Proximal Protection for Symptomatic Carotid Stenosis

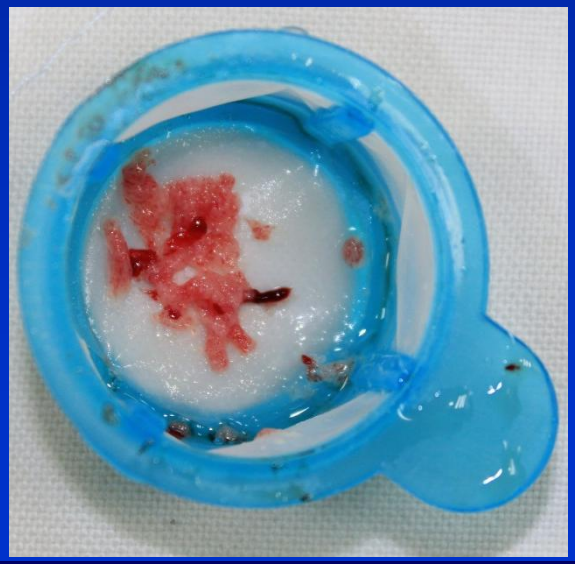
My Early Experiences And The Things To Know

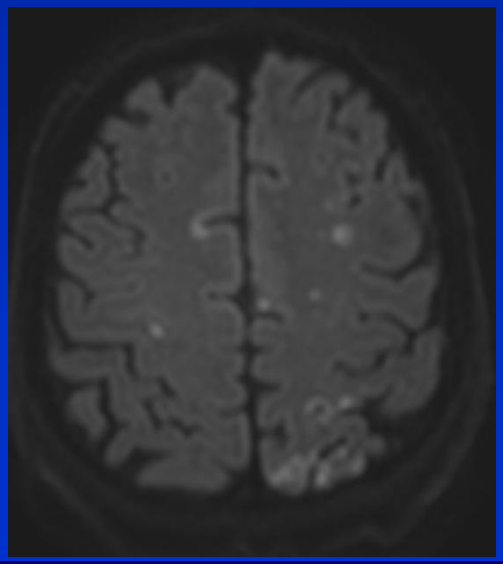
Jae-Hwan Lee, MD, PhD

Cardiovascular Center in
Chungnam National University Hospital

CAS Risk

- **The greatest risk associated with CAS is periprocedural stroke or asymptomatic brain infarction due to embolization**





Proximal vs. Distal Protection

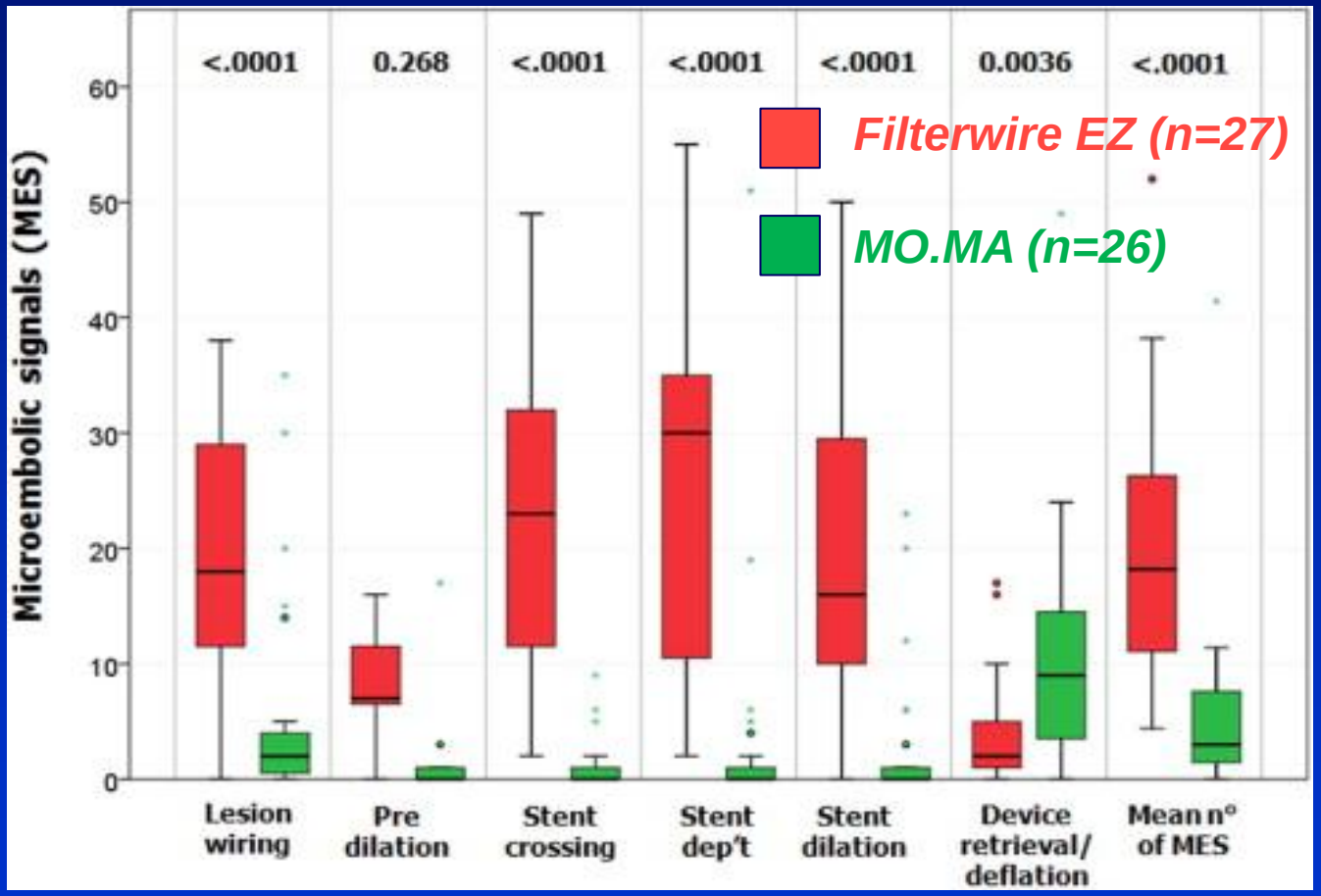
Randomized TCD MES Comparison for High-Risk, Lipid-Rich Plaque

