TAVR with Carotid Stenosis: Embolic Protection? Carotid Stenting before TAVR?

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Disclosure

- Tien-Ping Tsao: none

Introduction

- Cerebrovascular ischemic events complicating TAVR procedures often lead to severe disability and higher mortality
- Extracranial carotid artery disease (CD) has been associated with an increased risk of neurologic complications following cardiac surgery, including SAVR, the association between CD and cerebrovascular accidents after TAVR is unsettled
- A single-center analysis of 294 consecutive cases of TAVR identified 19% of patients had CD or vertebral artery disease, and a 6.8% 30-day post-TAVR rate of stroke. There was no association between the outcomes of stroke and mortality with CD

Carotid stenting is often associated with hypotension and bradycardia, may increase the risk in a patient having severe aortic stenosis

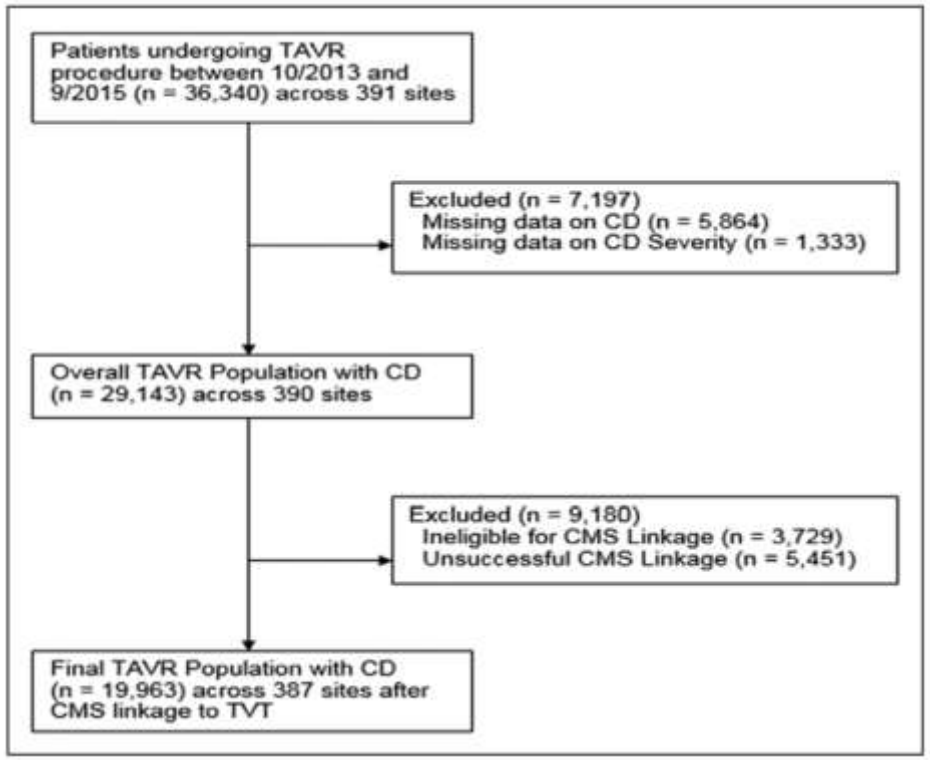
Is it safe to perform carotid stenting before TAVR?

Stroke and Cardiovascular Outcomes in Patients With Carotid Disease Undergoing Transcatheter Aortic Valve Replacement

Ajar Kochar, MD; Zhuokai Li, PhD; J. Kevin Harrison, MD; G. Chad Hughes, MD; Vinod H. Thourani, MD; Michael J. Mack, MD; Roland A. Matsouaka, PhD; David J. Cohen, MD; Eric D. Peterson, MD, MPH; W. Schuyler Jones, MD; Sreekanth Vemulapalli, MD

Data collected from Society of Thoracic Surgeons (STS) and American College of Cardiology (ACC) Transcatheter Valve Therapies (TVT) Registry

Patient flow diagram



CMS, Centers for Medicare and Medicaid Services

Circ Cardiovasc Interv. 2018;11:e006322. DOI: 10.1161/CIRCINTERVENTIONS.117.006322

Results

From October 2013 to September 2015, 29,143 patients underwent TAVR, of which 6410 patients (22%) had CD

Observed In-Hospital Outcomes

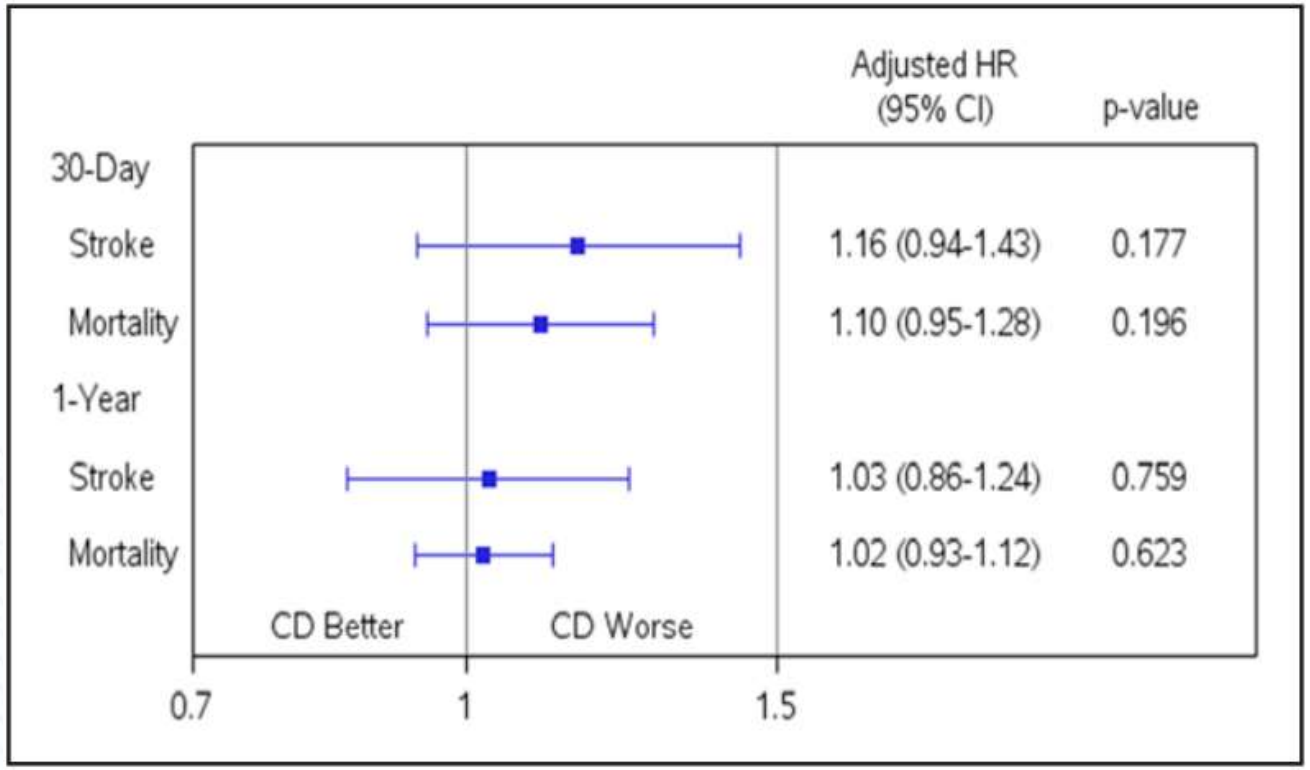
Outcomes	No CD (N=22733)	CD (N=6410)	*P* Value*
Stroke	2.0% (452)	2.6% (167)	0.003
TIA	0.2 (38)	0.3% (19)	0.039
Death	3.4% (784)	4.4% (279)	0.001
MI	0.4% (82)	0.5% (34)	0.057
VARC major or life-threatening bleeding	7.2% (1625)	8.7% (552)	<0.001
Major access site complication	1.3% (287)	1.2% (75)	0.552

