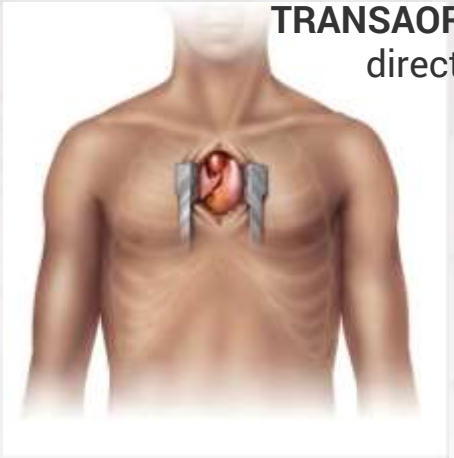
Alternative Vascular Access: Where and How to Open & Close

Yohei Ohno, MD, PhD, FESC

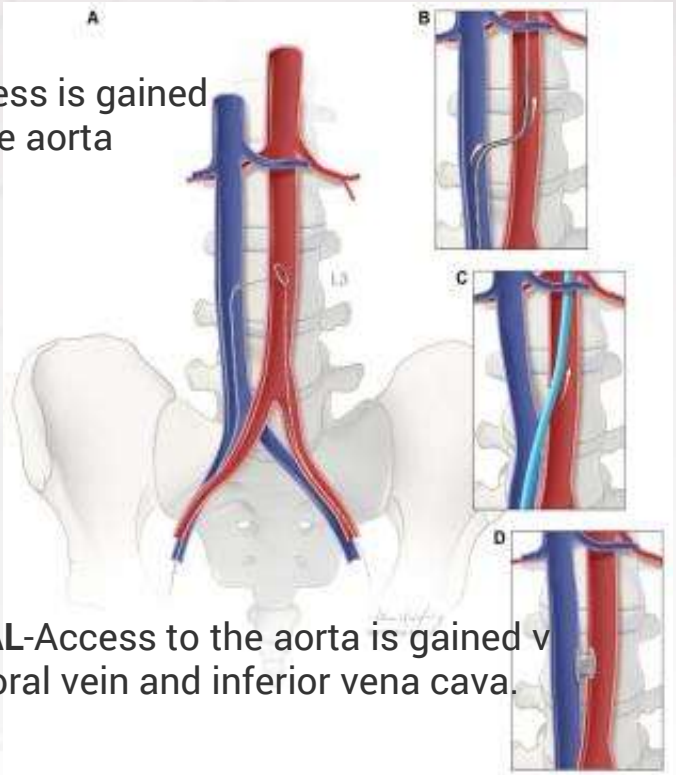
Department of Cardiology, Tokai University School of Medicine

Various Alternative Approaches to TF

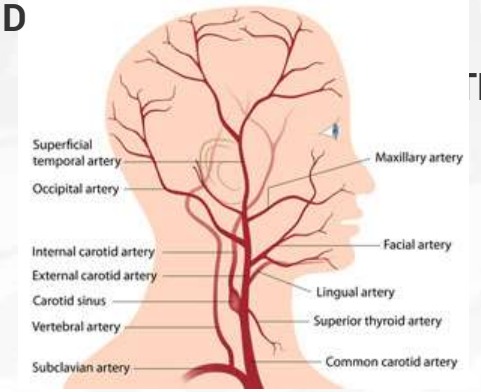
TRANSAPICAL-Access is gained v ia left ventricular apex



TRANSAORTIC-Access is gained directly into the aorta



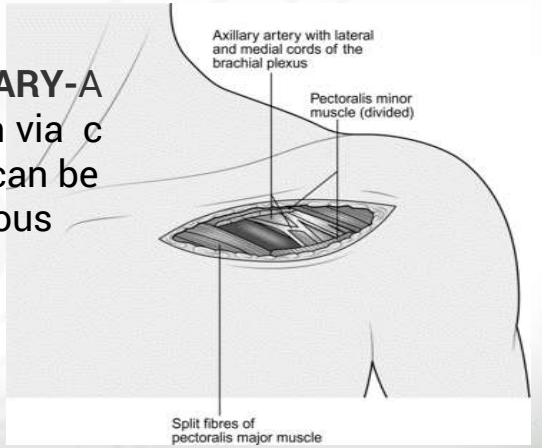
TRANSCAROTID



TRANSCAVAL-Access to the aorta is gained v ia the femoral vein and inferior vena cava.

TRANSSUBCLAVIAN-Access is a lways via cut-down

TRANSAXILLARY-A ccess is often via c ut-down but can be percutaneous

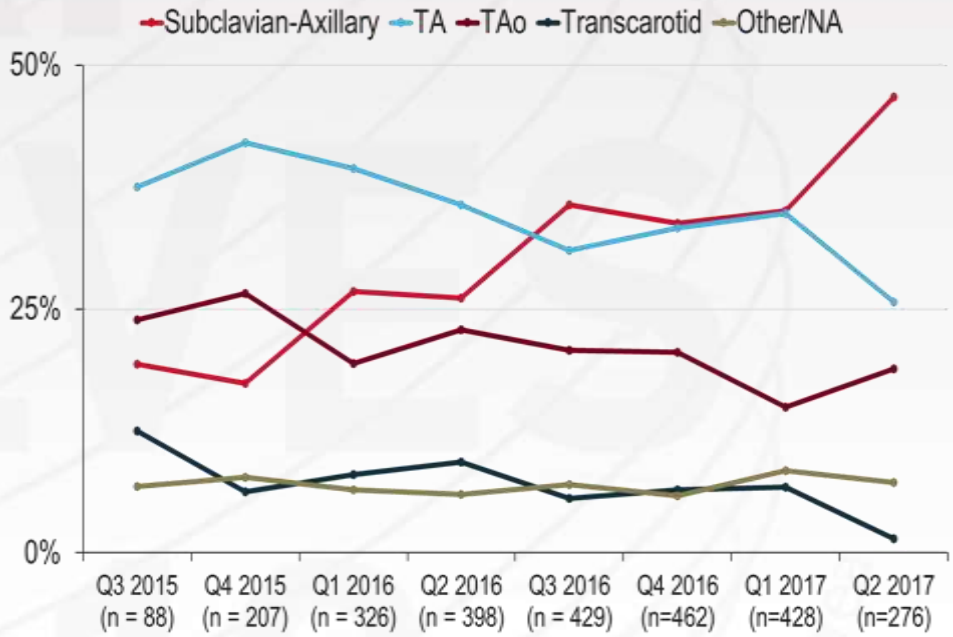


Current Utilization of Alternative Access

Based on TVT Registry, < 10% of TAVR patients are not suitable for TF approach

Currently the following alternative accesses are being used:

- Subclavian, Axillary, Transcaval, Transcarotid, TA, and TAo
- Transthoracic accesses (TA and TA o) are associated with sub-optima l outcomes compared to TF[1]
- The subclavian and axillary are becoming more popular approaches
- Adoption of the transcaval approach (Other) is increasing while transcarotid is decreasing



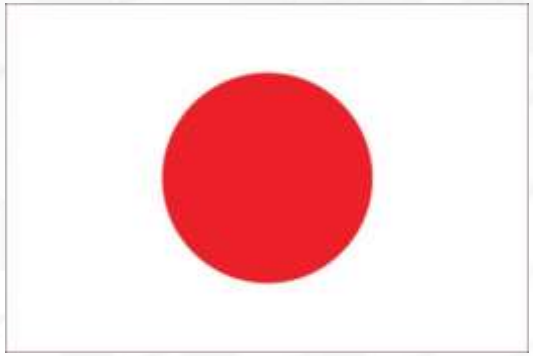
Source: TVT Registry 10 Feb 2017 Data Extract