Steps	FilterWire EZ (n = 27)	MO.MA (n = 26)	p Value
Lesion wiring	26 (96%)	19 (73%)	0.145
Pre-dilation	6/7 (86%)	4/10 (40%)	0.578
Stent crossing of the lesion	27 (100%)	7 (27%)	<0.0001
Stent deployment	27 (100%)	7 (27%)	<0.0001
Stent post-dilation	26 (96%)	7 (27%)	<0.0001
Device retrieval/deflation	22 (81%)	25 (96%)	0.721

Montorsi P et al. JACC 2011;58:1656-63

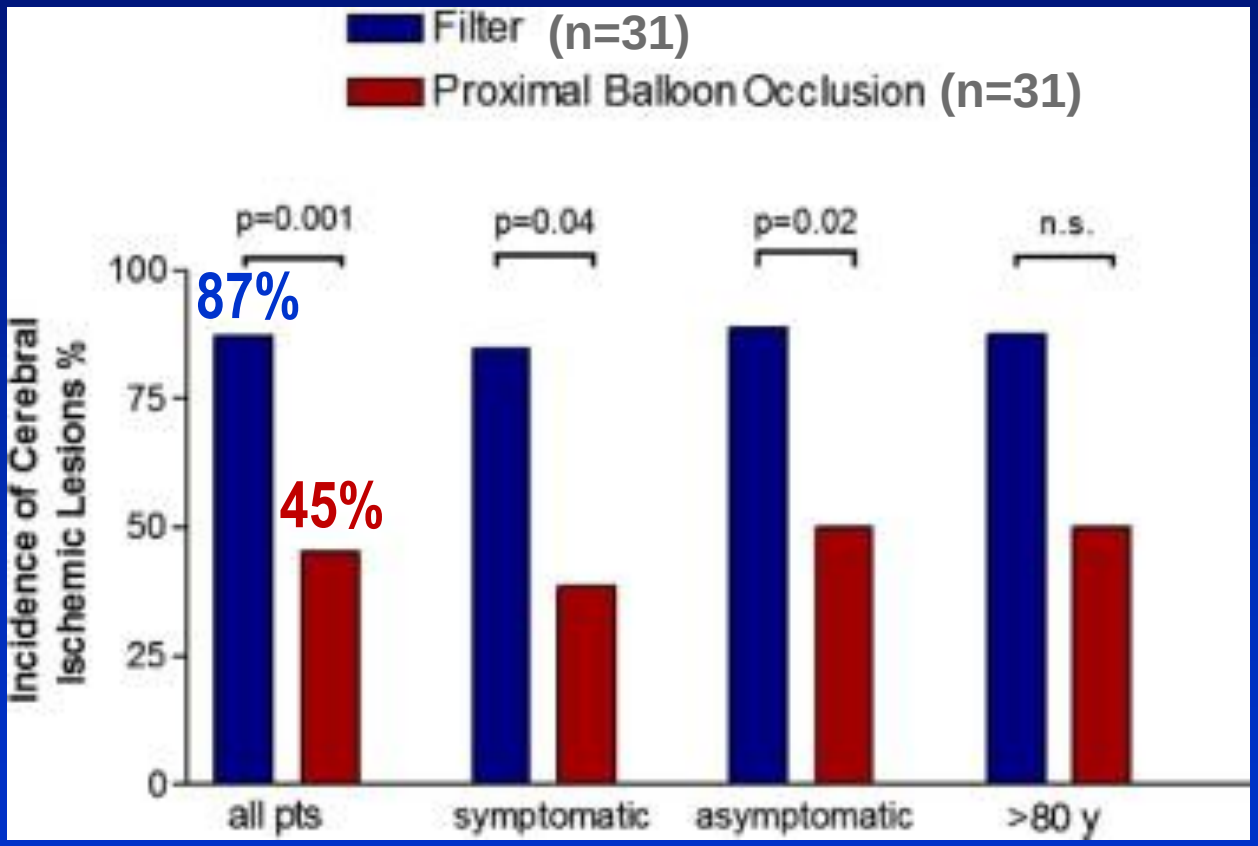
Proximal vs. Distal Protection

Randomized TCD MES Comparison for High-Risk, Lipid-Rich Plaque



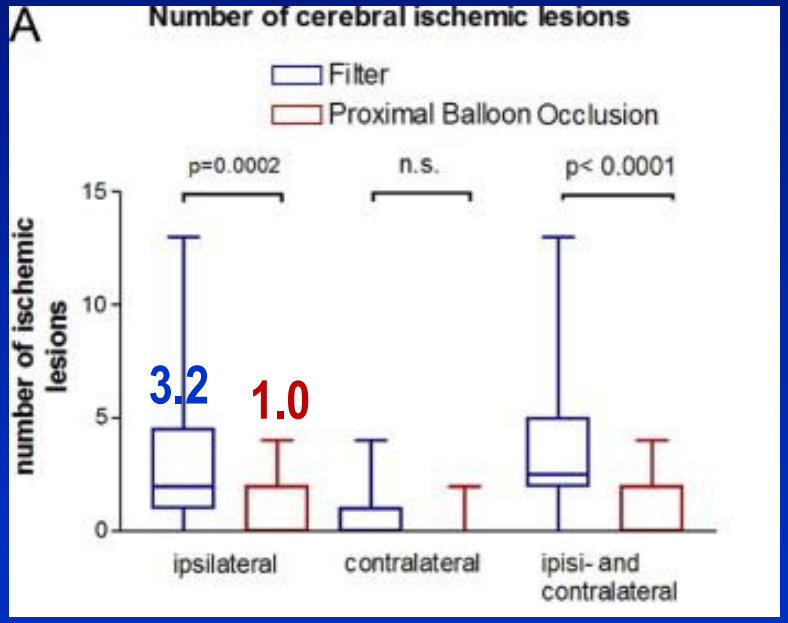
Montorsi P et al. JACC 2011;58:1656-63

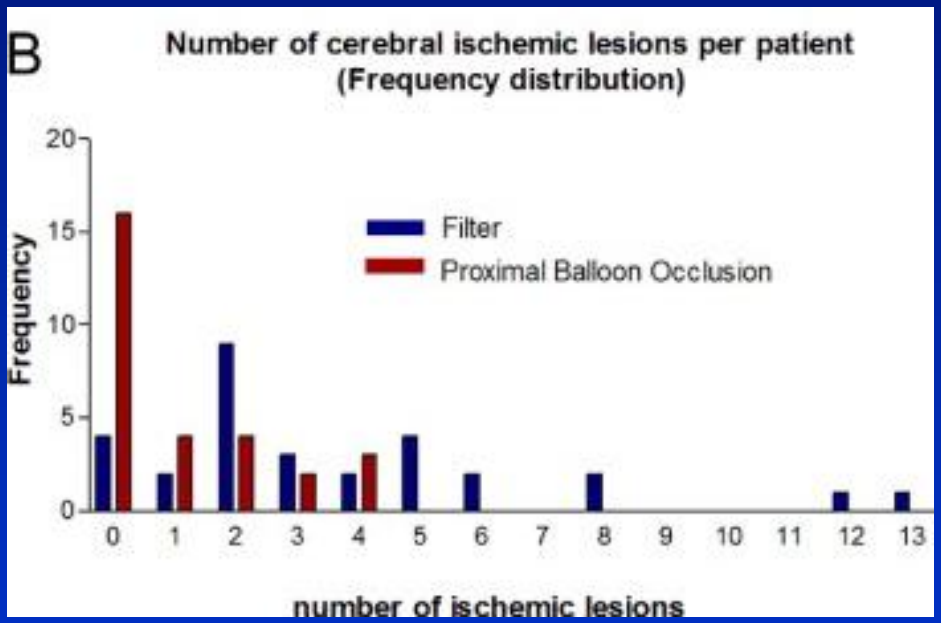
Proximal vs. Distal Protection
Randomized DWMRI Comparison



Bijuklic K et al. JACC 2012;59:1383-89