Patients with CD had higher observed in-hospital outcomes and higher cumulative incidence for stroke and mortality at 30 days and 1 year

Unadjusted Cumulative Incidence of 30-Day and 1-Year Outcomes

Outcomes	No CD		CD		*P* Value
	N	% (95% CI)	N	% (95% CI)	
30 d					
Stroke	366	2.4 (2.2–2.7)	136	3.1 (2.6–3.7)	0.011
Mortality	740	4.9 (4.6–5.2)	268	6.1 (5.4–6.9)	0.001
Composite of mortality or stroke	1027	7.0 (6.6–7.5)	370	8.8 (8.0–9.7)	<0.001
Myocardial infarction	86	0.6 (0.5–0.7)	40	0.9 (0.7–1.3)	0.011
Any bleeding	1674	11.2 (10.7–11.8)	574	13.4 (12.4–14.4)	<0.001
1 y					
Stroke	531	4.1 (3.8–4.5)	171	4.5 (3.9–5.3)	0.155
Mortality	2359	19.9 (19.1–20.6)	749	21.5 (20.1–23.0)	0.002
Composite of mortality or stroke	2542	22.6 (21.8–23.5)	799	24.5 (23.0–26.2)	0.001
Myocardial infarction	204	1.9 (1.6–2.2)	89	2.8 (2.3–3.5)	<0.001
Any bleeding	2794	22.4 (21.7–23.2)	893	24.6 (23.2–26.2)	<0.001

Outcomes of TAVR with CD vs. no CD



- After adjustment for patient characteristics, these observed differences were no longer significant.
- Among CD patients and no-CD patients, there was no difference in the risk of 30-day and 1-year stroke or mortality

TAVR with vs. without prior Carotid Revascularization in severe CD

	Severe CD With Prior Carotid Revascularization (N=63)		Severe CD Without Prior Carotid Revascularization (N=518)	
	N	% (95% CI)	N	% (95% CI)
30-d stroke	2	3.2 (0.8–12.8)	20	3.9 (2.5–6.0)
30-d mortality	0	0	30	5.9 (4.2–8.4)
30-d composite of mortality or stroke	2	3.2 (0.8–12.8)	46	9.1 (6.9–12.0)
1-y stroke	3	7.7 (2.2–27.1)	25	5.3 (3.6–7.9)
1-y mortality	8	14.6 (7.6–28.2)	100	23.8 (19.9–28.5)
1-y composite of mortality or stroke	10	20.0 (10.7–37.4)	111	26.0 (21.9–30.8)

CD indicates carotid artery disease; and CI, confidence interval.

The major findings of the study

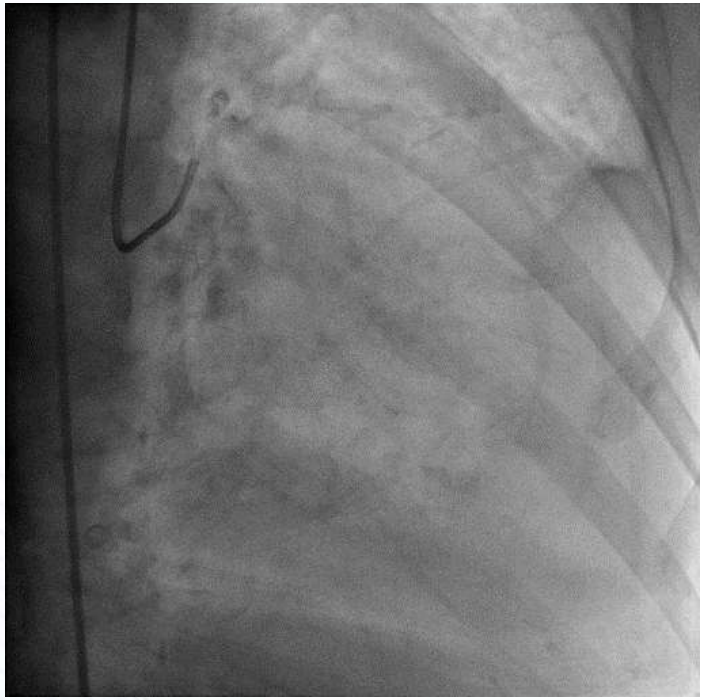
- One fifth of TAVR patients have CD
- There was no association between CD and the 30-day and 1-year risk of stroke or mortality
- Despite technological improvements, post-TAVR stroke is still a major complication
- The results suggest CD does not influence this risk of stroke

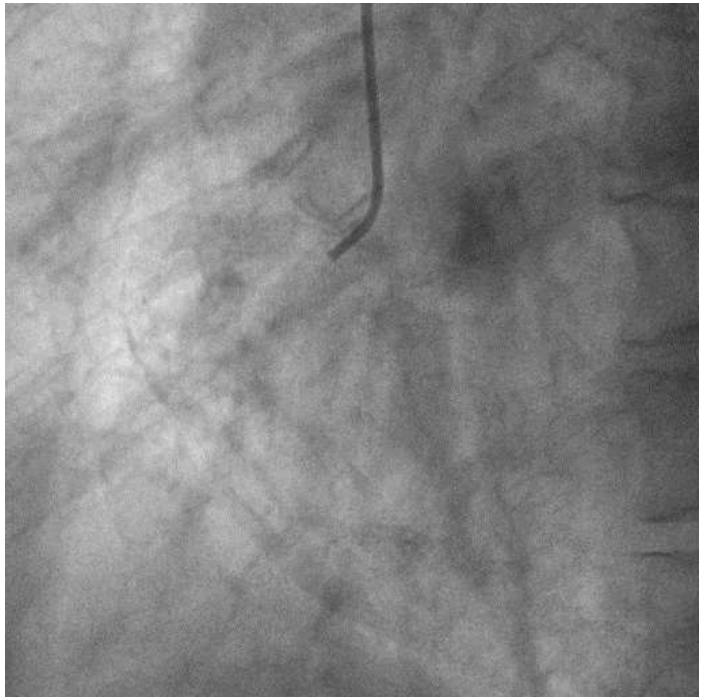
Embolic Protection during TAVR from Cheng Hsin General Hospital

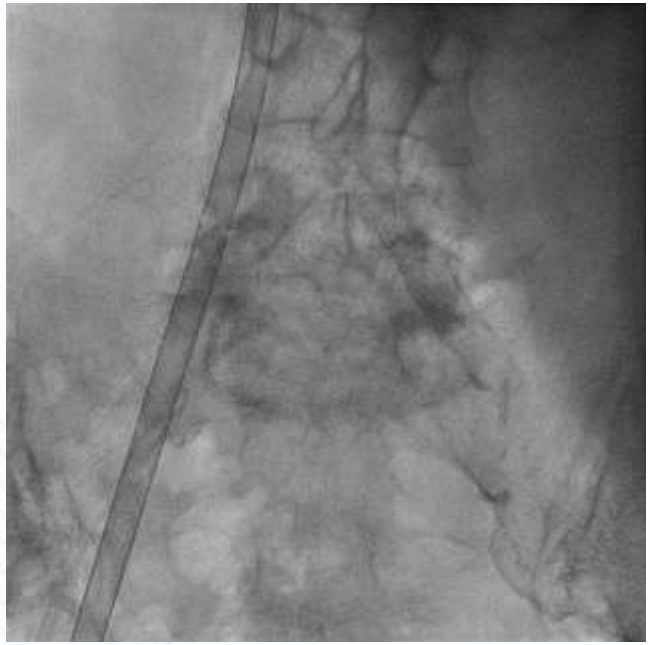
- Jan. 2022~ April 2023, TAVR with Sentinel cerebral protection system: 100 patients
- Internal carotid artery stenosis > 50%, 7 patients (7%)
- Carotid stenting before TAVR: 2 patients (2%)
- In-hospital stroke: 1 (1%)

