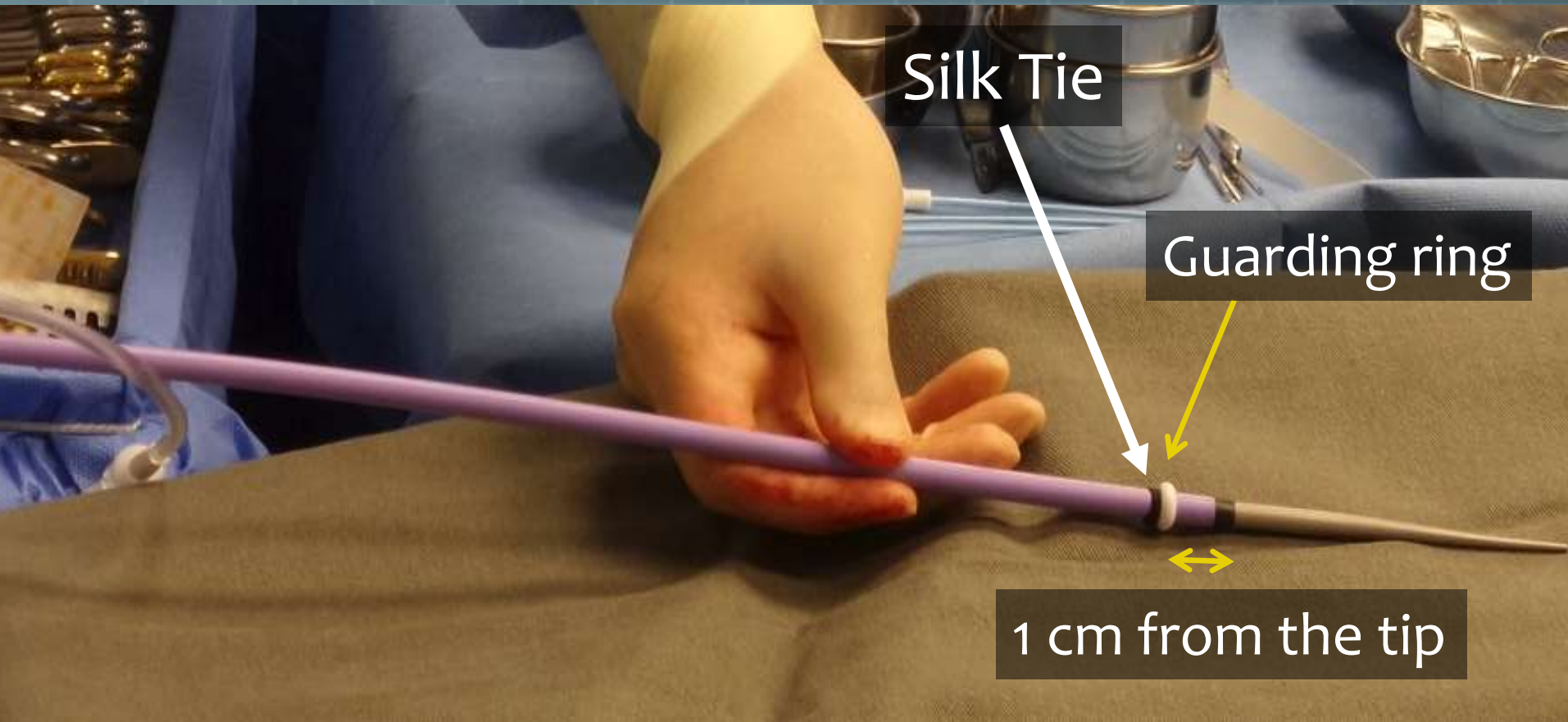
Secured and tied with a snugger



Preparation of 18 Fr Sheath



Preparation of the 18 Fr sheath



Silk Tie

Guarding ring



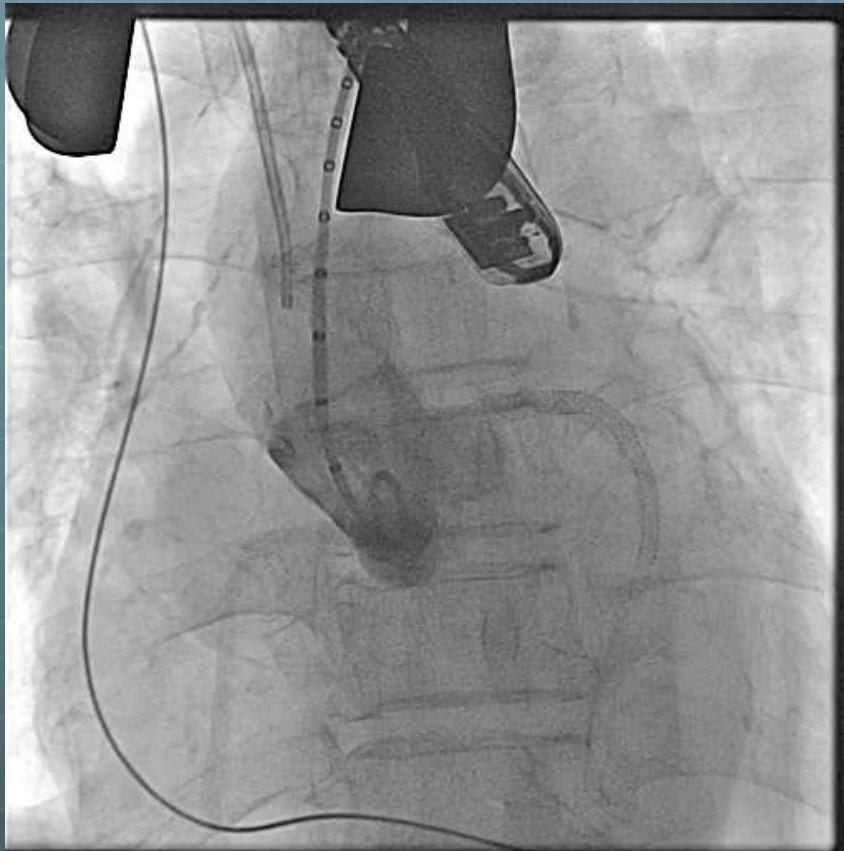
1 cm from the tip

Introduction of Sheath