Proximal vs. Distal Protection
Randomized DWMRI Comparison





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Proximal Embolic Protection
Disadvantages

- Intolerance possible with poor collateral or contralateral occlusion
- Some loss of visualization due to occluded flow
- Larger device (8~9 Fr introducer)
- More manipulation of aortic arch

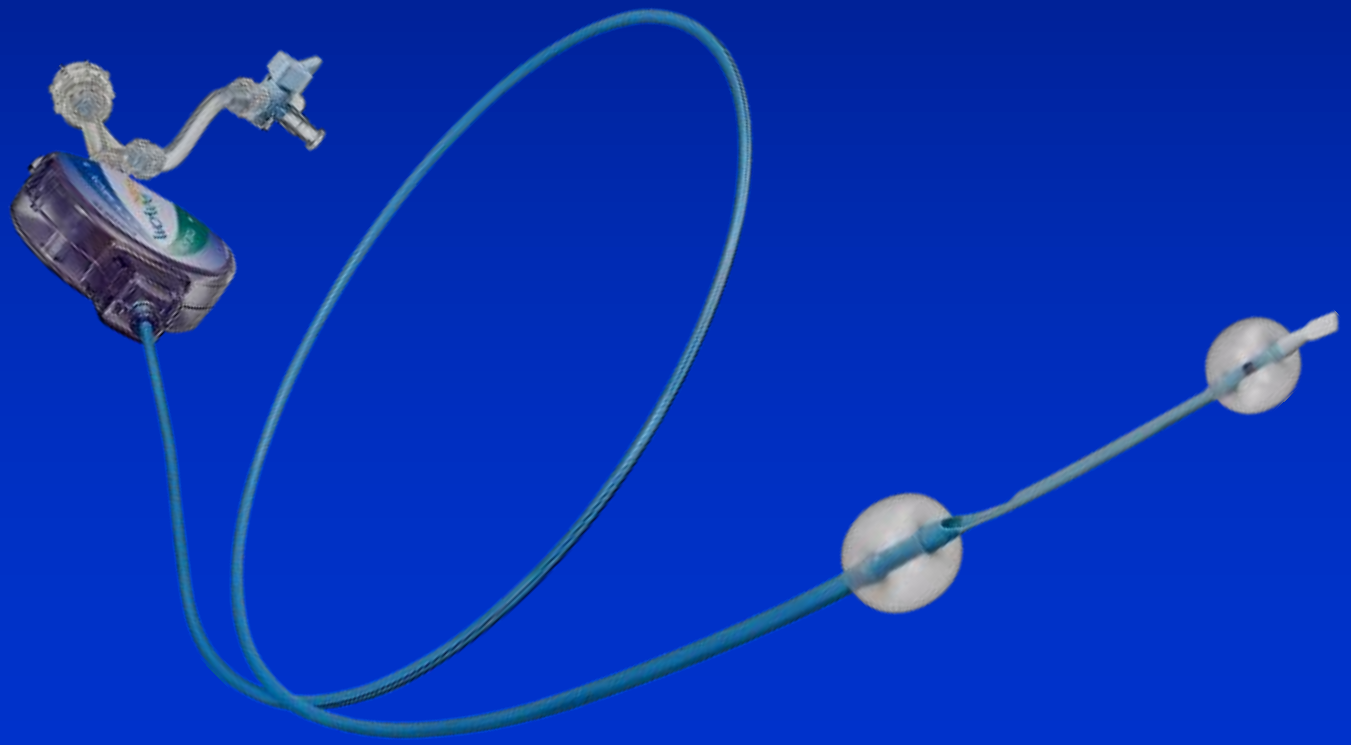
Proximal Embolic Protection

Advantages

- Easy to use with experience
- Intolerance is rare, and usually reversible
- Do not require crossing of the stenotic lesion without protection
- Landing zone tortuosity doesn't matter
- Less emboli get to brain… on TCD & DWI
- Great results especially elderly and symptomatic patients