Case Sharing

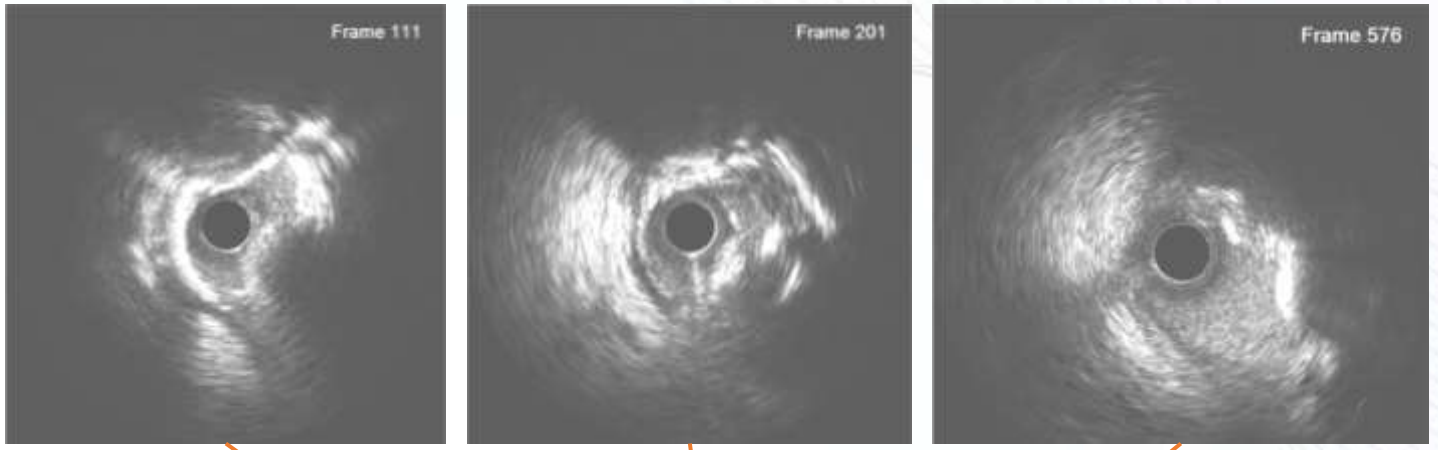
A 72 y/o lady on HD, Critical AS (AVA 0.4 cm2), Admitted with HF LVEF 30%. Pre-TAVR CAG