1. N Engl J Med 2016; 374:1609-1620

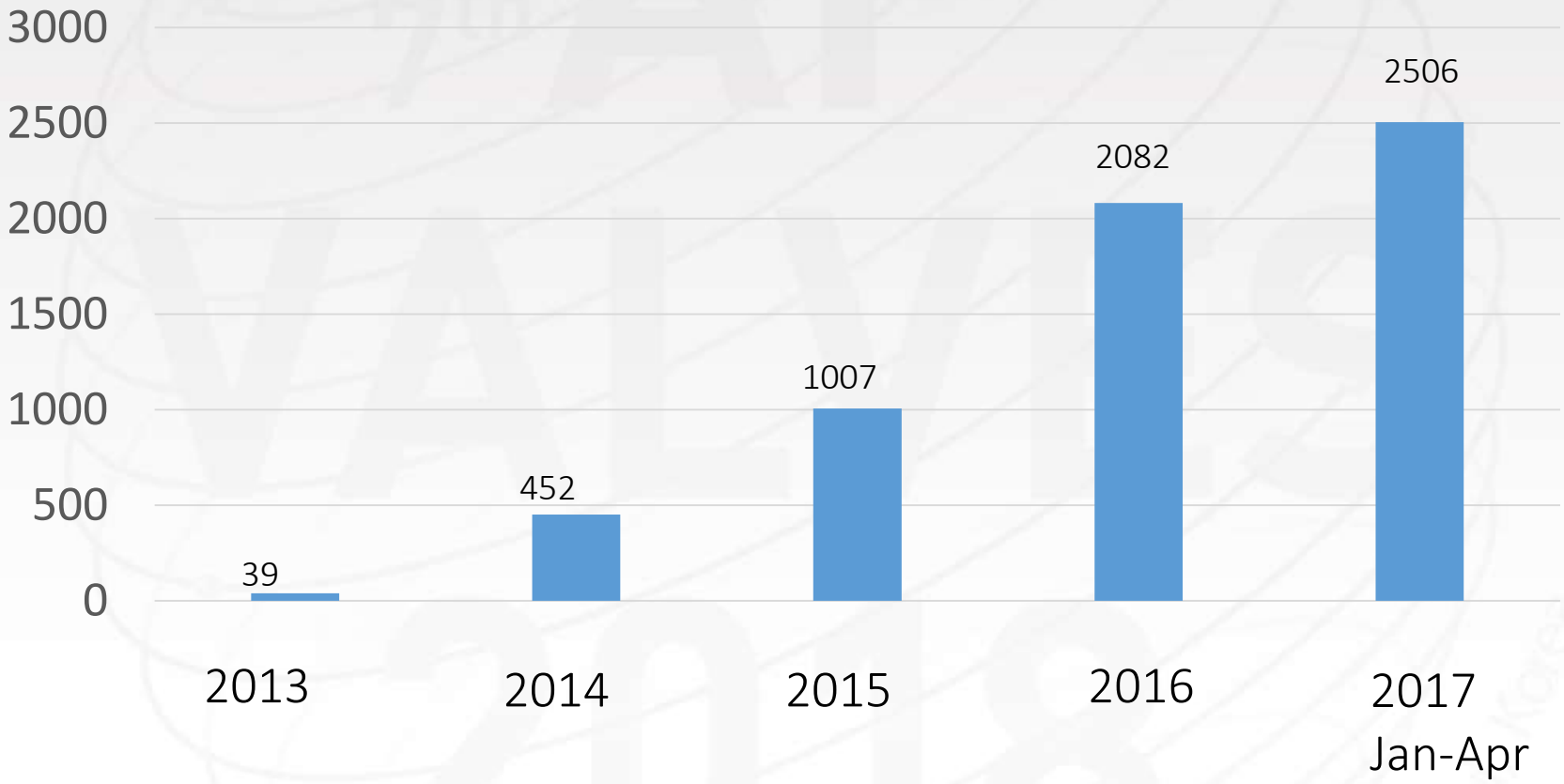
Optimized transCathEter vAlvular iNtervention (OCEAN) TAVI registry

- Ongoing multicenter prospective registry, currently involving 13 institutions in Japan

OCEAN-SHD
Optimised transCathEter vAlvular interveNtion
Structual Heart Disease



Number of enrolled patients

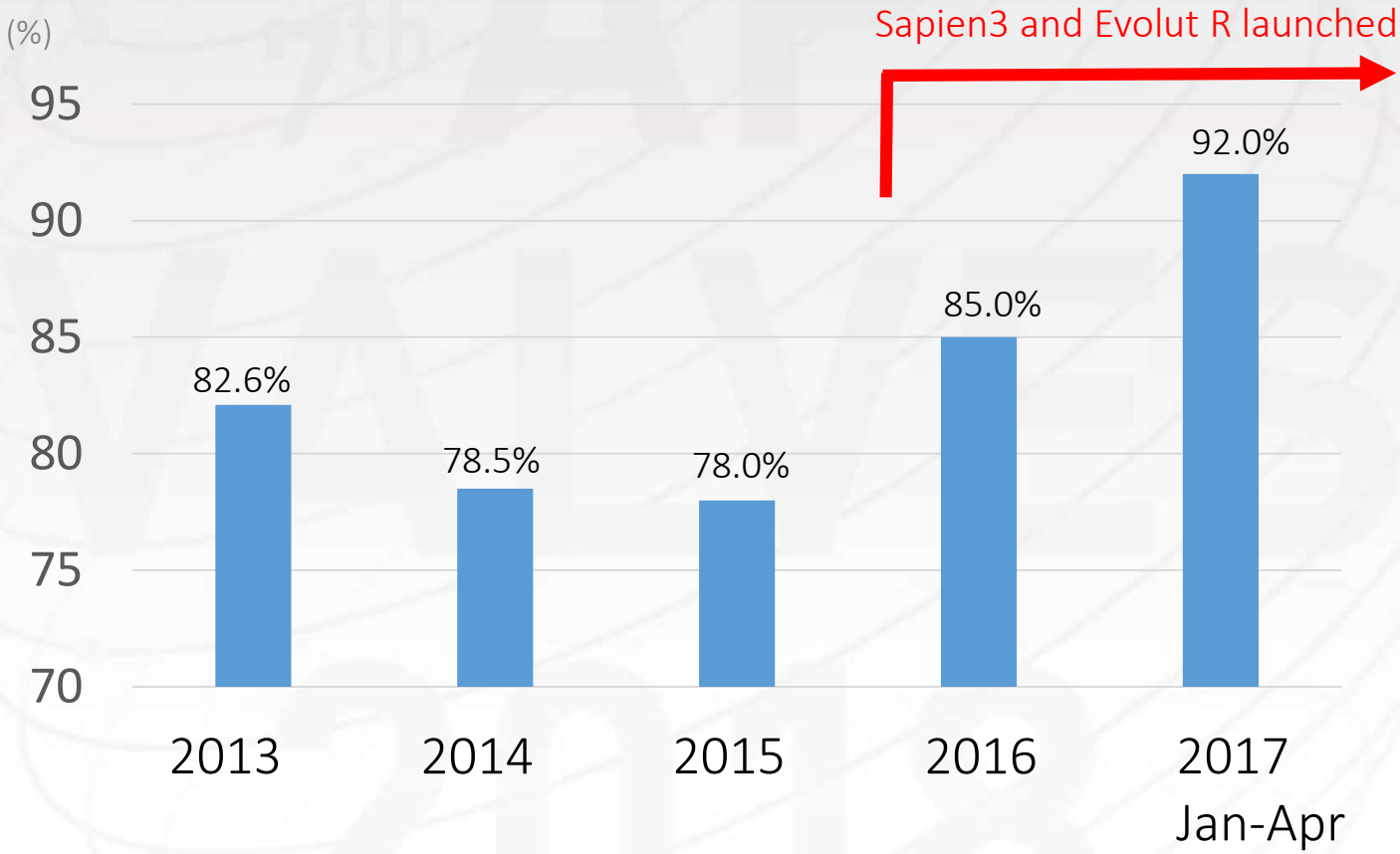


Procedural Details

Patients	n=2506
Approach	
Trans femoral	2094 (83.5)
Trans apical	350 (14.0)
Trans iliac	30 (1.2)
Direct aorta	14 (0.6)
Trans subclavian	18 (0.7)
Procedure time, min	81.2±44.8
General anesthesia	1933 (77.1)
Conscious sedation	573 (22.9)
Direct implantation	907 (36.2)
Post dilatation	551 (22.0)