MO.MA in Korea

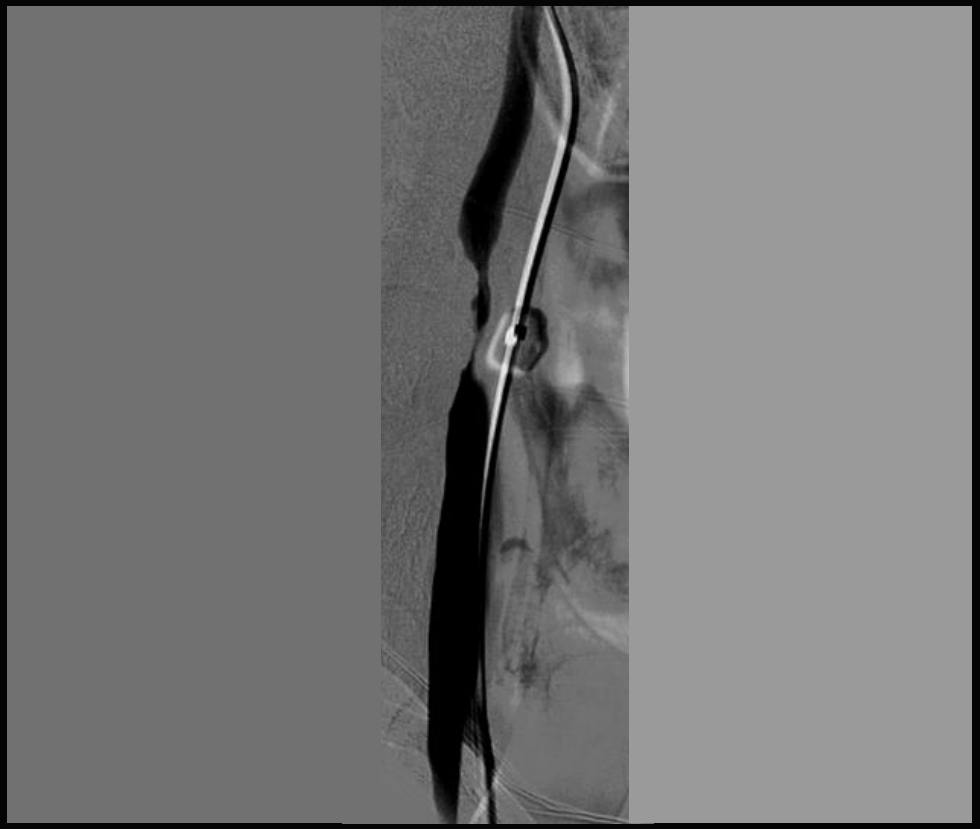
- **KFDA approval in Nov. 2011**
- **Increasingly using since 2012 Summer**
- **≤200 MO.MA procedures have performed in Korea**



MO.MA in My Cath Lab

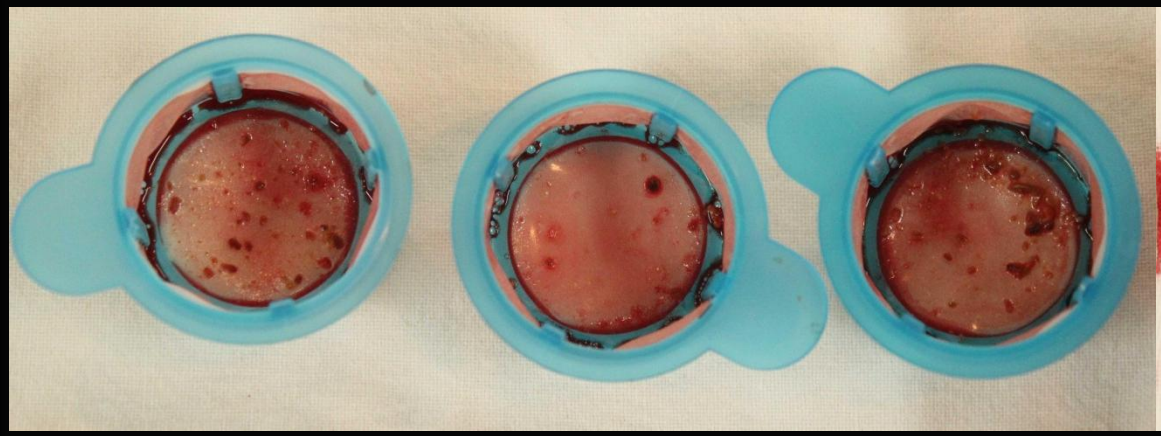
- **The 1st MO.MA procedure; July, 2012**
- **All 261 CAS procedures except two had performed with Filter protection before MO.MA usage.**
- **I was still afraid of total blockage to the brain**
- **Attending neurologist was also worry about to MO.MA procedure.**

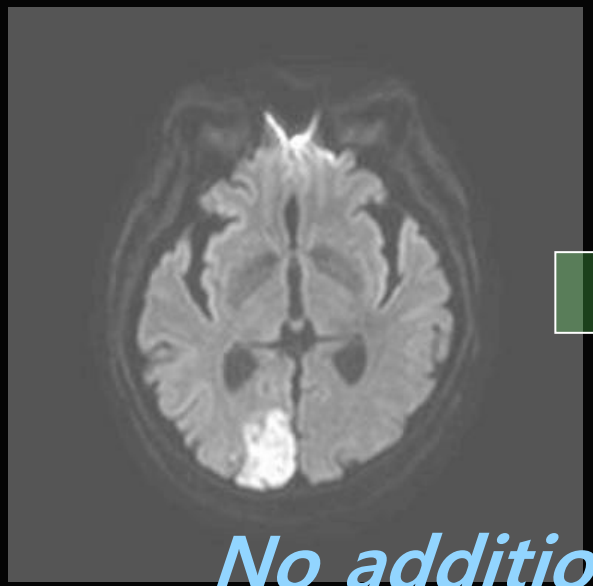
4th case – Symptomatic 76 YO man

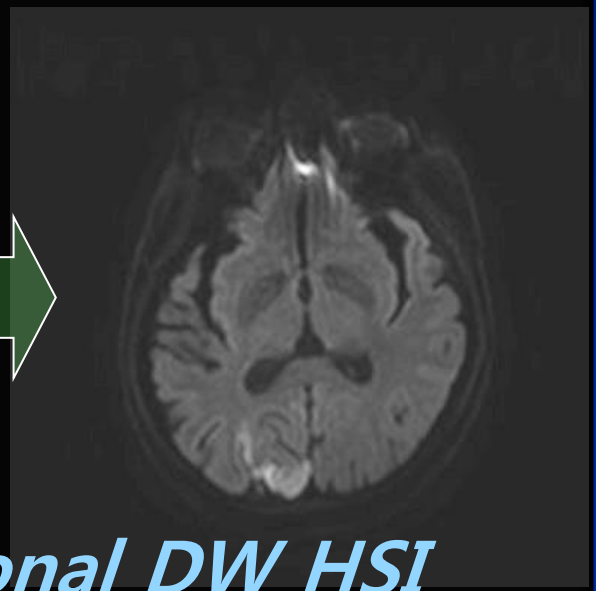


- Occlusion duration
  - 6 min 30 sec
- The pt. revealed motor weakness and fell into stuporous mentality.
- Attending neurologist was very anxious.