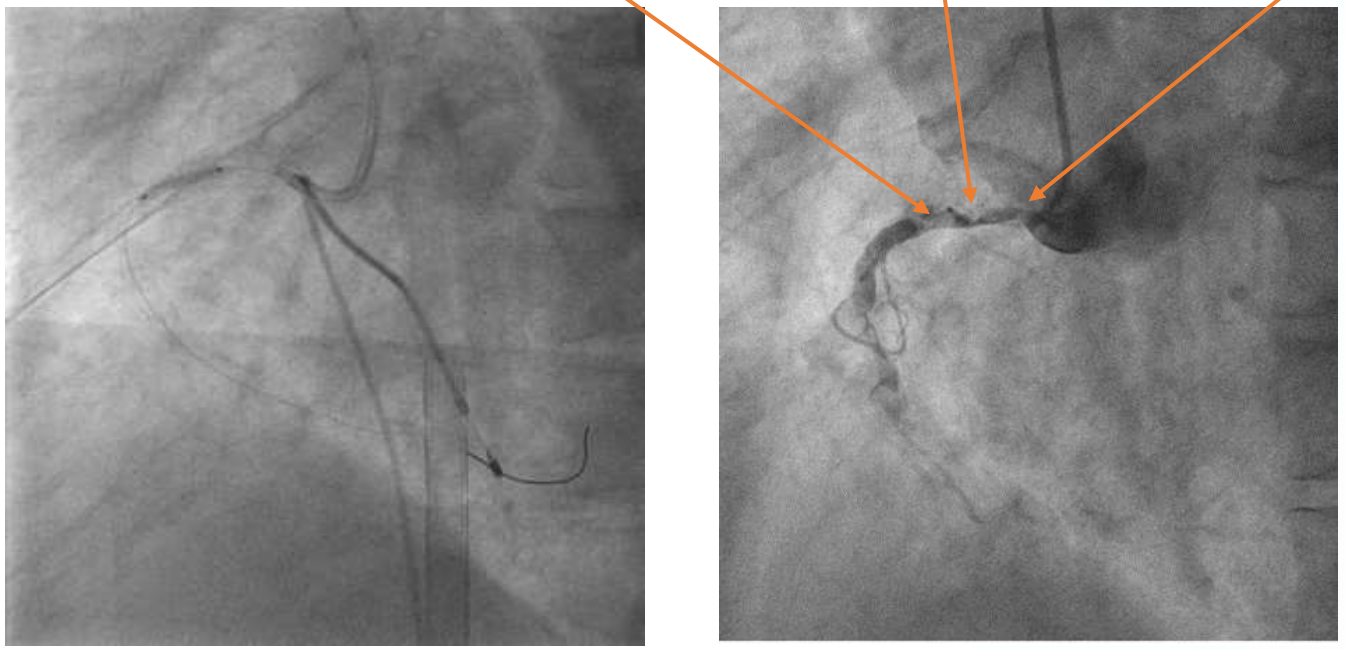




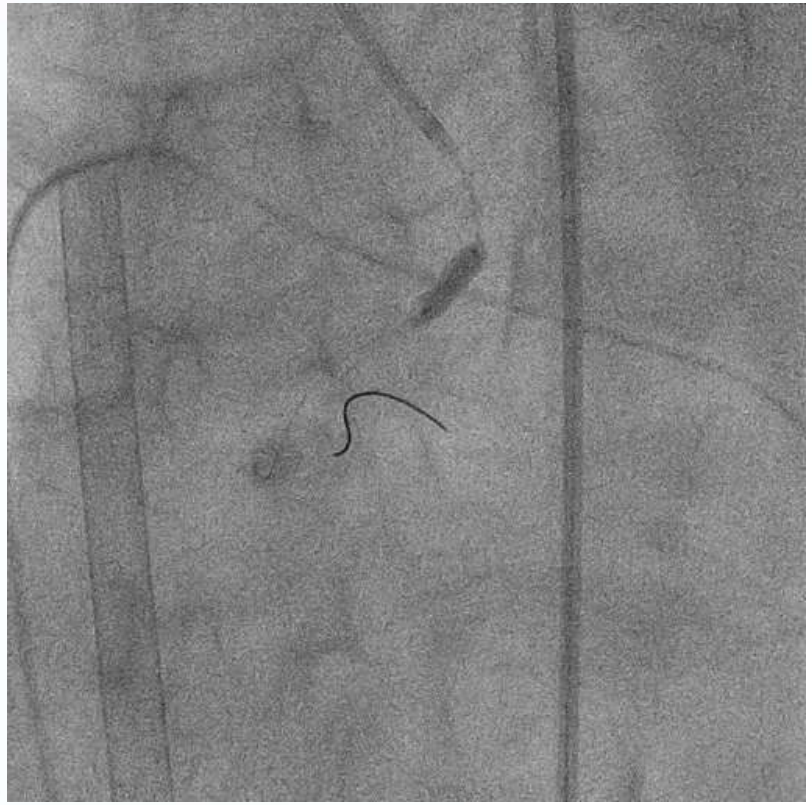


VA ECMO

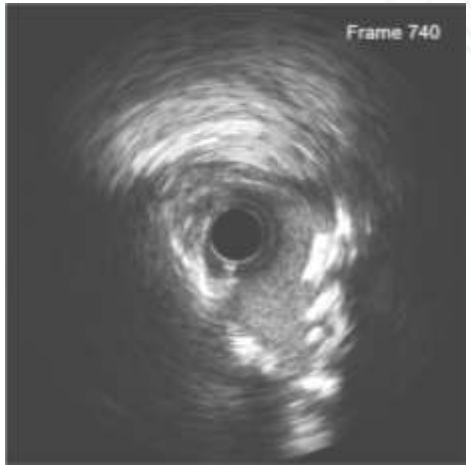


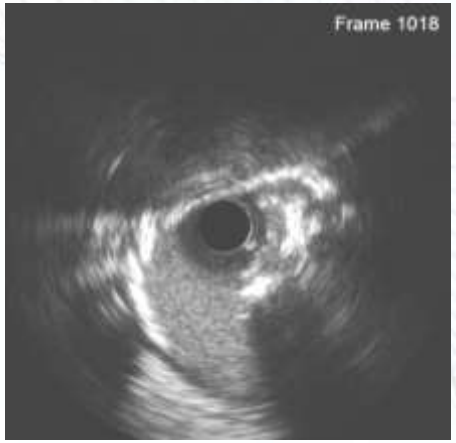


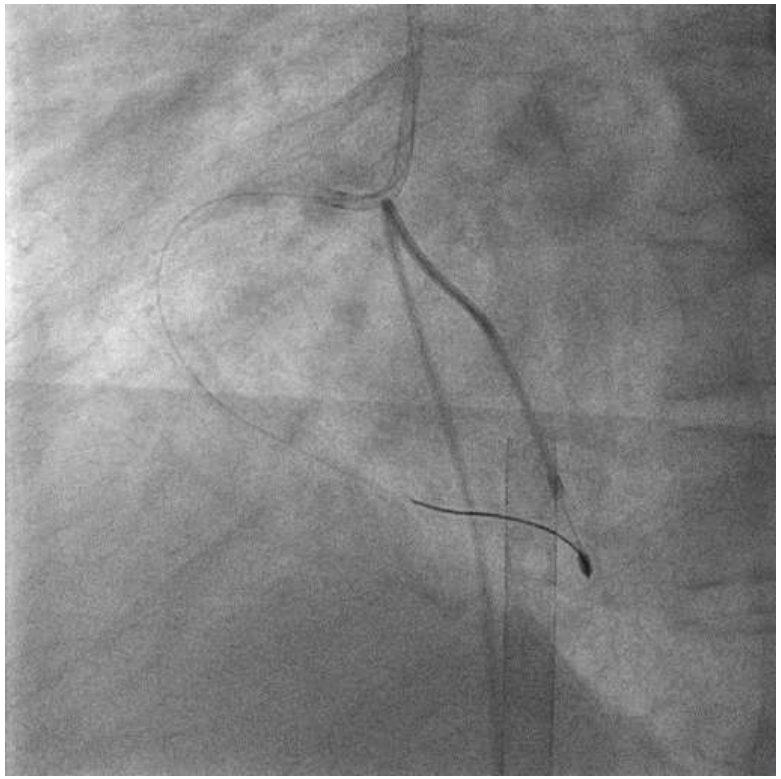
2.0 mm balloon dilatation

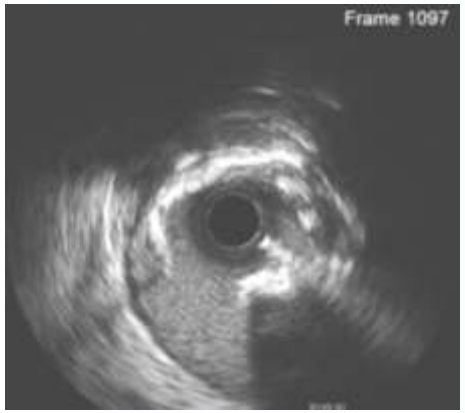


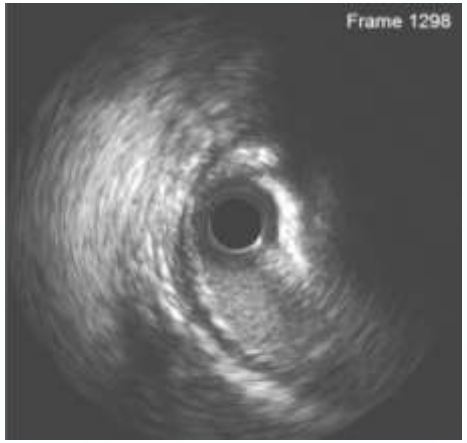
IVL balloon 3.5 x 12 mm 80 pulses

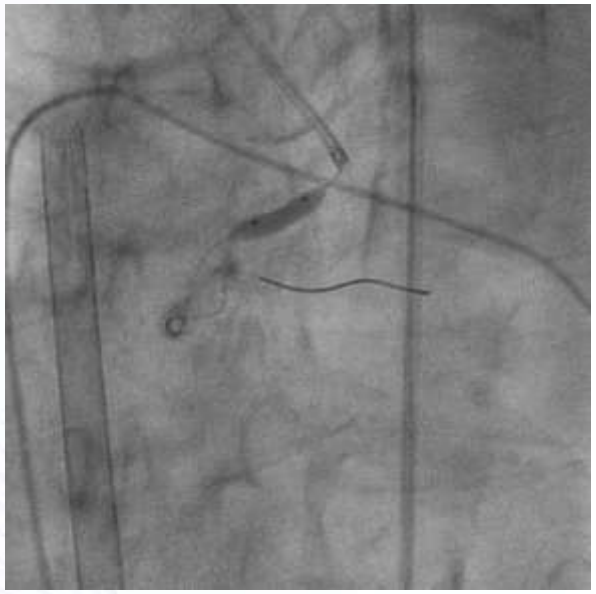


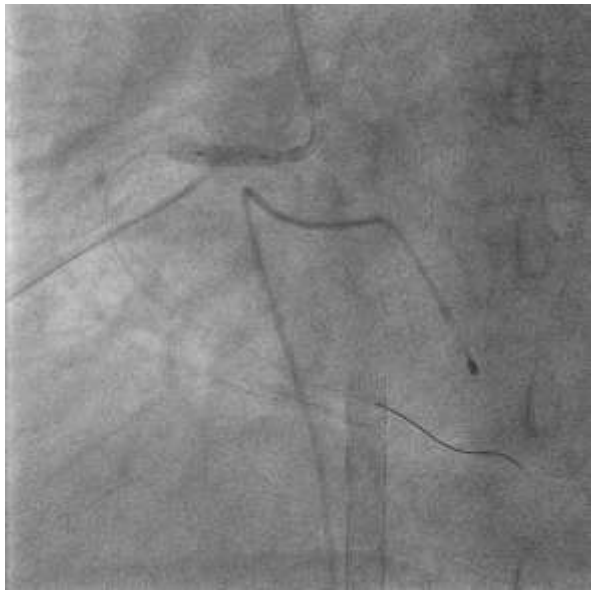




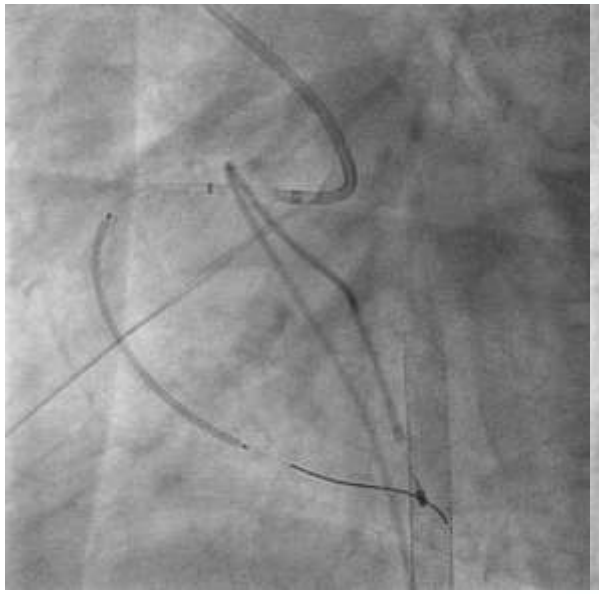


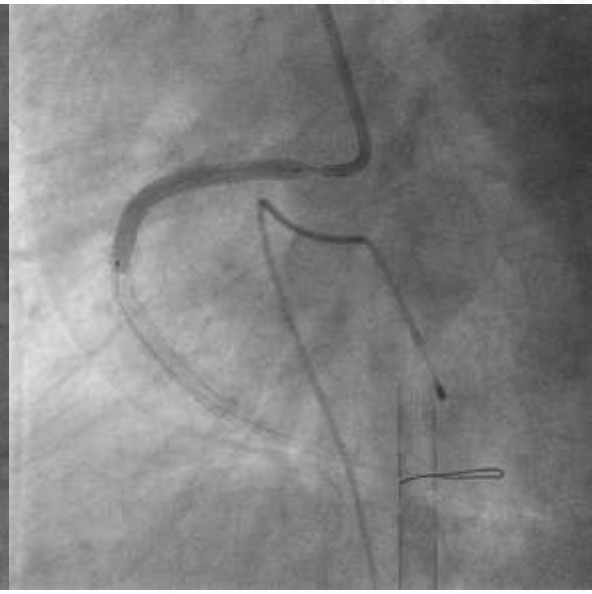






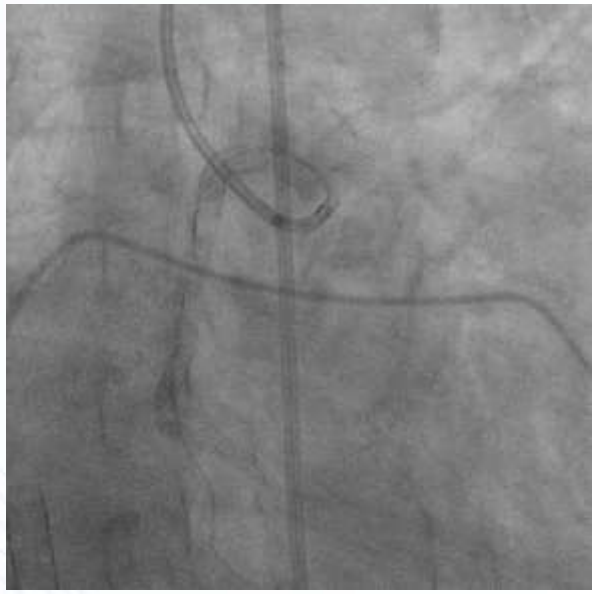
3.5 NC balloon dilatation

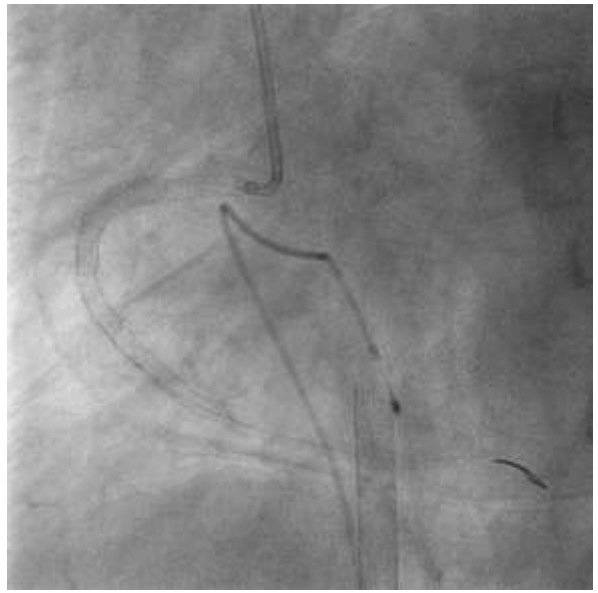


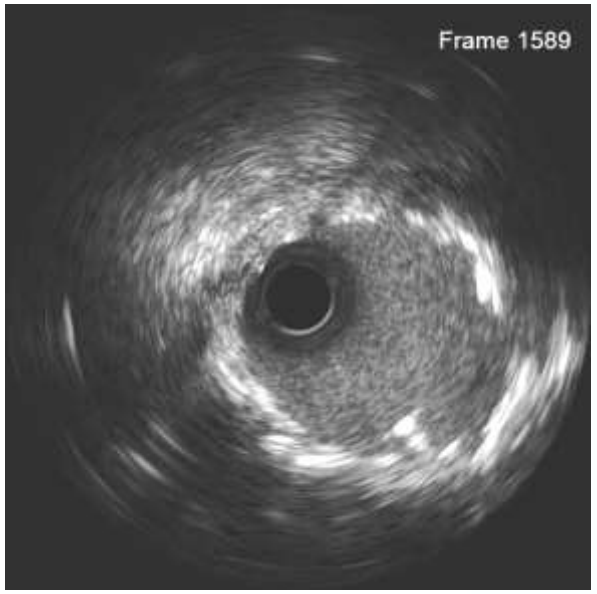


2 long stents

Final angiographic results and IVUS







ECMO was removed immediately after the PCI

Hospital Course

- The patient developed VT at the night of PCI before HD, hyperkalemia was noted with serum K^+ 6.6
- The patient received CPR and re-inserted ECMO, the CAG showed no acute stent thrombosis
- The ECMO was maintained for 2 days till TAVR

CT Scan

Medtronic — Evolut™ TAVR platform