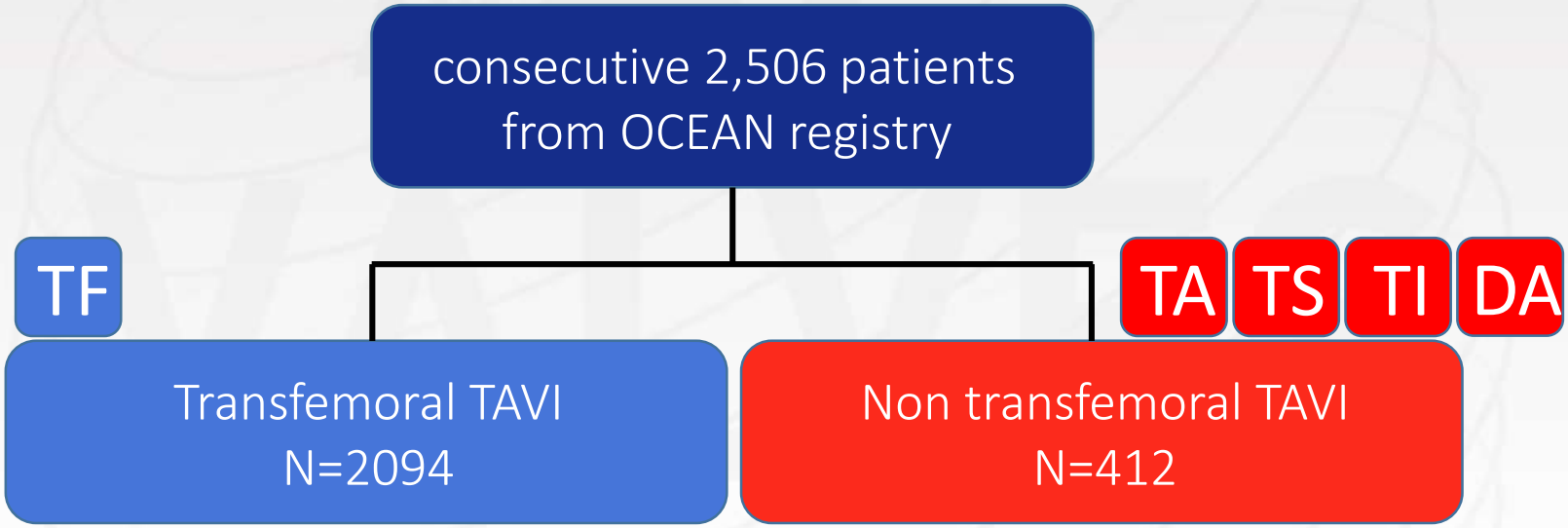
Values are mean±SD or n (%)

Proportion of trans-femoral approach



Subject

Terms: Oct. 2013 to Apr. 2017

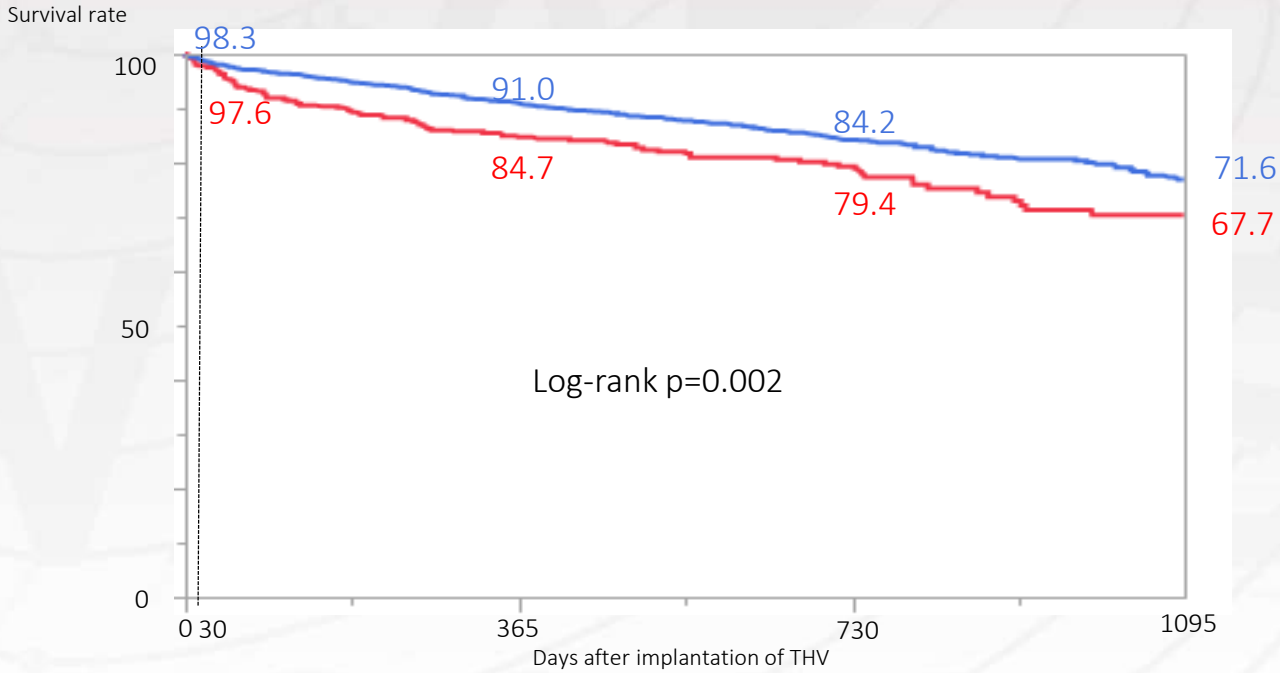


Evaluation items

✓ Patient characteristics, clinical outcome

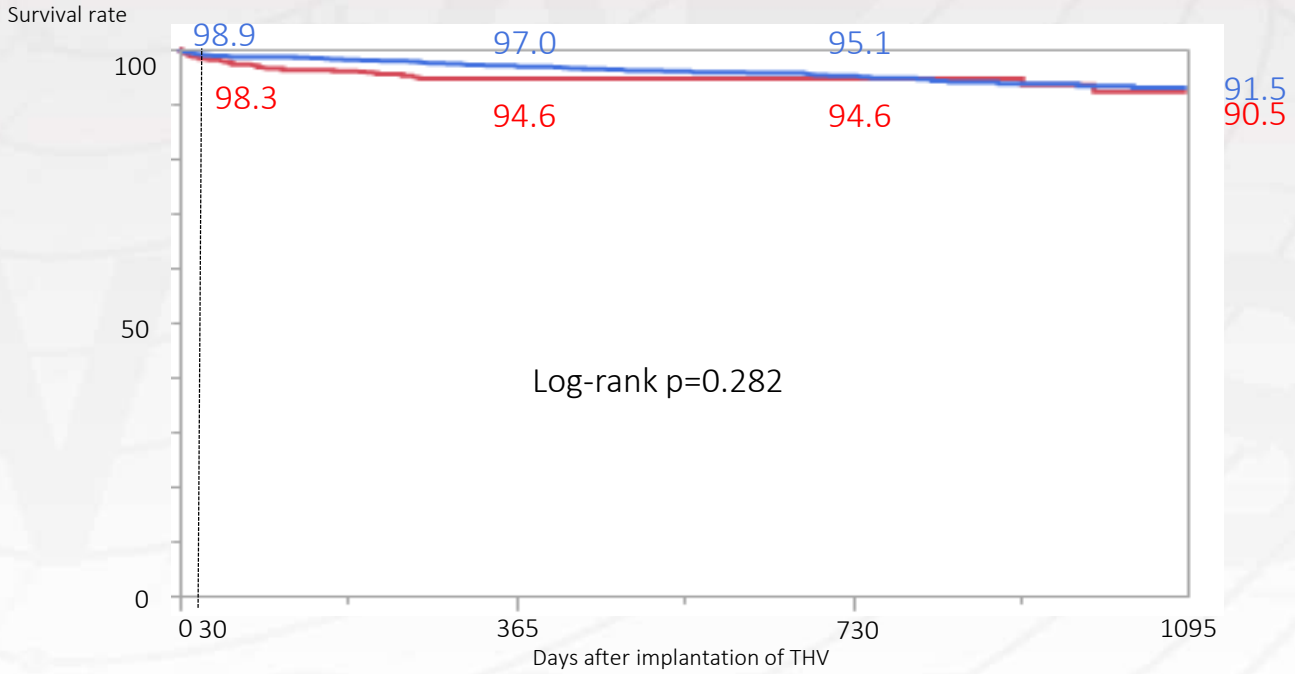
✓ All cause mortality and cardiac death at 3 year