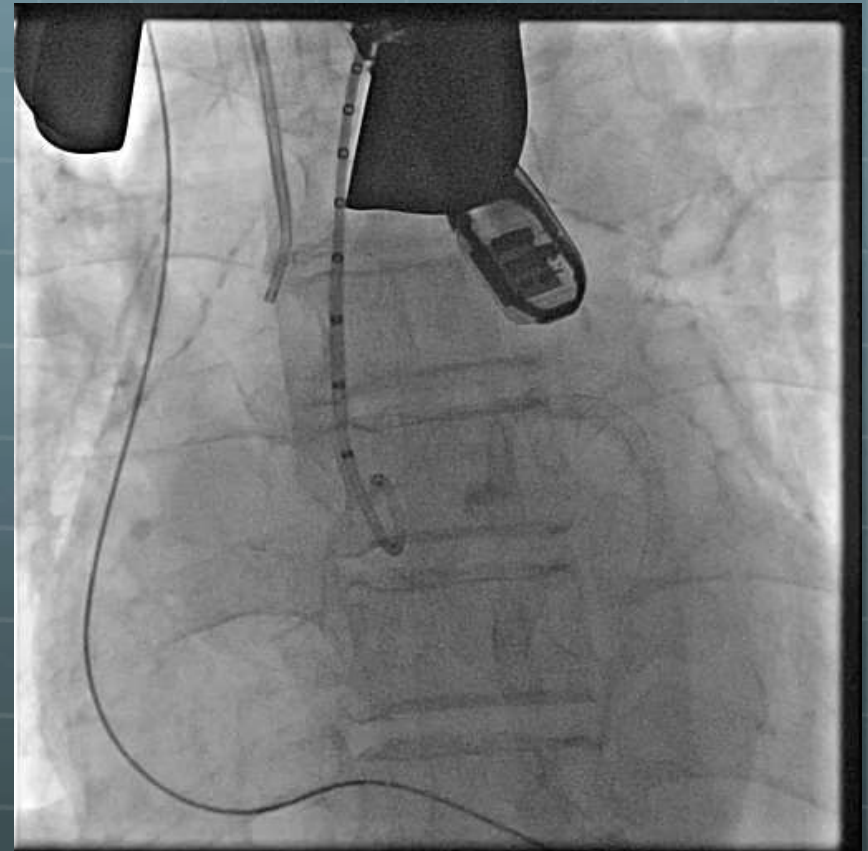


Tied down the 18 Fr Sheath
with snugger
and anchored to skin





Baseline Aortogram

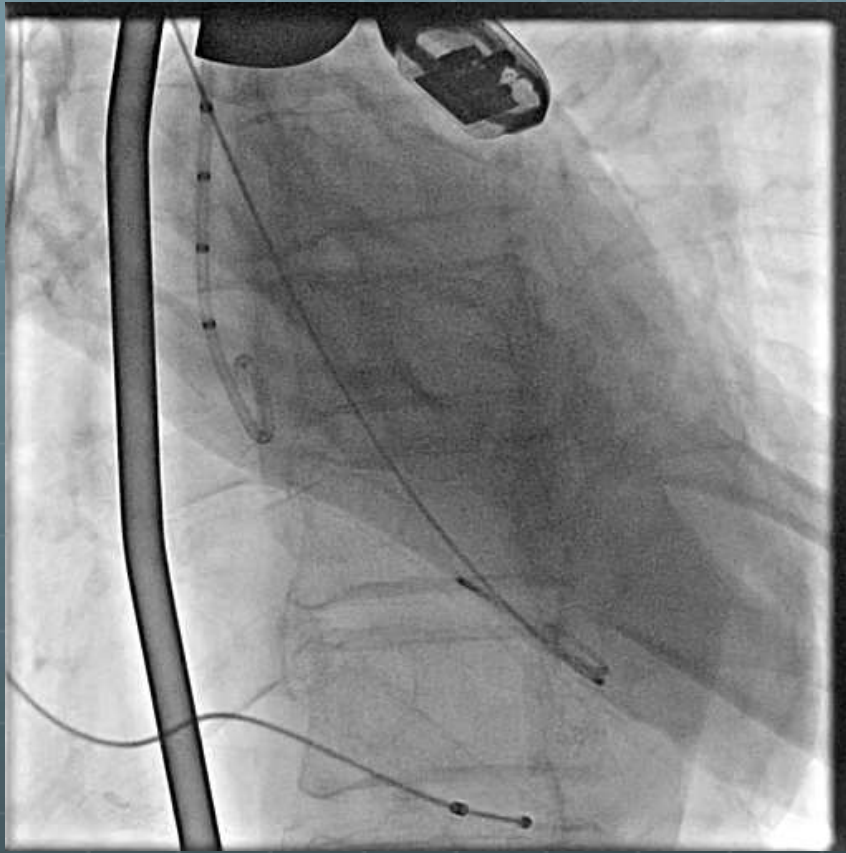


Wire crossing AV

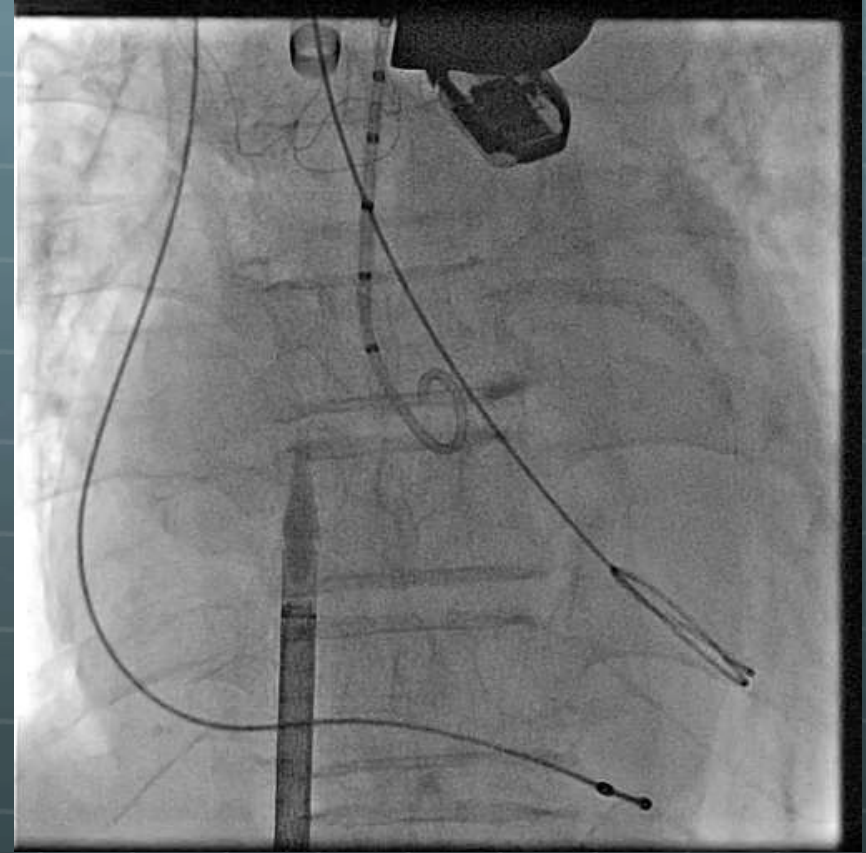
Simultaneous pressure measurement:

Ao 81/31, LV 125/8

Courtesy of Dr Gary Cheung

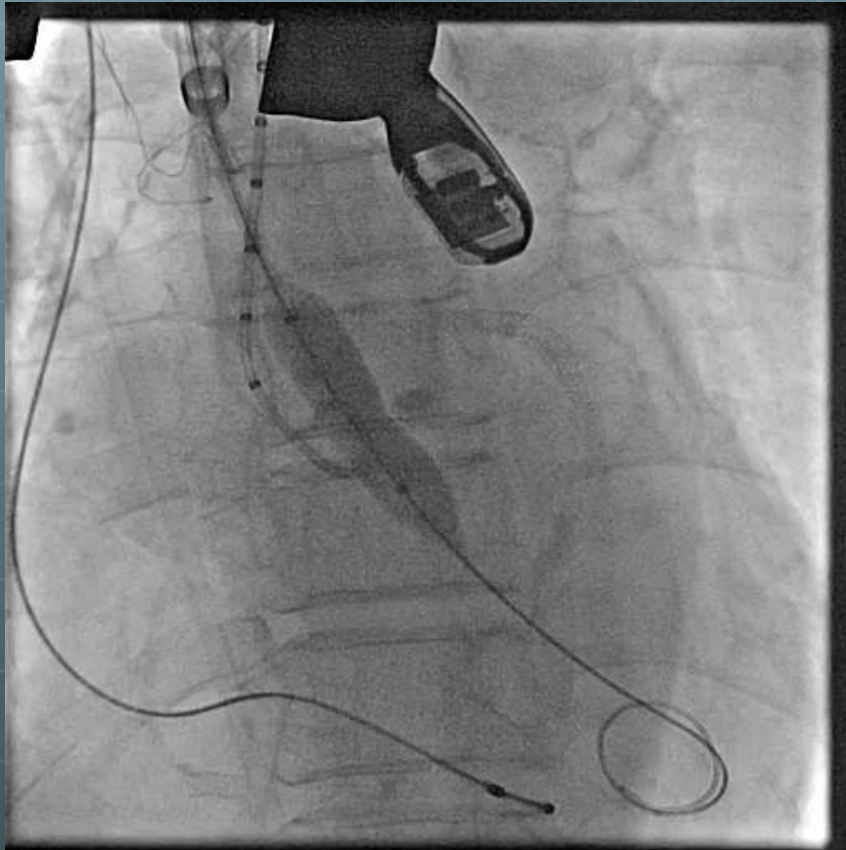


Inserting 18Fr Cook
Sheath over Confida wire

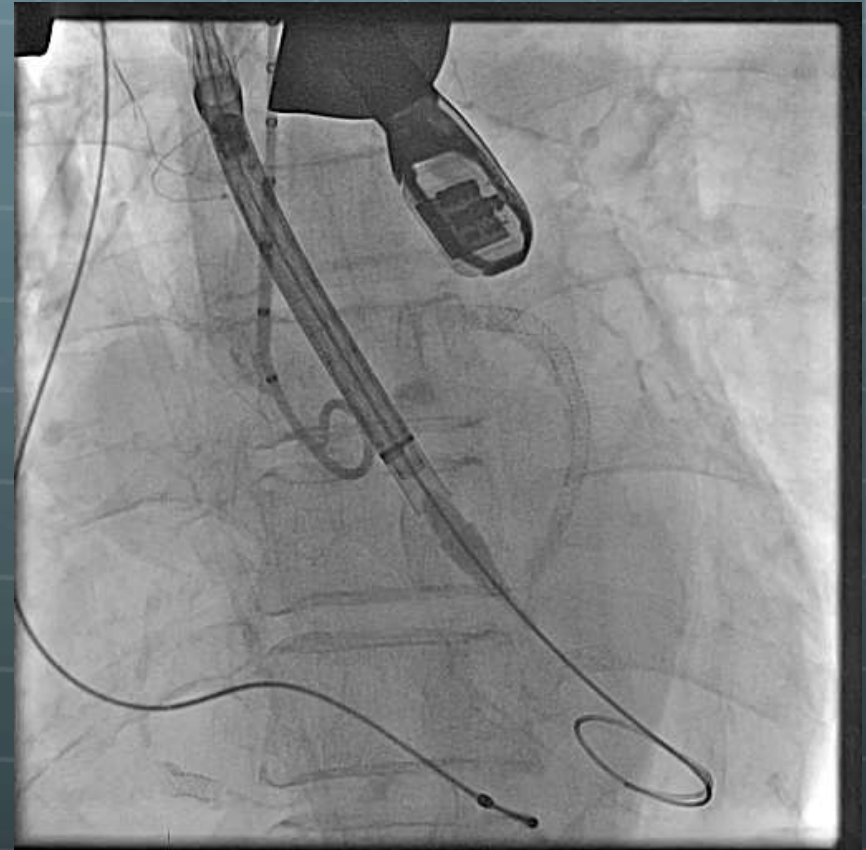


Checking the loaded