Patient	TA 004-429 游許阿吻 D881648	**Height**	m	**Physician**	9175	**Received Date**	2023-03-20
Sex	Female	**Weight**	kg	**Hospital**	CHGH	**Reviewed Date**	2023-03-20
Year Of Birth (Age)	1954 (68)	**BMI**		**City**	TPE		
		EOA needed to achieve an iEOA > 0.85 cm²/m²		**Country**	TW		

Clinical History

MEDTRONIC ANALYSIS

ANNULUS

	Min		Max		Mean
Diameter (mm)	19.1	x	25.7	,	22.4
Perimeter (mm)	71.6	, Derived Ø (mm)			22.8
Area (mm²)	390.6	, Derived Ø (mm)			22.3

LVOT

	Min		Max		Mean
Diameter (mm)	19.4	x	27.5	,	23.5
Perimeter (mm)	73.4	, Derived Ø (mm)			23.4
Area (mm²)	403.9	, Derived Ø (mm)			22.7

Max Ascending Aorta Diameter (mm)	34.4		
Sinotubular Junction Diameter (mm)	23.8 (Min)	x	27.8 (Max)
Sinus of Valsalva Diameter (mm)	29.3 (LCC)	31.3 (RCC)	31.8 (NCC)
Sinus of Valsalva Height (mm)	17.2 (LCC)	21.5 (RCC)	16.1 (NCC)
Coronary Ostia Height (mm)	10.0 (Left)	15.5 (Right)	

	RIGHT	LEFT
CIA Min Diameter (mm)	4.1 x 6.7	3.6 x 3.6
EIA Min Diameter (mm)	5.6 x 6.0	4.6 x 5.6
Femoral Min Diameter (mm)	6.3 x 6.9	3.9 x 5.7

	RIGHT	LEFT
Subclavian Min Diameter (mm)	x	3.4 x 5.2
Annular Angulation	51°	

Please review images for direct aortic evaluation.