Estimated 3y survival curve: TF vs. Non-TF



days	0	30	365	730	1095
Transfemoral					
N at risk	2094	2045	1573	641	199
Incidence (%)		98.3	91	84.2	71.6
Non transfemoral					
N at risk	410	401	306	184	53
Incidence (%)		97.6	84.7	79.4	67.7

Estimated 3y cardiac death: TF vs. Non-TF



days	0	30	365	730	1095
Transfemoral					
N at risk	2094	2045	1573	641	199
Incidence (%)		98.9	97.0	95.1	91.5
Non transfemoral					
N at risk	410	401	306	184	53
Incidence (%)		98.3	94.6	94.6	90.5

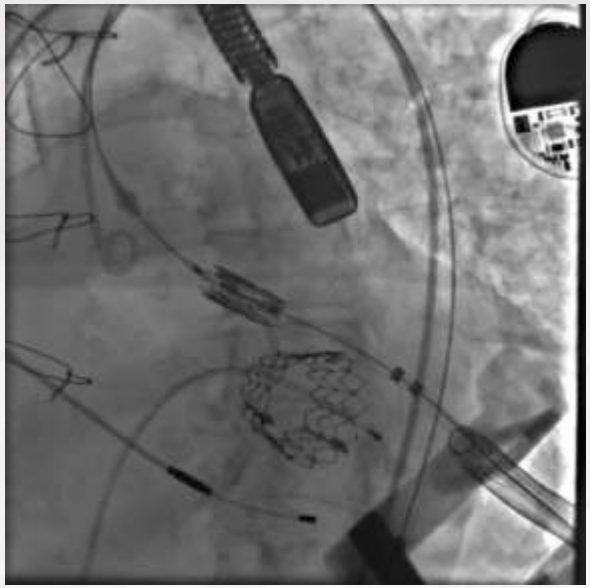
Transapical Access

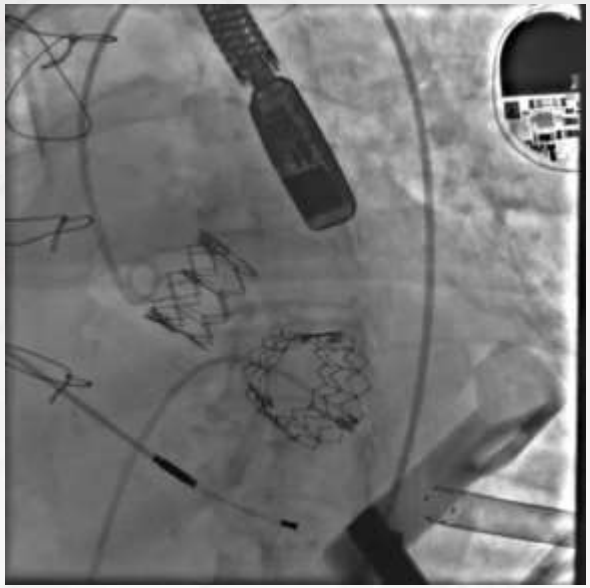
✓Was initially the only option for non-transfemoral TAVR

	PROS	CONS
TA	▪Antegrade access ▪More direct, shorter distance to native aortic valve ▪Standard surgical approach, surgeons familiar with technique ▪Enables easy access to mitral valve	▪Need for post op pain management (access site) ▪Potential increased risk of atrial fibrillation and pleural effusion ▪Effect on respiratory dynamic in COPD ▪Suboptimal outcomes compared to other approaches ▪Require deep GA

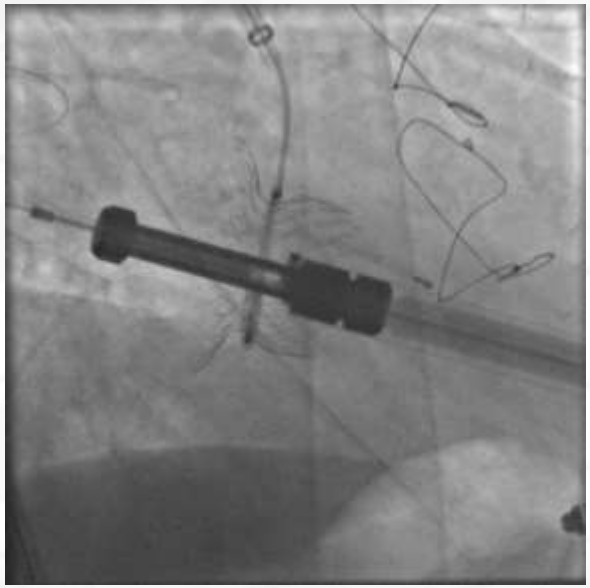
Heart team should have a choice of TA approach