4th case – Symptomatic 76 YO man

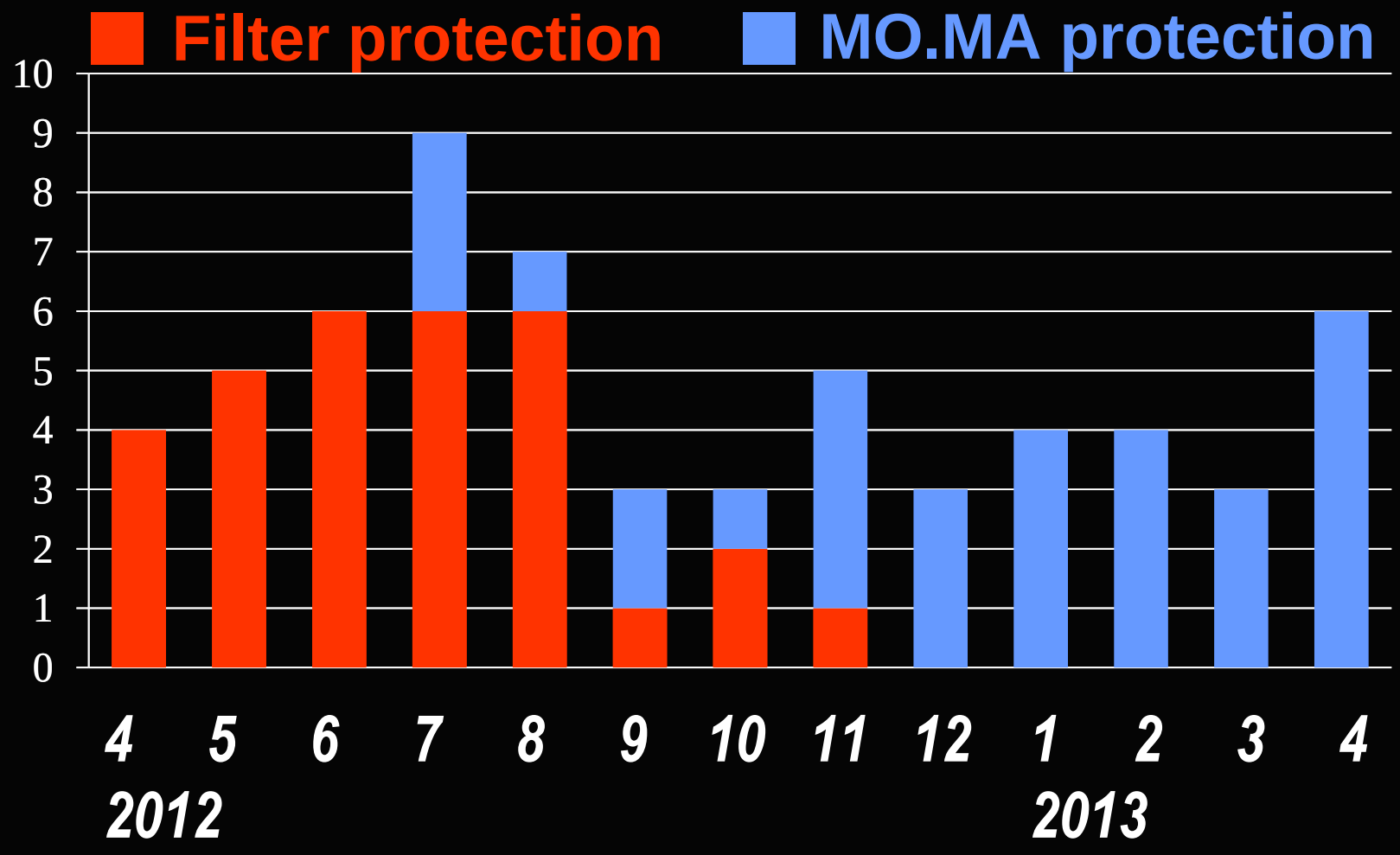






No additional DW HSI

Monthly CAS Protection



Results of 31 MO.MA Protection

30 elective & 1 urgent cases

Baseline Characteristics (n=30)

Mean age, yrs	71 ± 9
≥80 yrs	5 (20%)
M : F	28 : 2
Diabetes	11 (37%)
Smoking	17 (57%)
Hypertension	26 (87%)
Dyslipidemia	13 (43%)
Symptomatic vs. Asymptomatic	19 : 11
Recent stroke ≤3 months	19 (63%)
Coronary artery disease	19 (63%)
Peripheral artery disease	5 (17%)

Lesion Characteristics (n=30)

Right vs. Left	15 : 15
Mean stenosis, pre-procedure	91 ± 6%
Mean lesion length	15 ± 6 mm
Arch type, I : II : III	15 : 13 : 2
Calcified lesions	14 (47%)
Ulcerated lesions	7 (23%)
Thrombotic lesions	9 (30%)
Bilateral stenoses	4 (13%)
Severe proximal torutuosity	3 (10%)
Severe distal tortuosity	7 (23%)
ECA occlusion → Mono-Mo.Ma	1 (3%)

Procedural Characteristics (n=30)

9 Fr long femoral sheath used	21 (70%)
Mean duration of procedure	32 ± 8 min
Duration of protection	
Mean	6.0 ± 2.5 min
Median	5’ 05”
Range	3’ 10” – 9’ 35”
Fractionation of protection	2 (7%)
Difficult GW passage	1
Additional stenting for miscoverage	1
No superior thyroid artery occlusion	7 (23%)

Procedural Characteristics (n=30)