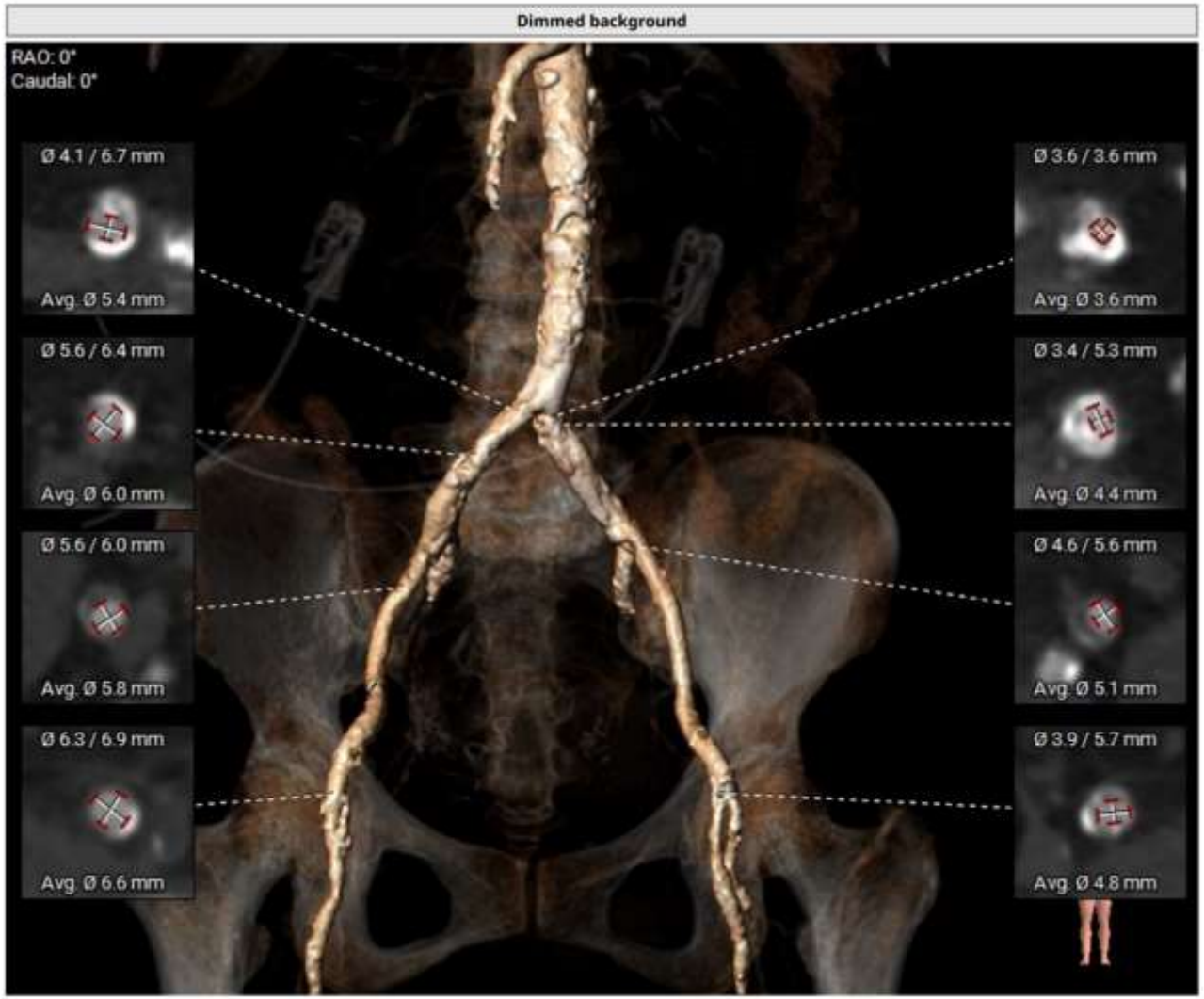
Calcium: Mild ☐ Moderate ☐ Severe ☑

VIV ADDITIONAL MEASUREMENTS

Valve to Coronary Distance (mm)	To LCA	To RCA
Valve to STJ Distance (mm)	LCC	RCC

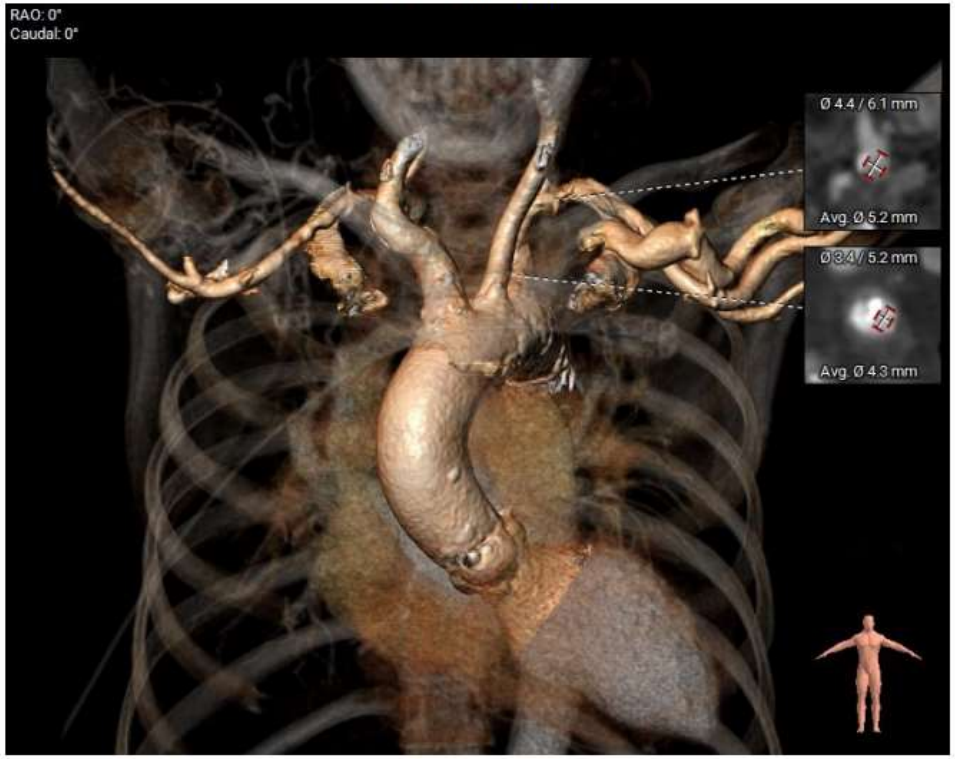
Procedural Considerations

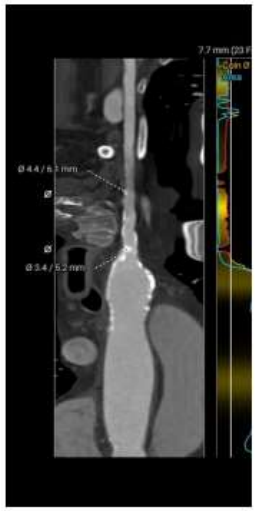
1. Please be aware of calcium in right common iliac artery and left subclavian artery.