Simultaneous VinV for Mitral and TAVR



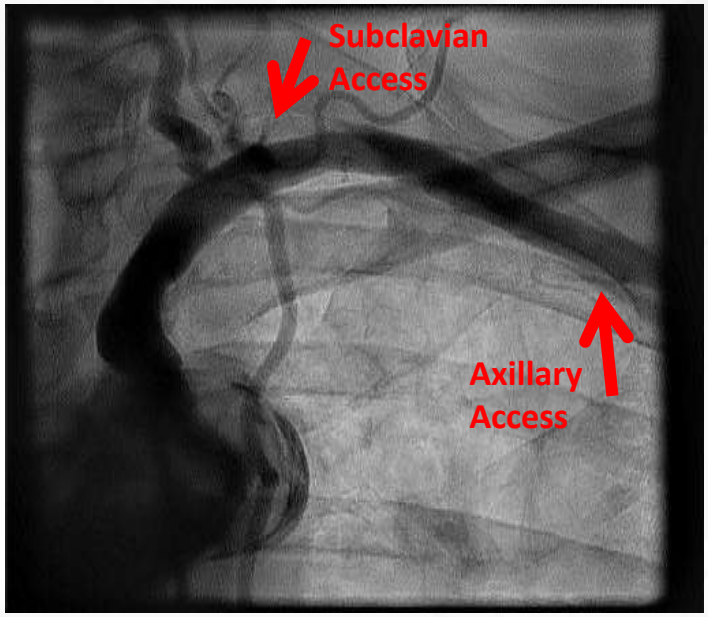


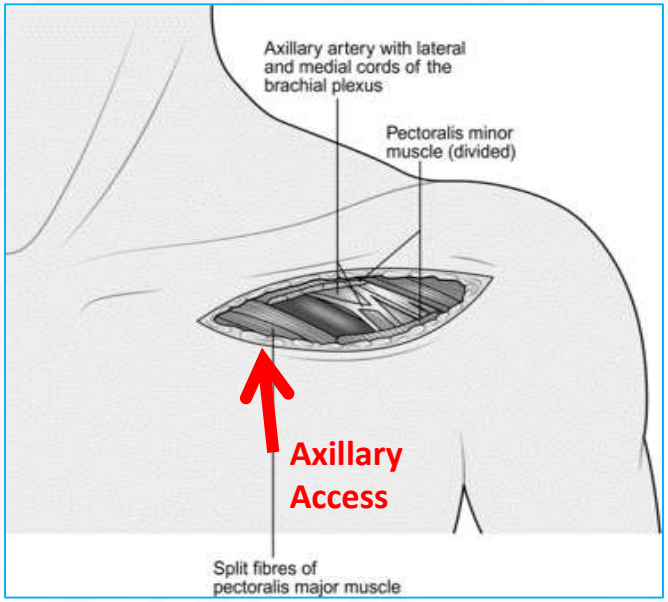
TMVR



Subclaian/Axillary Access

	PROS	CONS
Subclavian/Axillary	▪Approach well known by CV surgeons ▪Right or left side (left better) ▪Can be done percutaneously by an experienced operator ▪Sedation / local anesthesia	▪Brachial plexus injury ▪Anatomy challenges - diameter / calcium / angle of vessel entering aorta ▪Potential to occlude flow to LIMA graft during procedure





【 76y.o. male】

<Problem List>

Severe AS

AAA (2014/7 : s/p EVAR)

Hx of SAH, left hemiparesis

<PE> HT 166cm, BW 58.8kg, BMI 21.1, BSA 1.61m^2

EuroScore 6.02%

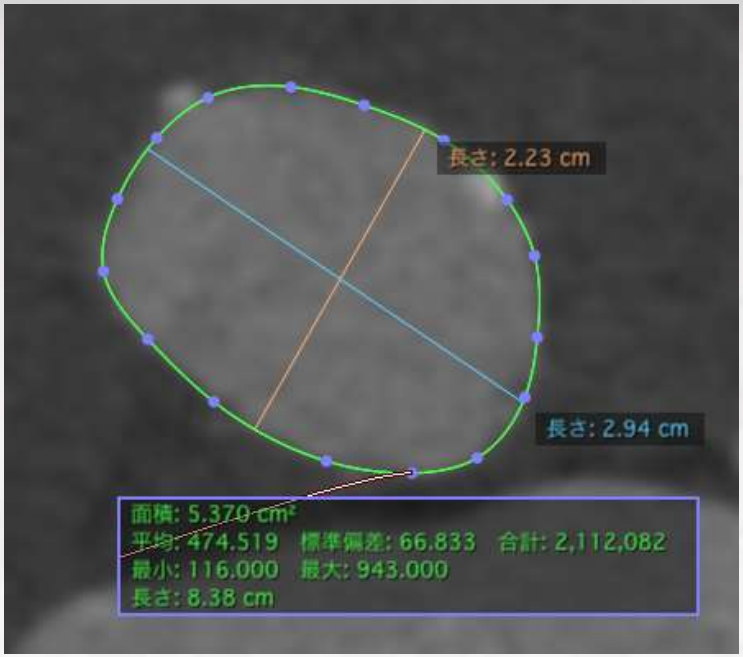
EuroScore Ⅱ 1.8%, STS score 1.92%

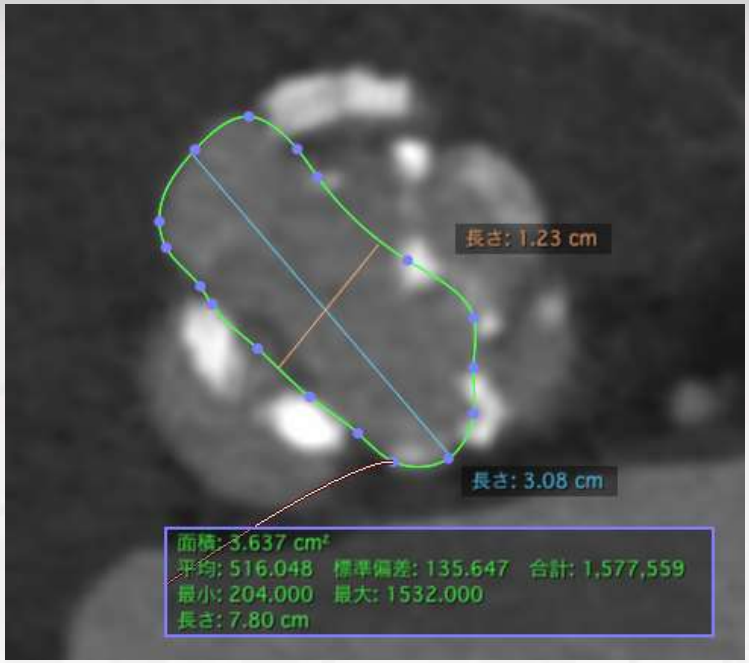
Clinical Frailty Scale 7

Cr 0.71 (eGFR 81), Hb 15.4, Plt 16.8, Alb 3.7, BNP 214.3

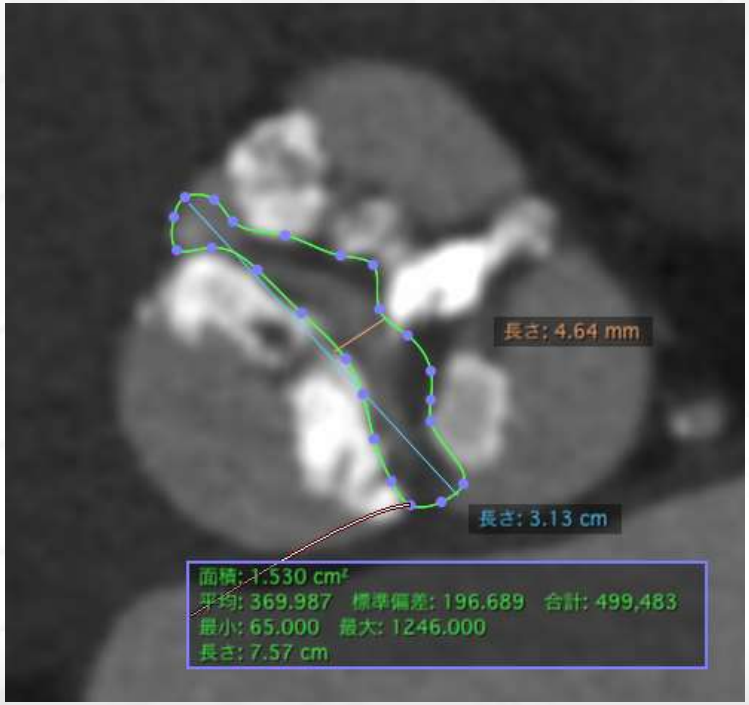
<ECG> SR, LVH

<Spirometry> FVC 2.14L (61.9%), FEV 1.72L(65.6%)