Evolut R Bioprosthesis
over the chest wall

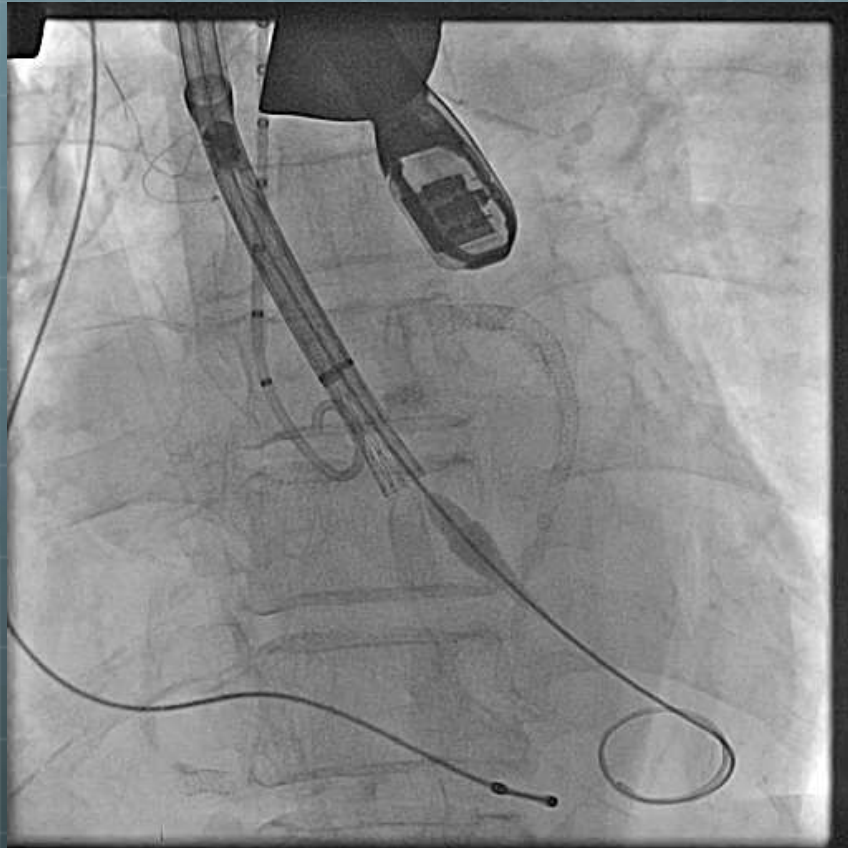
Courtesy of Dr Gary Cheung



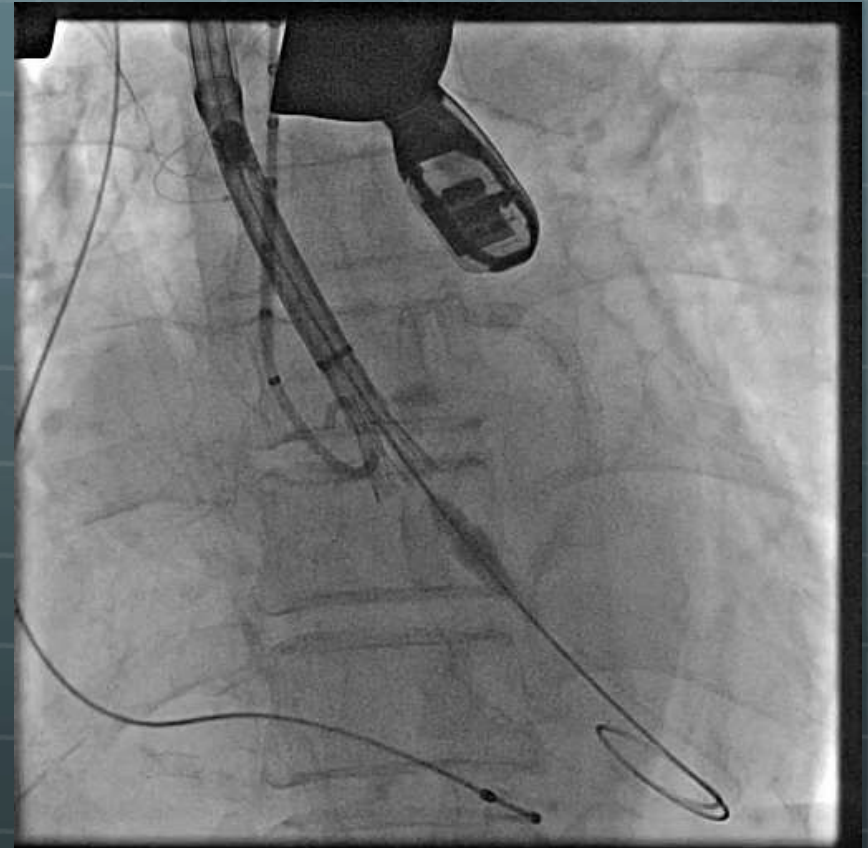
BAV by 15mm balloon
under rapid pacing 150bpm