Predilation balloon size (2.5 : **3** : 3.5 mm)	1 : 28 : 1
Postdilatation balloon size (5 : **6** mm)	9 : 21
Stent used	
Open : Closed : **Hybrid**	2 : 1 : 27
Length, 30mm : **40mm** : Overlapped	4 : 24 : 2
Tubular vs. **Tapered**	7 : 23
Patient intolerance during protection	7 (23%)
Sx Initiation after occlusion	3.5±0.7 min
Sx Improvement after deflation	1.9±0.9 min
Prolonged neurologic deficit ≥5min	0

Procedural Characteristics (n=30)

Debris captured	
None	13 (43%)
< 10 debris	8 (27%)
10-20 debris	4 (13%)
≥ 20 debris	5 (17%)
New MR DWI HSI lesion (n=28)	7 (25%)
No HSI	23
1 HSI	2
2 HSI	3
15 HSI	1
20 HSI	1
New HSI, ipsilateral vs. bilateral	5 : 2

1 TIA

1 TIA

What I Have Learned in 31 MO.MA Procedures

30 elective & 1 urgent cases

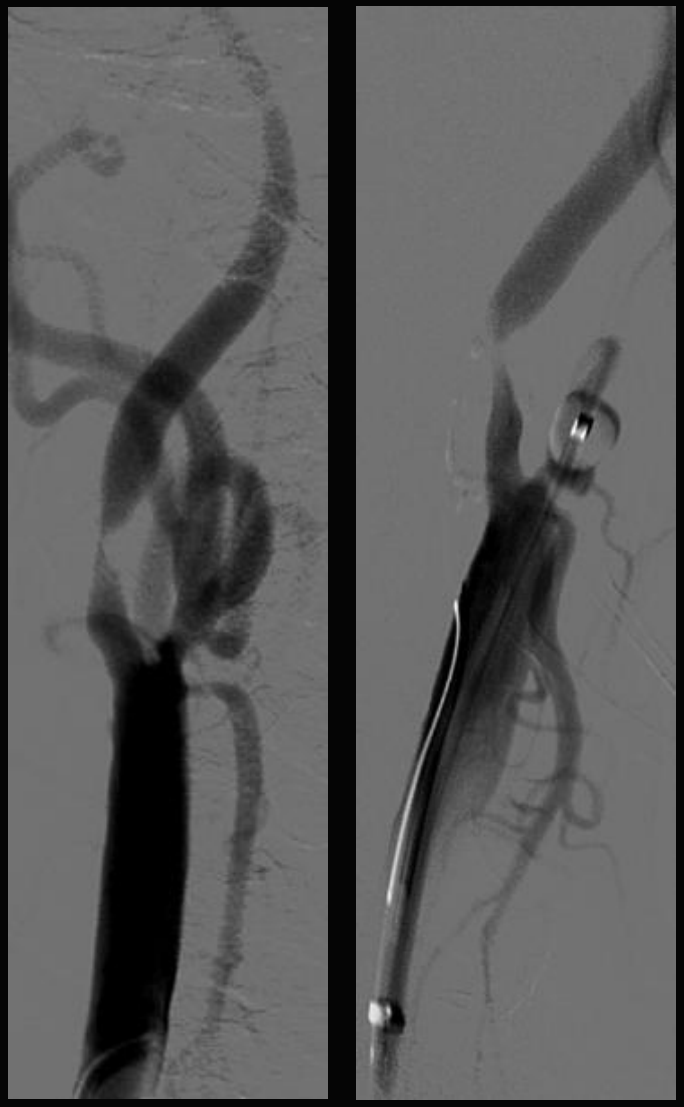
Simple Way To Reduce Clamping Time

After ECA occlusion,
Before CCA occlusion,

Touch proximal entry of lesion with a floppy tip of the 0.014" GW.
Reshape GW tip if needed

Predilation balloon is ready before GW insertion

MO.MA and Uncoverage of Sup. Thyroid Artery

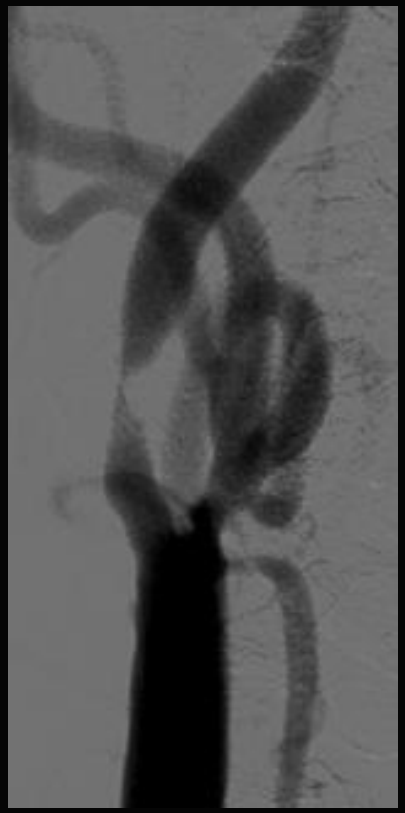


Can it create a retrograde Flow in to ICA?

Sup. Thyroid artery pressure in open surgery	
Average pressure of ECA	60 mmHg
Average pressure of ICA	80 mmHg
Average pressure of Thyroid	50 mmHg

NO flow detectable with Doppler toward the brain after clampage of CCA and ECA

Uncoverage of Sup. Thyroid Artery; Overcome

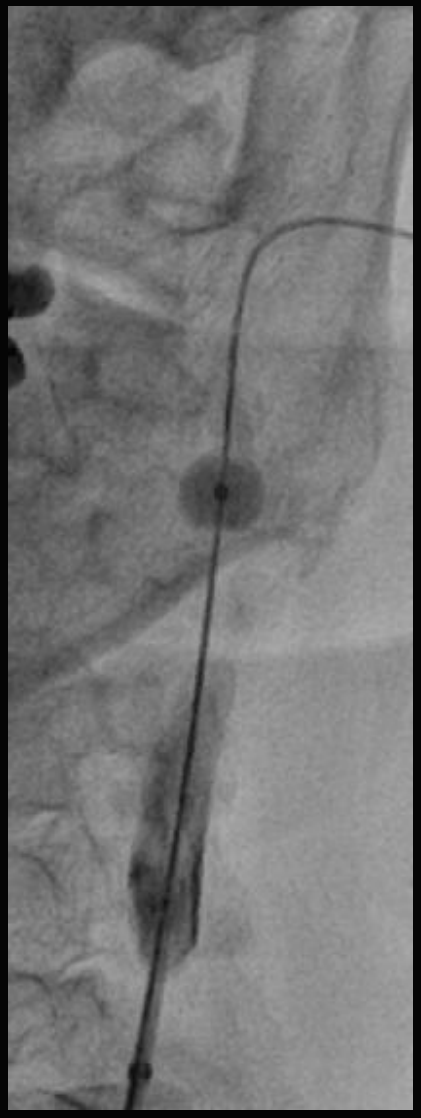


Difficult to block (2 cases)