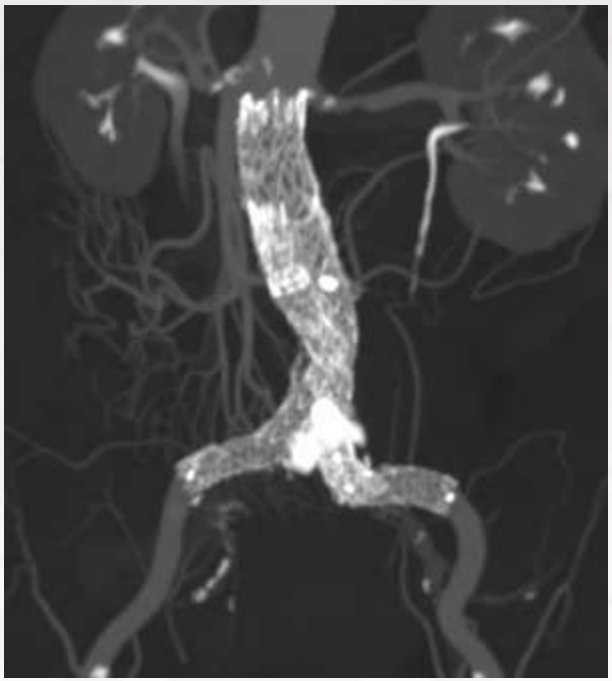

長さ: 2.23 cm
長さ: 2.94 cm
面積: 5.370 cm²
平均: 474.519 標準偏差: 66.833 合計: 2,112,082
最小: 116.000 最大: 943.000
長さ: 8.38 cm


長さ: 1.23 cm
長さ: 3.08 cm
面積: 3.637 cm²
平均: 516.048 標準偏差: 135.647 合計: 1,577,559
最小: 204.000 最大: 1532.000
長さ: 7.80 cm

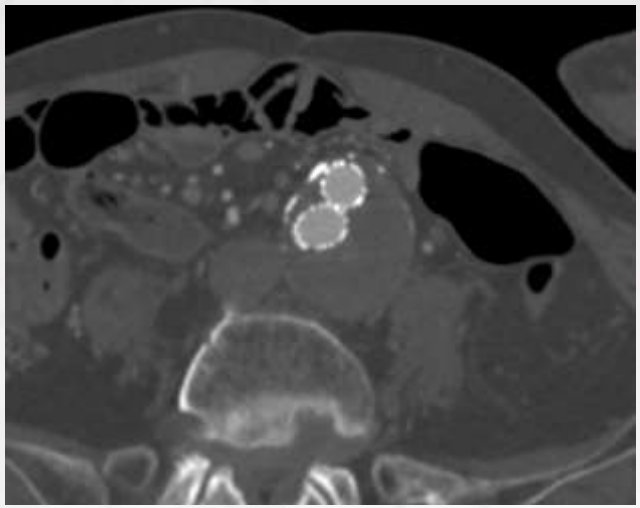

長さ: 1.14 cm
長さ: 2.99 cm
面積: 2.114 cm²
平均: 471.942 標準偏差: 177.971 合計: 864,125
最小: 93.000 最大: 1647.000
長さ: 7.09 cm

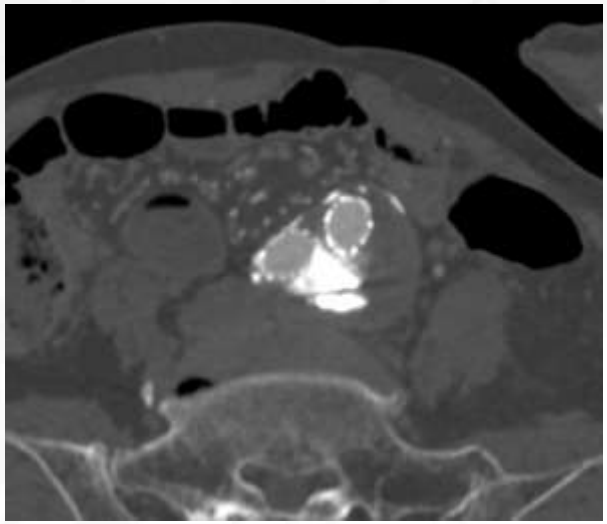

長さ: 4.64 mm
長さ: 3.13 cm
面積: 1.530 cm²
平均: 369.987 標準偏差: 196.689 合計: 499,483
最小: 65.000 最大: 1246.000
長さ: 7.57 cm