First position checking

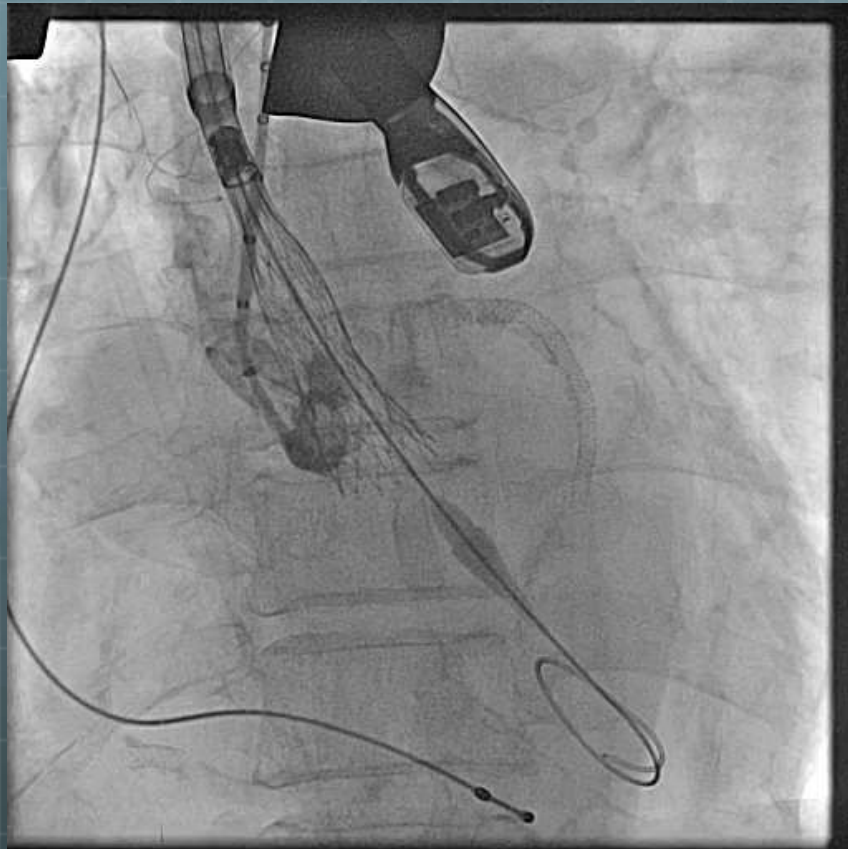


Position checking at
Band 0



Further valve
deployment

Courtesy of Dr Gary Cheung

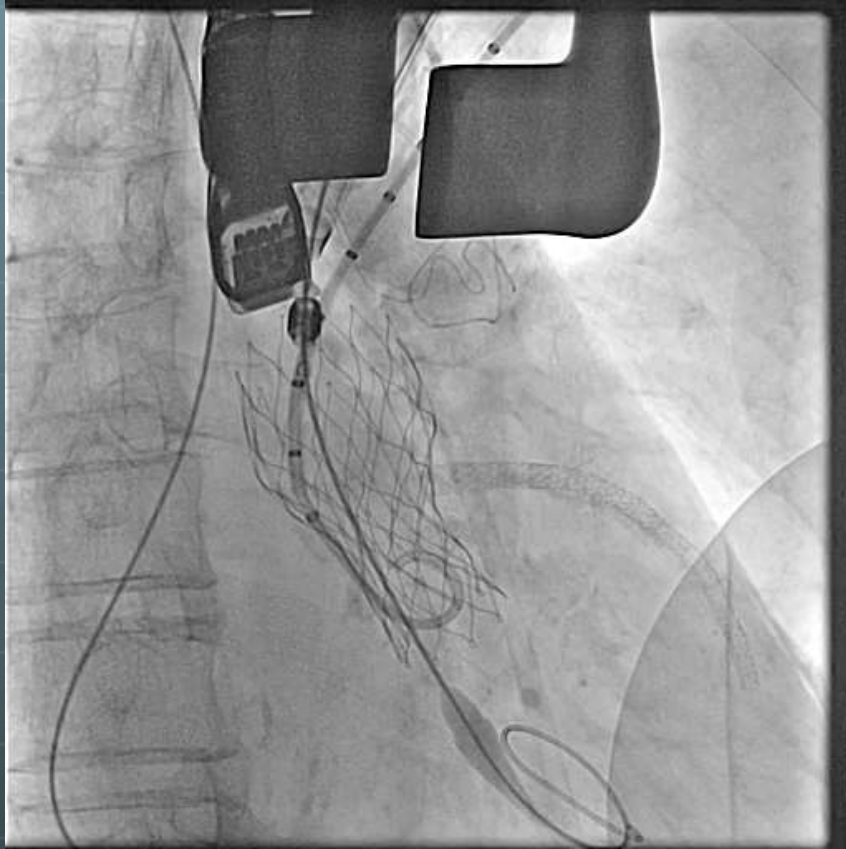


Final position checking
before the point of no
return