Subclavian Access

Left Subclavian

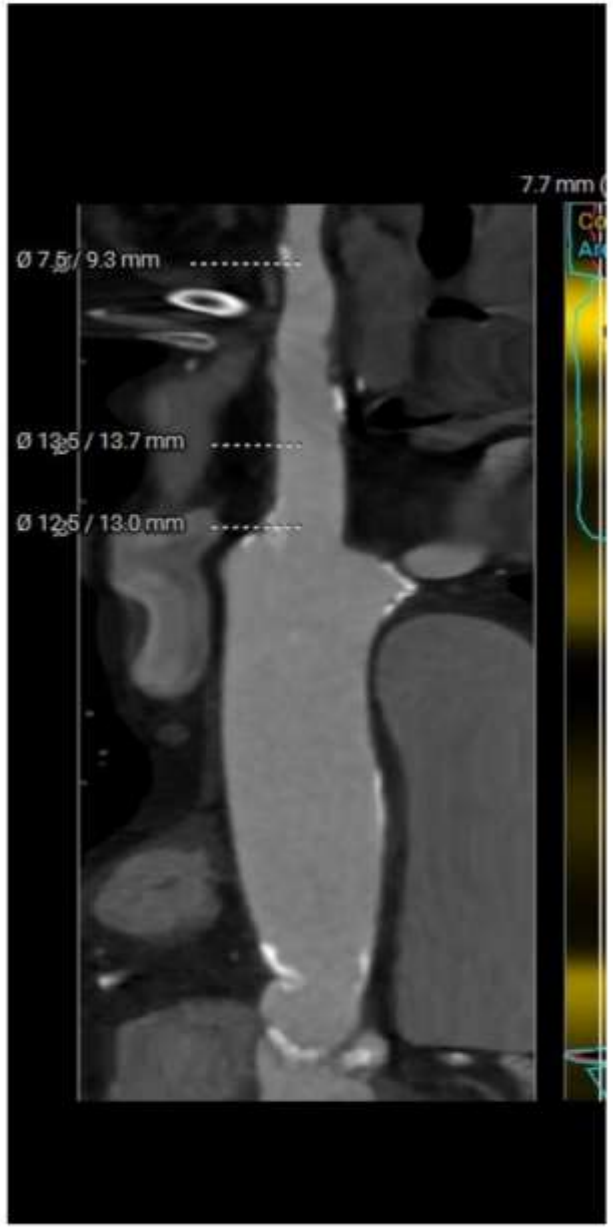




Additional Images

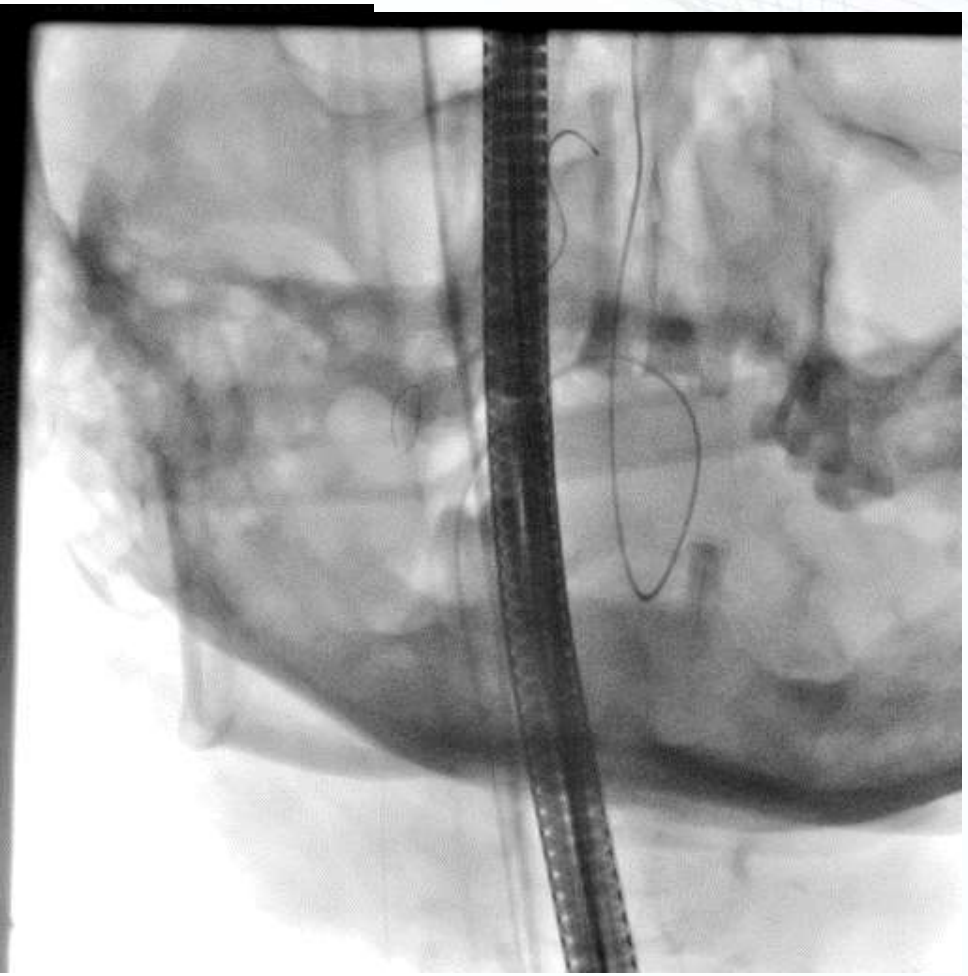
Stretched Vessel - Left Common Carotid Artery