Aorta

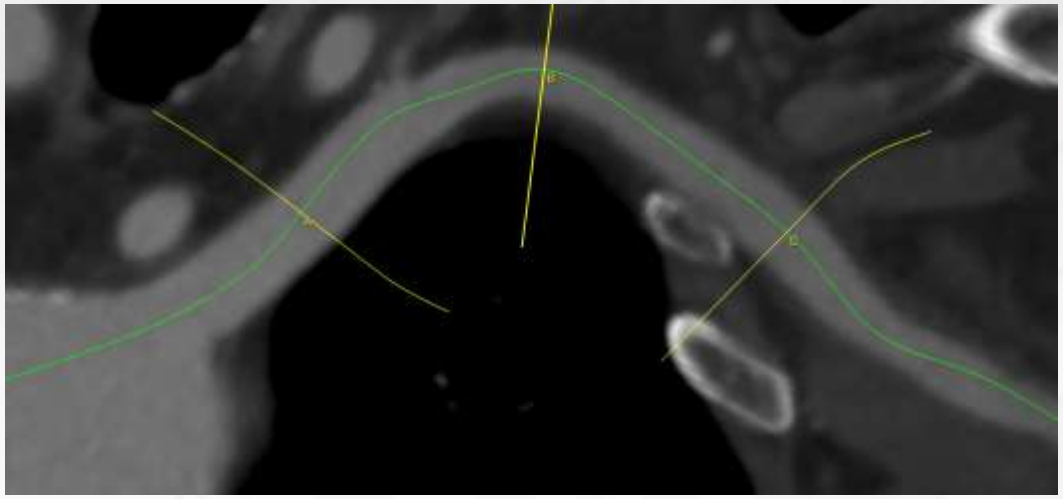


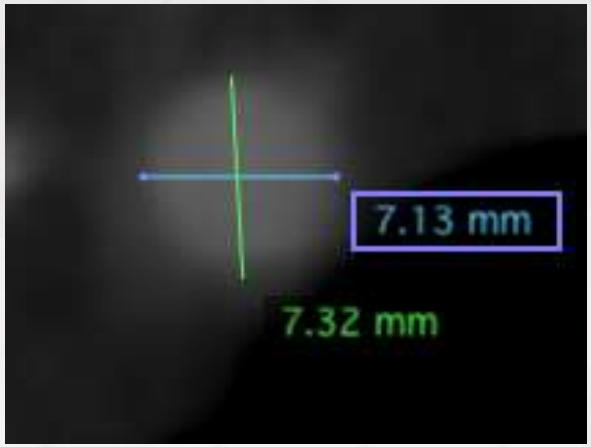
AAA s/p EVAR



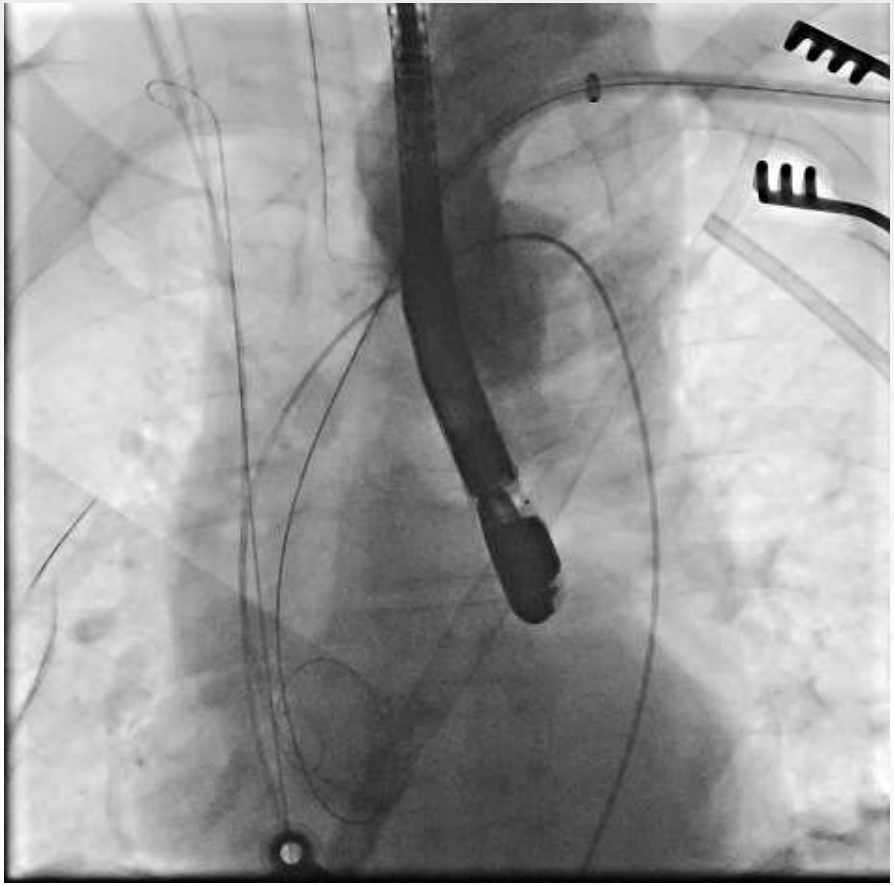


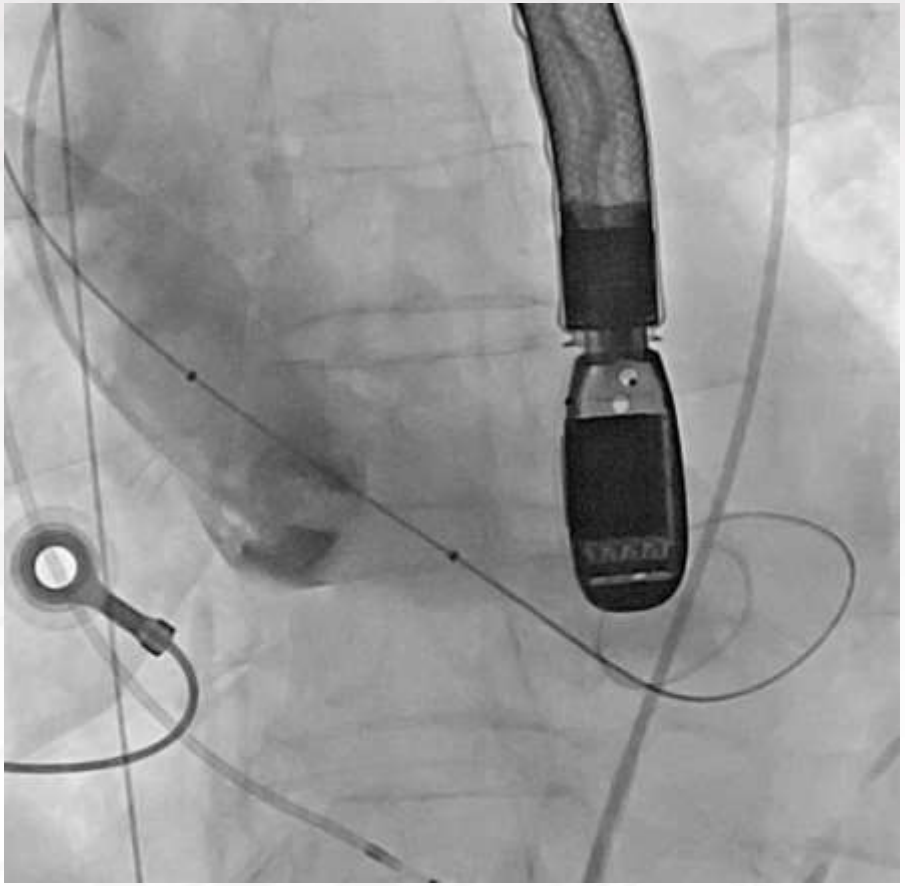
Lt.Subclavian



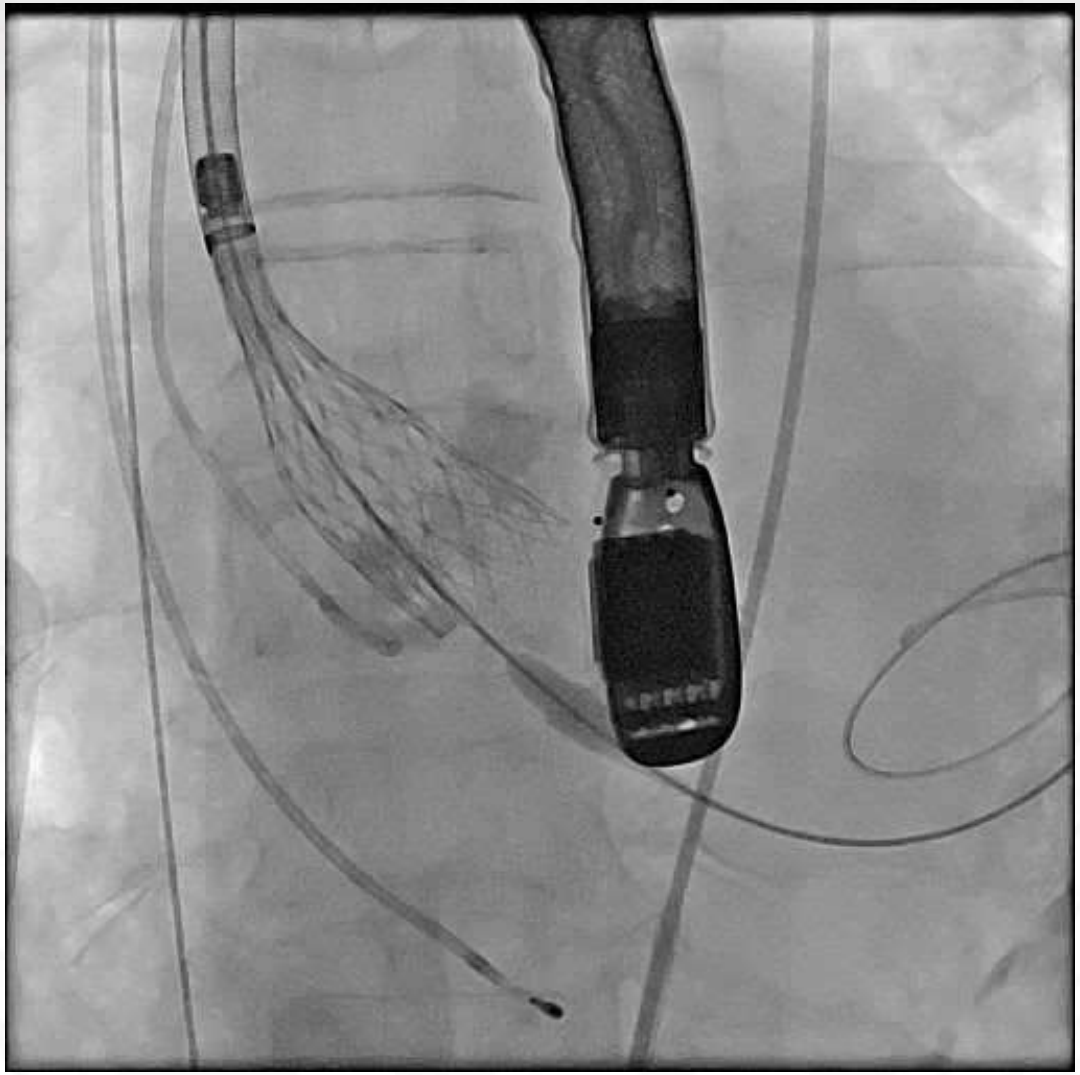


【Sheath insertion & Predilatation】

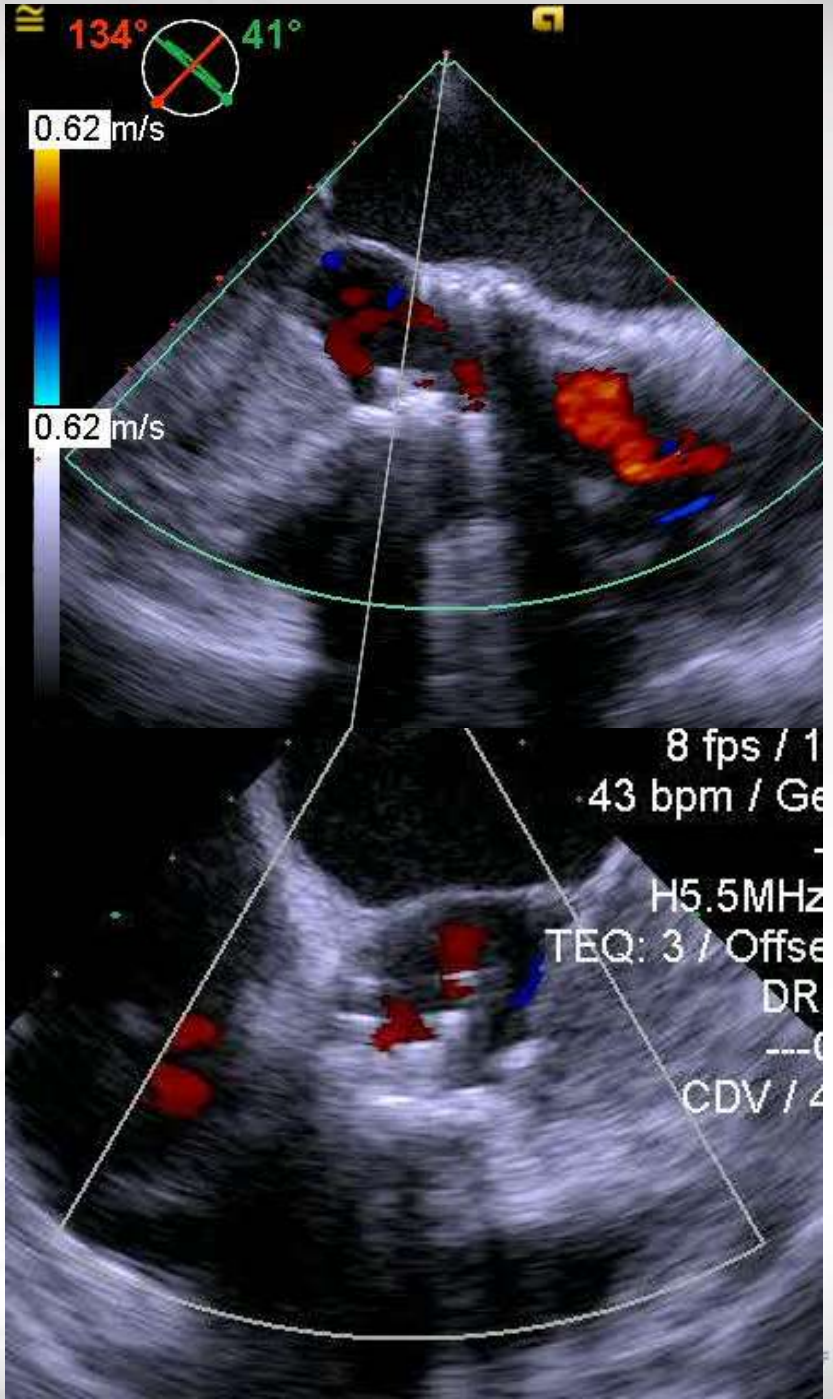




【Evolut R 29mm】



【Evolut R 29mm】



Comparative Survival After Transapical, Direct Aortic, and Subclavian Transcatheter Aortic Valve Implantation (Data from the UK TAVI Registry)

Georg M. Fröhlich, MD[a], Paul D. Baxter, PhD[b], Christopher J. Malkin, MD[a], D. Julian A. Scott, MD[c], Neil E. Moat, MD[d], David Hildick-Smith, MD[e], David Cunningham, MD[f], Philip A. MacCarthy, PhD[g], Uday Trivedi, Bsc[e], Mark A. de Belder, MD[h], Peter F. Ludman, MD[i], and Daniel J. Blackman, MD[a,*], on behalf of the National Institute for Cardiovascular Outcomes Research

Table 2
Outcomes

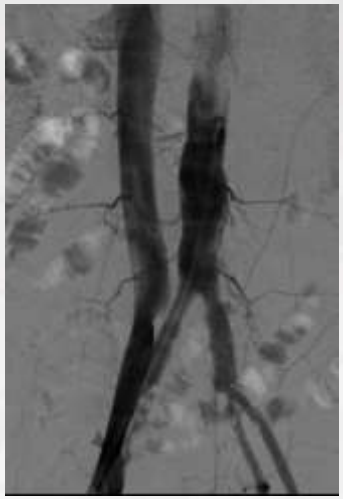
Variable	Subclavian (n=188)	Transapical (n=761)	Direct aortic (n=185)	Femoral (n=2828)	p-value
In-hospital death	8 (4.3%)	72 (9.5%)	14 (7.6%)	105 (3.7%)	<0.0001
30-day mortality	5 (2.9%)	80 (11%)	15 (8.4%)	121(4.7%)	<0.0001
12-months mortality	33 (20%)	187 (27%)	42 (29%)	388 (18%)	<0.0001