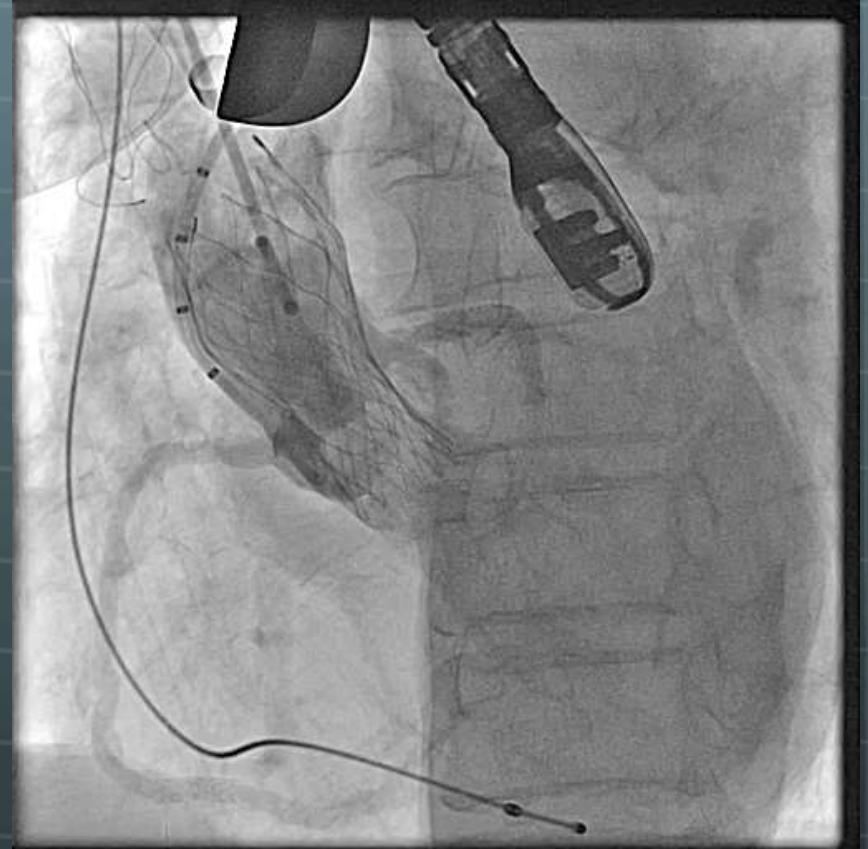


Final part of valve
deployment

Courtesy of Dr Gary Cheung

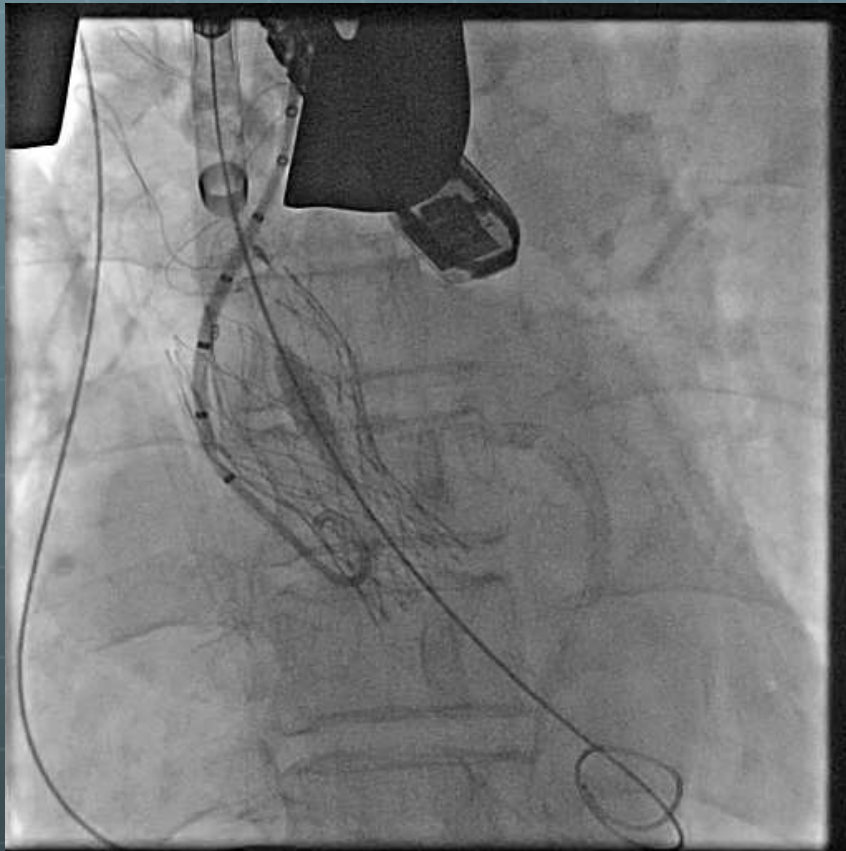


Aortogram at RAO

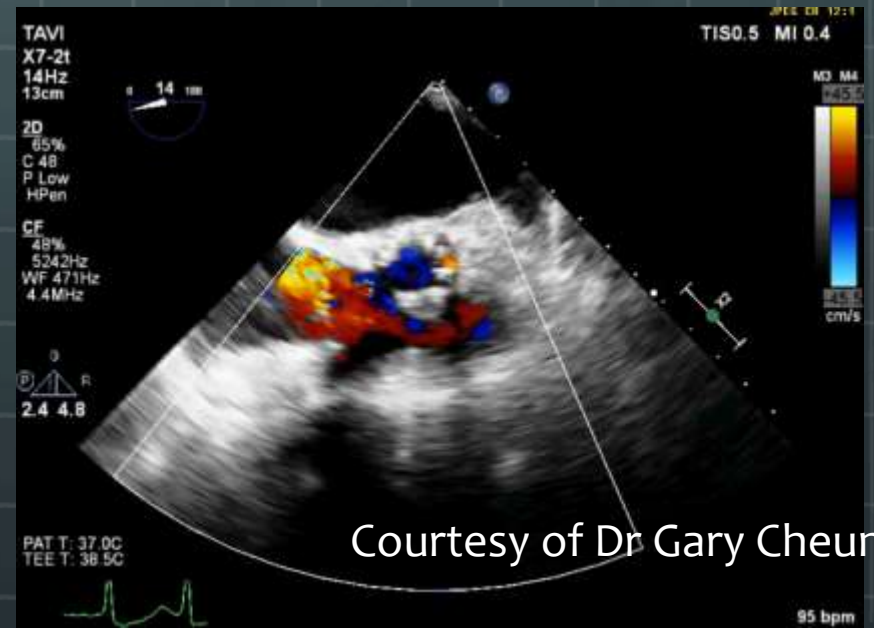
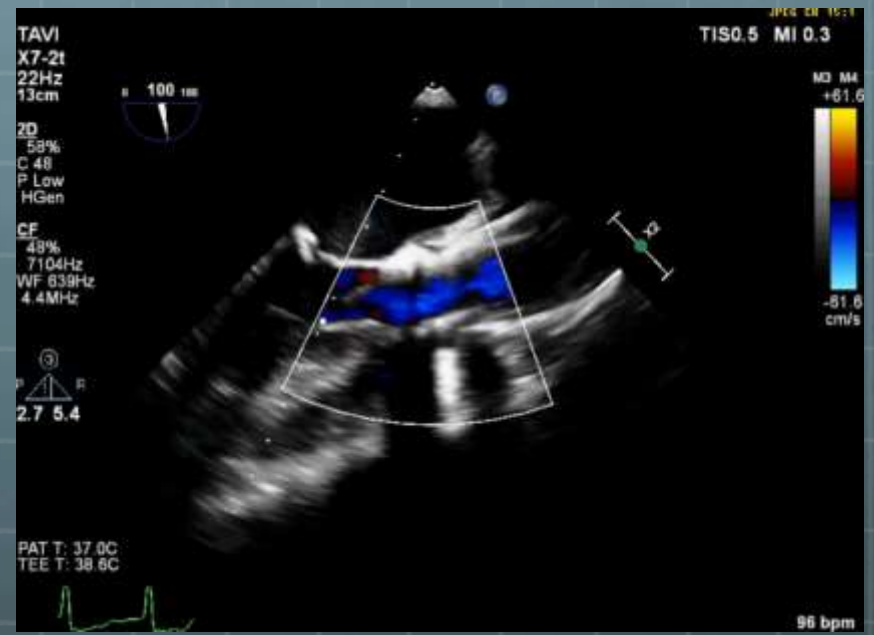