Stretched Vessel - Right Common Carotid Artery

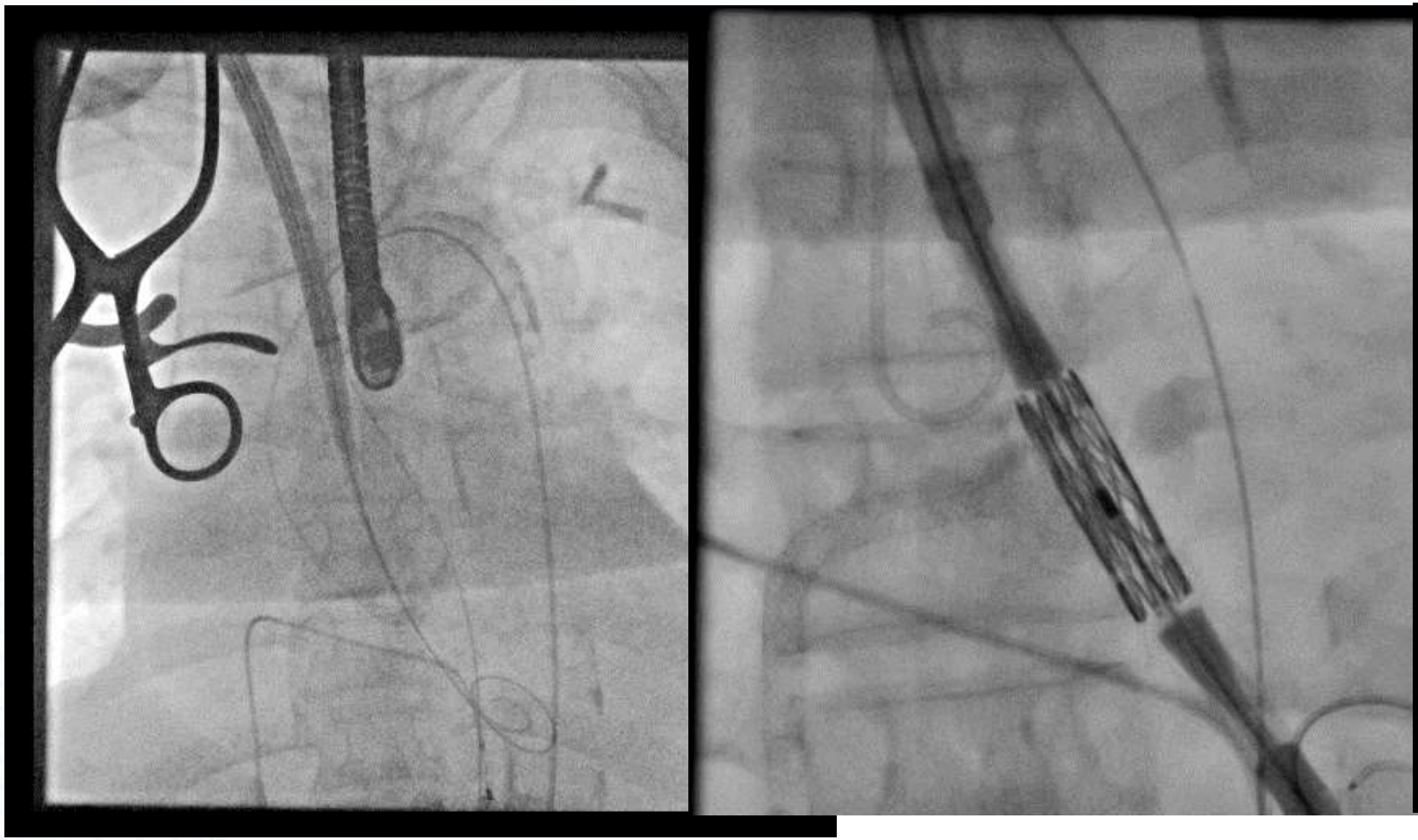


Carotid arteriography

Filter wire to Rt ICA

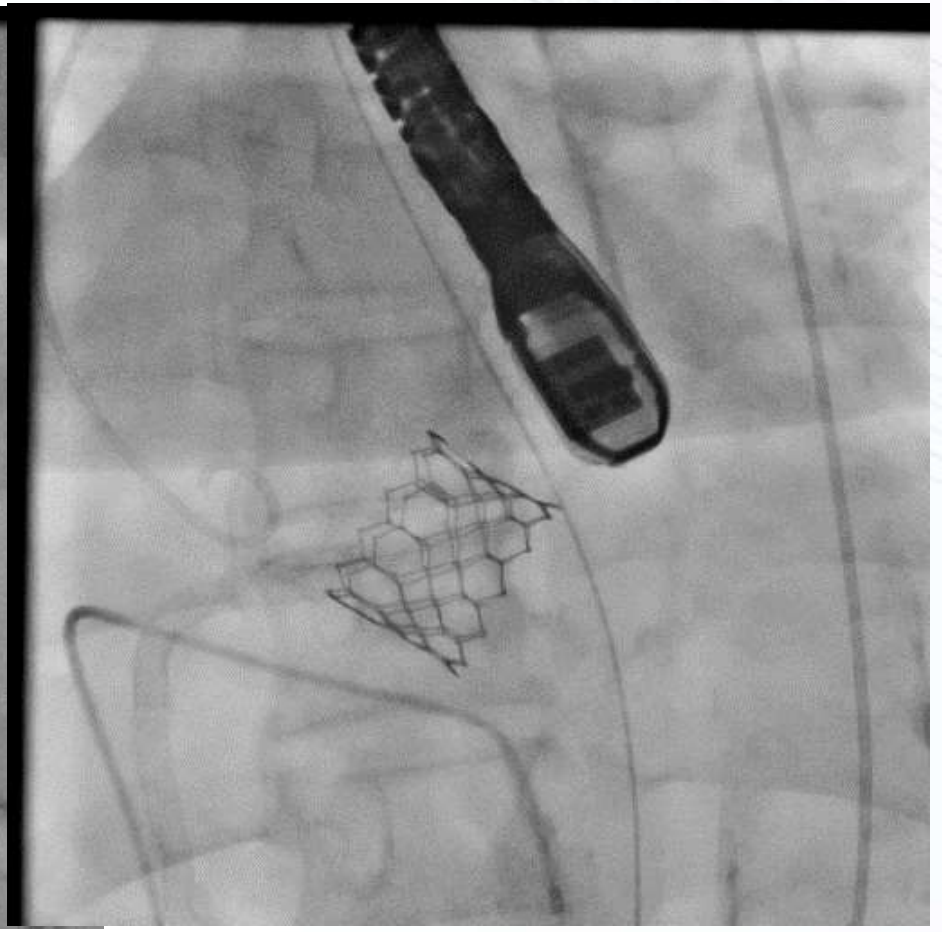


Deployed the Filter wire



E sheath from common carotid artery

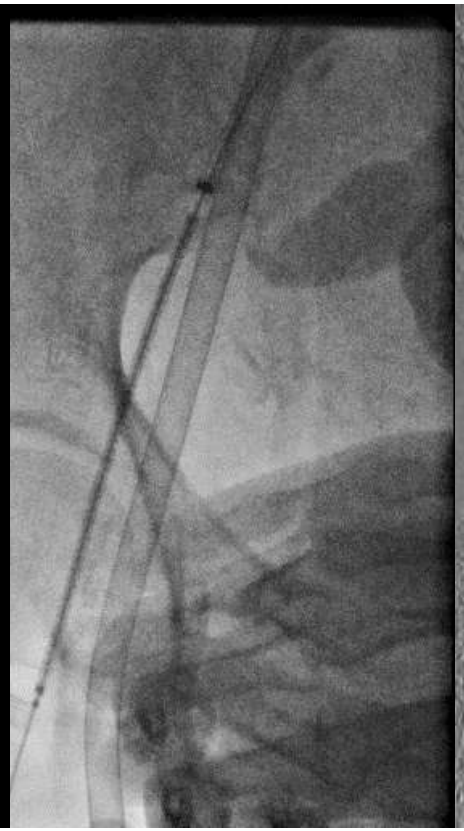
Sapien 3 23 mm



Post S3 implantation

Perforation of ECMO access site

Balloon inflation to Temporarily control the bleeding



Viabahn stent graft implantation

After Viabahn

TAVR with Carotid Stenosis: Embolic Protection? Carotid Stenting before TAVR?

Conclusion 1

- Carotid artery disease in TAVR does not require a carotid stenting before TAVR

- Screening carotid ultrasounds are commonly ordered before cardiovascular surgeries; this practice is not always necessary for TAVR patients

Debris captured by Sentinel















TAVR with Carotid Stenosis: Embolic Protection? Carotid Stenting before TAVR?

Conclusion 2

Embolic protection should be considered during TAVR procedure