Too distal ECA 0cclusion (5 cases)

5 of 7 uncovered cases were caused by too much distal ECA occlusion

Uncoverage of Sup. Thyroid Artery; Overcome



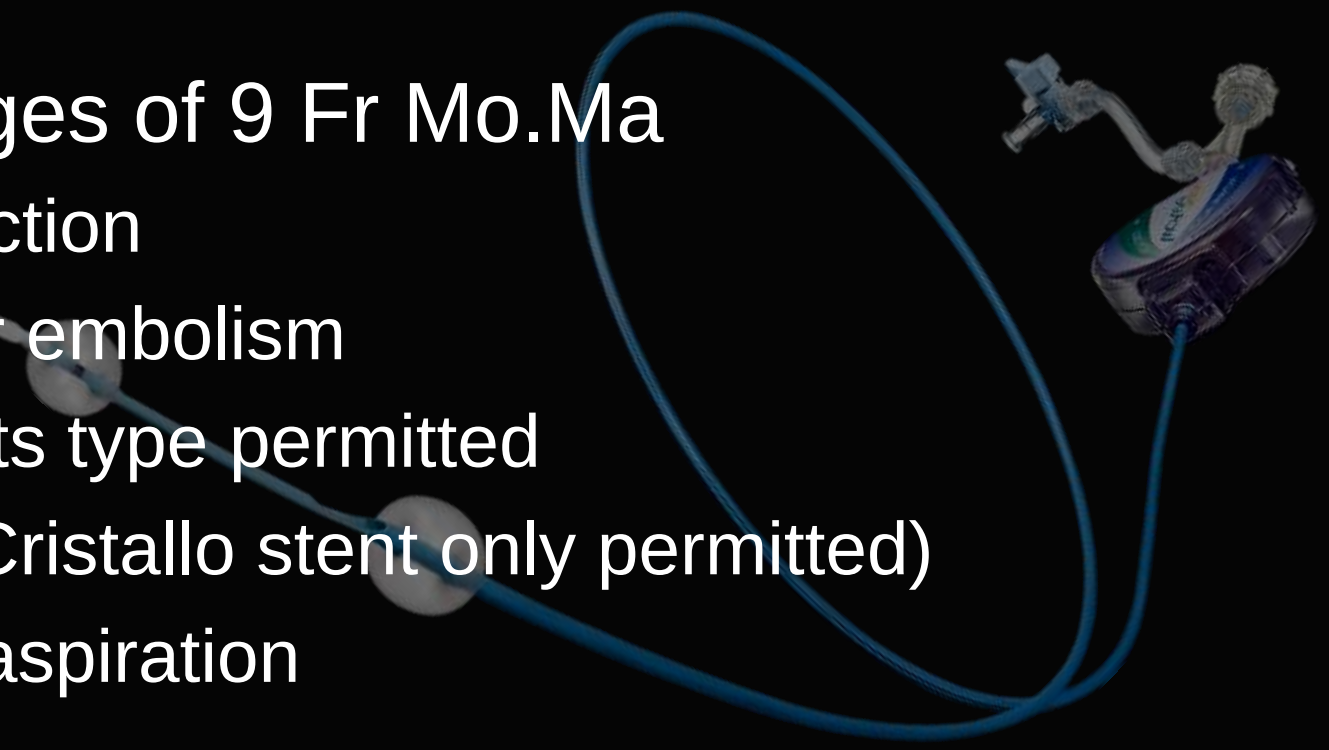
Occlusion near the ECA ostium for the ostial origin of sup. Thyroid artery.