Aortogram at LAO

Courtesy of Dr Gary Cheung

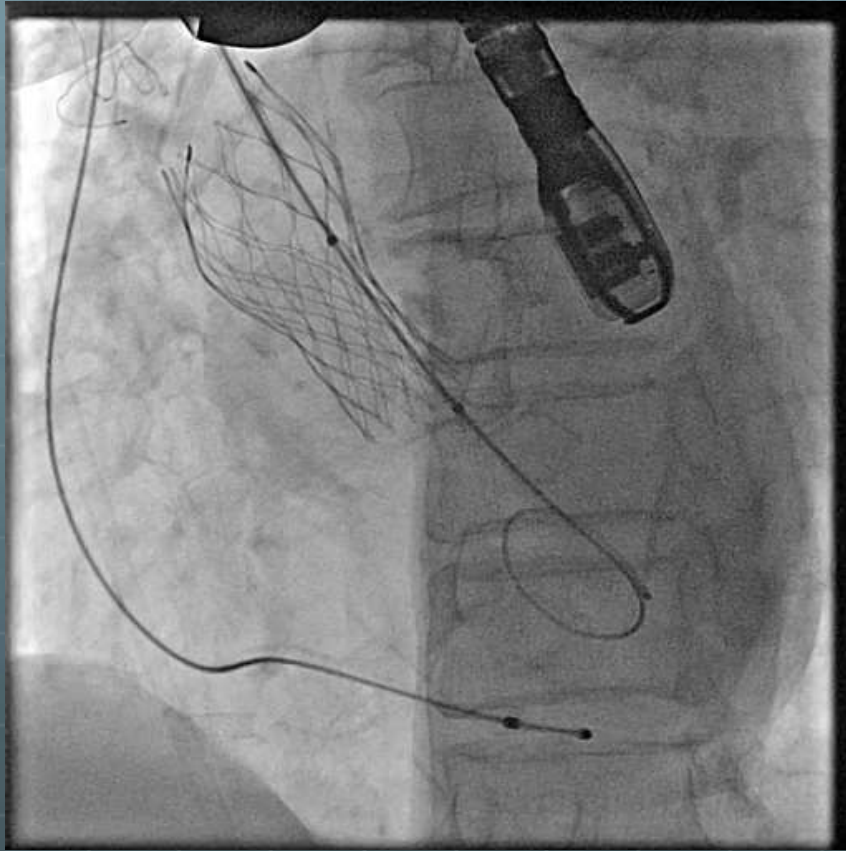


Closing capsule

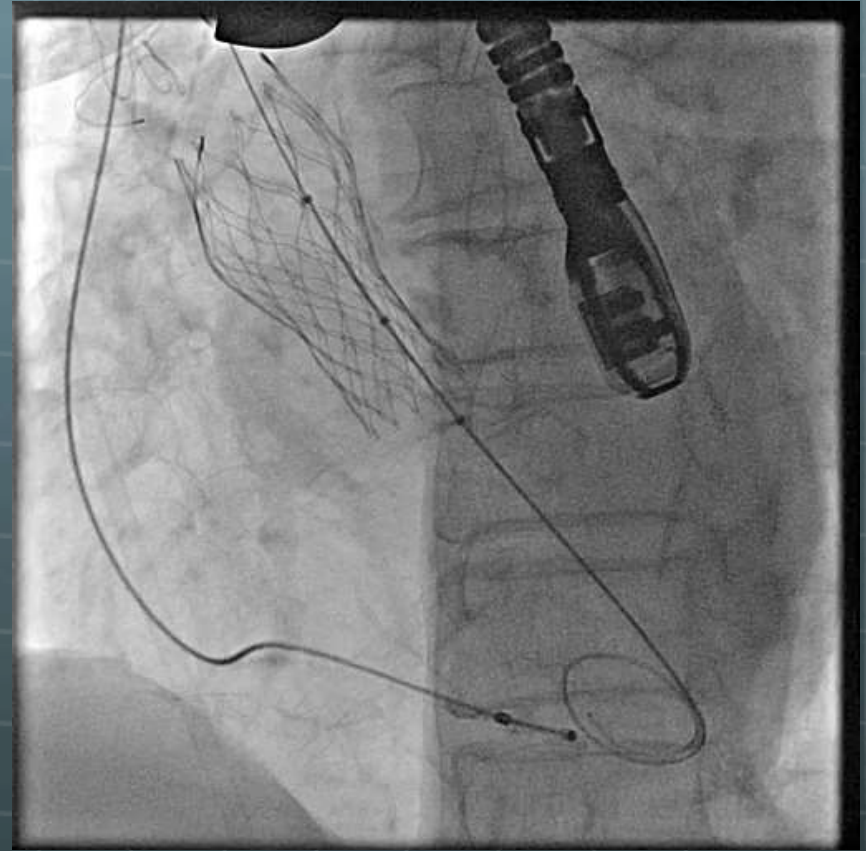


Courtesy of Dr Gary Cheung

Simultaneous pressure: Ao 105/31, LV 130/4



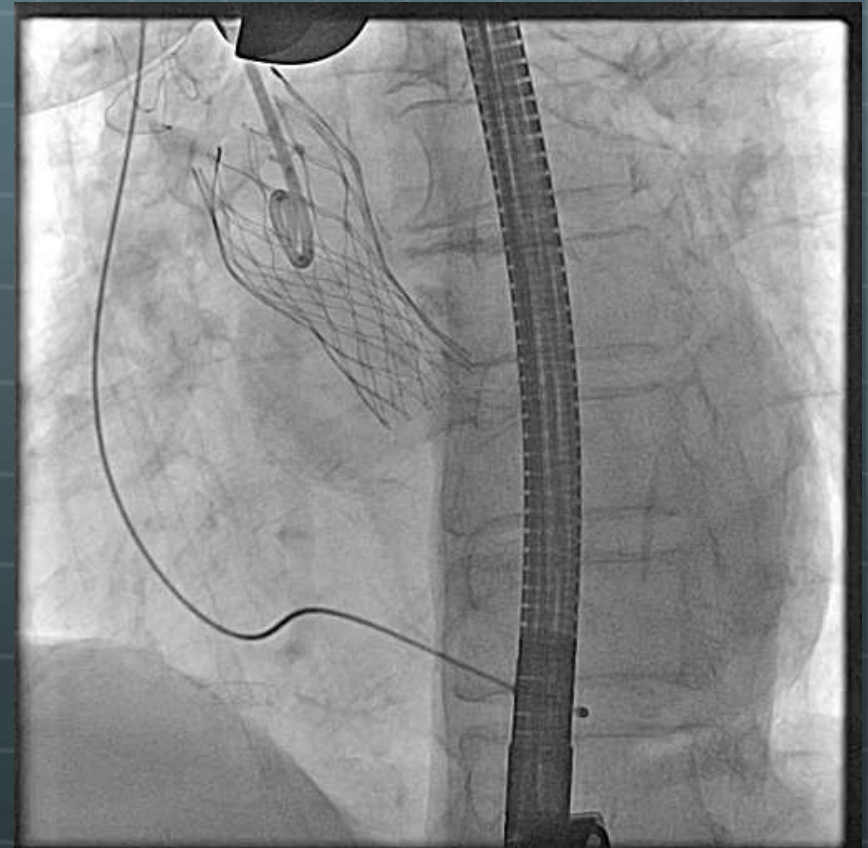
Postdilatation by 15mm
balloon



Postdilatation by 16mm
balloon

Simultaneous pressure: Ao 93/29, LV 86/9

Courtesy of Dr Gary Cheung



Final Aortogram

Courtesy of Dr Gary Cheung

Removal of sheath and tie down purse string sutures







Sternal closure

- 19 Blake drain placed in pericardial space
- Sternum closed with sternal wire
 - Figure of 8 x 1
 - Single loop x 1
- Skin closed with Vicryl 1 and 3-0 Vicryl