Table 3
Cox proportional hazard model

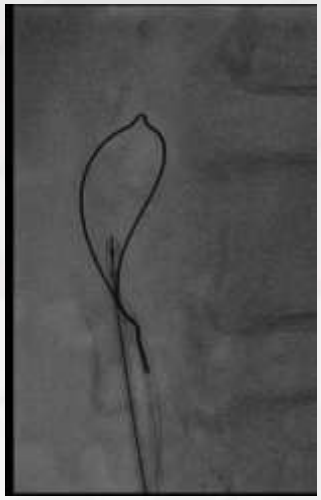
Variable	Hazard ratio	95% CI	p-value
Logistic EuroScore	1.02	1.01-1.02	<0.001
Year of implant 2012 vs. 2007	0.39	0.25-0.61	<0.001
Subclavian vs. femoral access	1.22	0.88-1.70	0.241
Trans-apical vs. femoral access	1.74	1.43-2.11	<0.001
Direct aortic vs. femoral access	1.55	1.13-2.14	0.007
CoreValve vs. Edwards	1.00	0.83-1.20	1.0
Atrial fibrillation vs. sinus rhythm	1.32	1.12-1.55	0.001
No/mild AR vs. moderate/severe AR	1.82	1.48-2.24	<0.001

Transcaval Aortic Access for TAVR

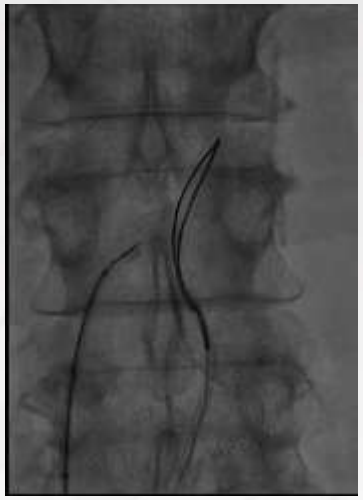
CT-based plan



Angiogram



Lateral “bullseye”



Electrified wire crossing into aortic snare

Introducer sheath from fe moral vein into aorta

Closure

Evaluation

Greenbaum, Babaliaros.. Lederman, JACC, 2017

Conclusions

- ✓ Non-femoral access is needed in 10% of TAVR patients
- ✓ Patients requiring non-TF access are a higher risk cohort
- ✓ Subclavian/axillary access appears to have the best outcomes of established non-TF options
- ✓ Multiple novel and less invasive non-TF access options are emerging
- ✓ TAVR operators should aim to master several access options to provide the best treatment for the patient