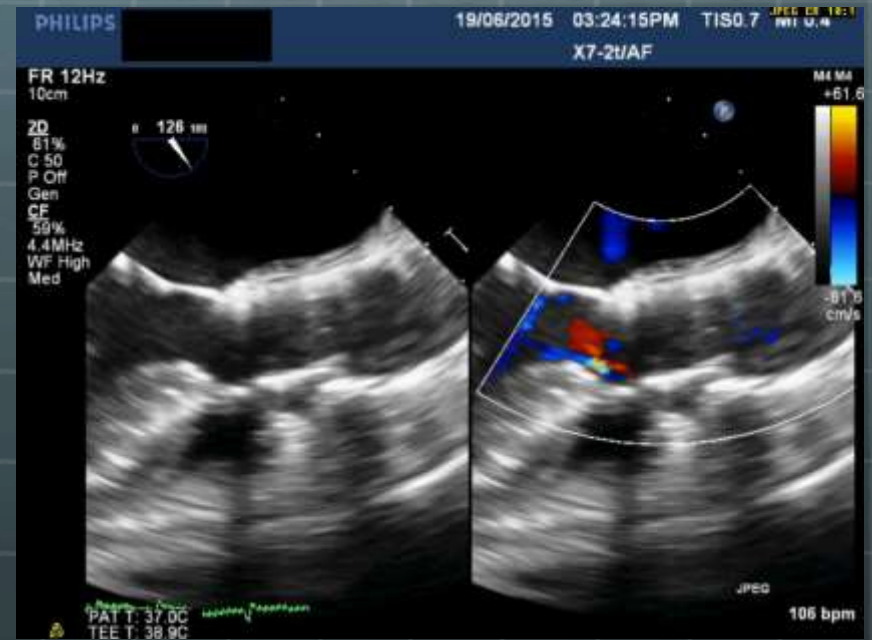
Drain exit site



Progress

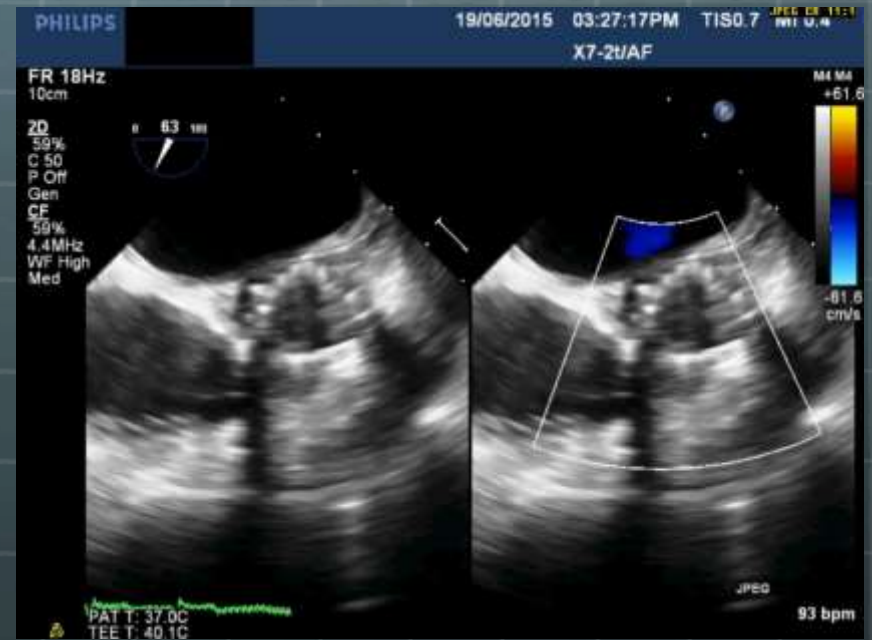
-  Extubated on the same day.
-  Stayed in ICU for one day.
-  Off temp. pacing at day 3.
-  Discharge home on day 8.

1 Month FU TEE



Courtesy of Dr Gary Cheung

1 Month FU TEE



Courtesy of Dr Gary Cheung

Direct aortic TAVI program at

Table 1. Baseline characteristics of patients

Baseline Characteristics (n= 5)	No. (%)
Age (yr)	78.4 +/- 3.9
Gender	
Male	3(60)
Female	2(40)
STS PROM (%)*	7.02
NYHA Class III – IV^	3(60)
Comorbidities	
History of Stroke	1(20)
Coronary artery disease	4(80)
Chronic renal failure requiring dialysis	1(20)
Diabetes Mellitus	3(60)
Peripheral vascular disease	2(40)
Echocardiogram Features	
Mean LVEF (%) #	63 +/- 0.05
Mean gradient (mmHg)	63.2+/-12.4
Mean AVA (cm ²) §	0.62+/-0.18
Moderate to severe mitral regurgitation	2(40)

*Society of thoracic surgeons predicted risk of mortality expressed in percentage |

^ New York heart association heart failure classification

Left ventricular ejection fraction

§ Aortic valve area

Table 2. Procedural information for direct aortic TAVI

Procedural information (n=5)	No. (%)
Approach	
Right parasternal mini-thoracotomy	4 (80)
Upper J partial sternotomy	1 (20)
Valve size implanted	
Evolut R Corevalve 23mm	1 (20)
Evolut R Corevalve 26mm	1 (20)
Evolut R Corevalve 29mm	3 (60)
Total procedural time (mins)	171.4+/-16.9
Aborted procedure	0
Converted to full sternotomy	0
Reoperation for bleeding	1 (20)
Intraprocedural mortality	0
Vascular access complications*	1 (20)
Aortic dissection / perforation	0

*Aortic sheath insertion site bleeding leading to reoperation for hemostasis

Parasternal incision



Table 3. Echocardiographic and clinical outcomes*

Parameters	No. (%)	
	At Discharge	3 months
Death	0	0
All cause mortality	0	0
Cardiac related mortality	0	0
Stroke / TIA	1 (20)	1 (20)
Acute kidney injury requiring Renal replacement therapy	2 (40)	2 (40)
Myocardial infarction	0	0
Major bleeding complication #	1 (20)	1 (20)
Major vascular access complications	1 (20)	1 (20)
Endocarditis	0	0
Pacemaker implantation	0	0
Post implantation immediate LV systolic to aortic pressure gradient (mmHg)	0.4 mmHg	
Echocardiographic findings at 1 month ^		
Mean LVEF (mmHg)	57 +/- 0.03	
Mean AV gradient (mmHg)	8.3 +/- 5.2	
Mean AVA (cm ²)	2.2 +/- 0.6	
Paravalvular regurgitation (more than mild)	0	
Valve thrombosis	0	
Readmission for valve intervention since discharge	0	

Conclusion

- 🌐 A significant portion of patients in Asian has limited peripheral access for TAVI
- 🌐 Direct aortic TAVI is a good alternative when peripheral access is not favourable
- 🌐 Heart team approach with allow versatile patient-specific access selection

Acknowledgement

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