No stent damage

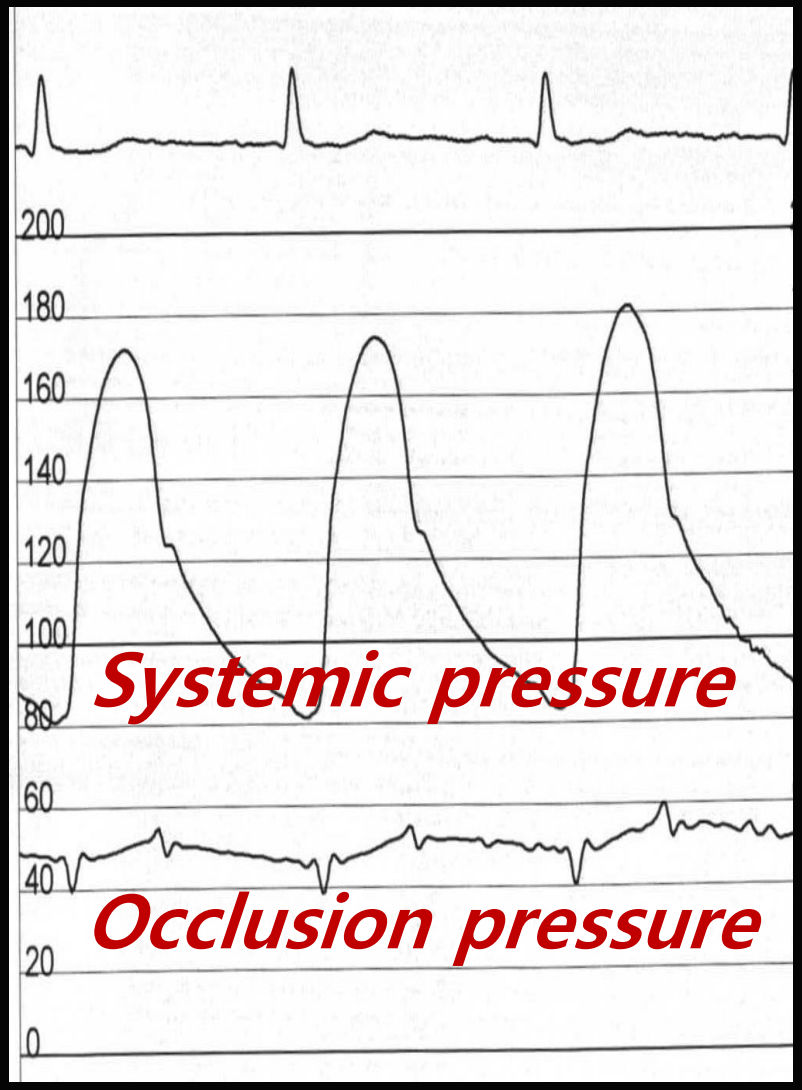
Not prohibit stent passage

8 Fr MO.MA → 9 Fr MO. MA

- 8 Fr vs. 9 Fr
  - 9 Fr → 6 Fr (0.083“/ 2.12 mm) working channel
  - 8 Fr → 5Fr (0.072“/ 1.76 mm) working channel
- Advantages of 9 Fr Mo.Ma
  - Less friction
  - Less air embolism
  - All stents type permitted
    (8 Fr; Cristallo stent only permitted)
  - Easier aspiration



9 Fr Long Femoral Sheath for 9 Fr MO.MA



- Less femoral artery damage
- Less MO.MA tip and shaft damage
- Overcome iliac tortuosity

- Dual pressure monitoring in a single puncture (systemic and CCA pressure)

Drainage of CCA Blood During Procedure

- **Disadvantage**

  - Blood will be stolen from the Circle of Willis

  → potential intolerance

  - Blood loss

- **Advantage**

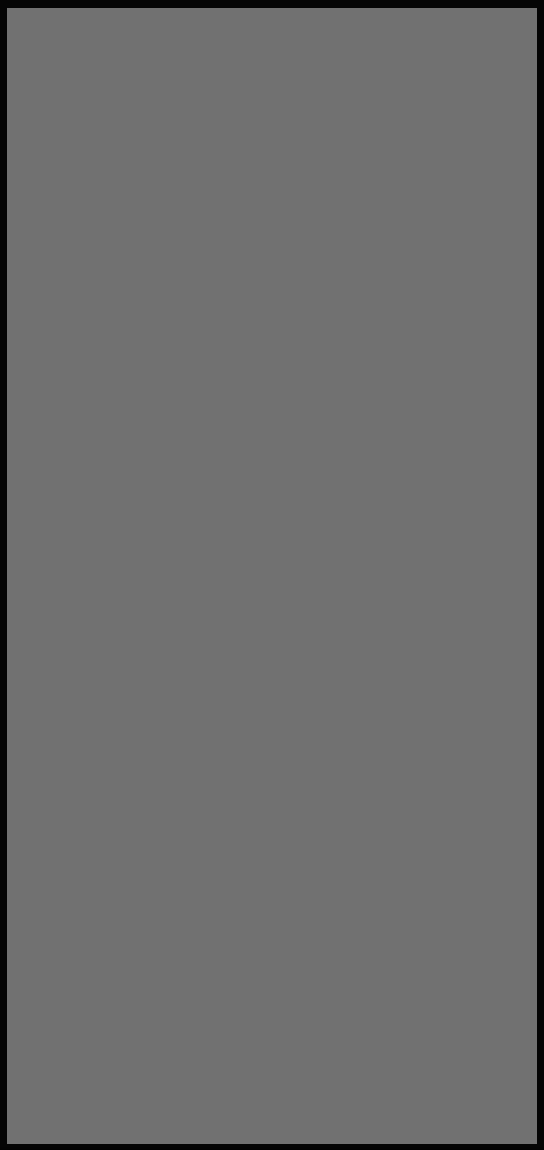
  - Prevent thrombi migration to brain

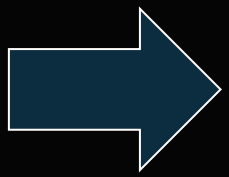
Carotid Near Occlusion or Thrombi Containing Lesions

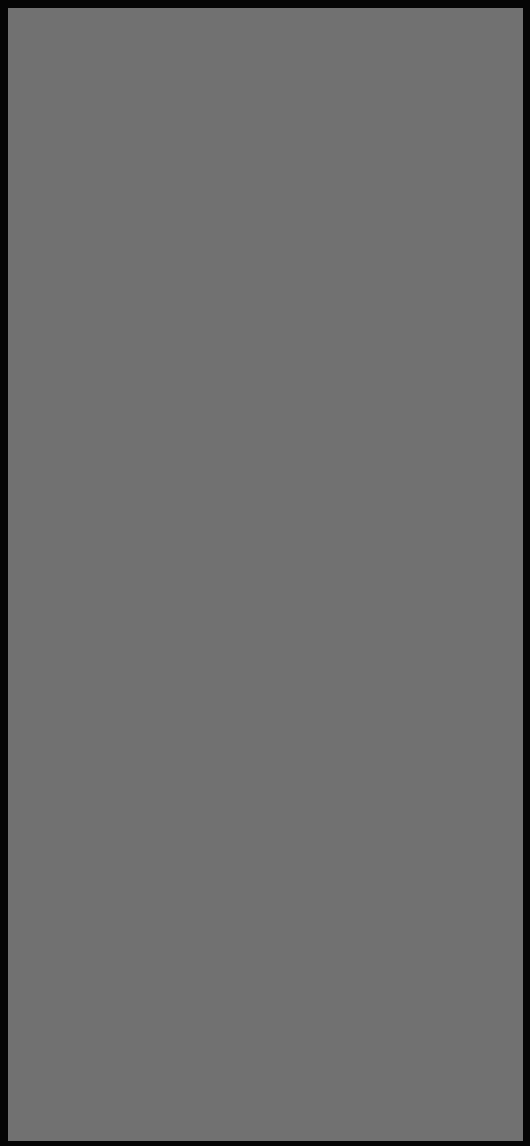
for Filter Protection

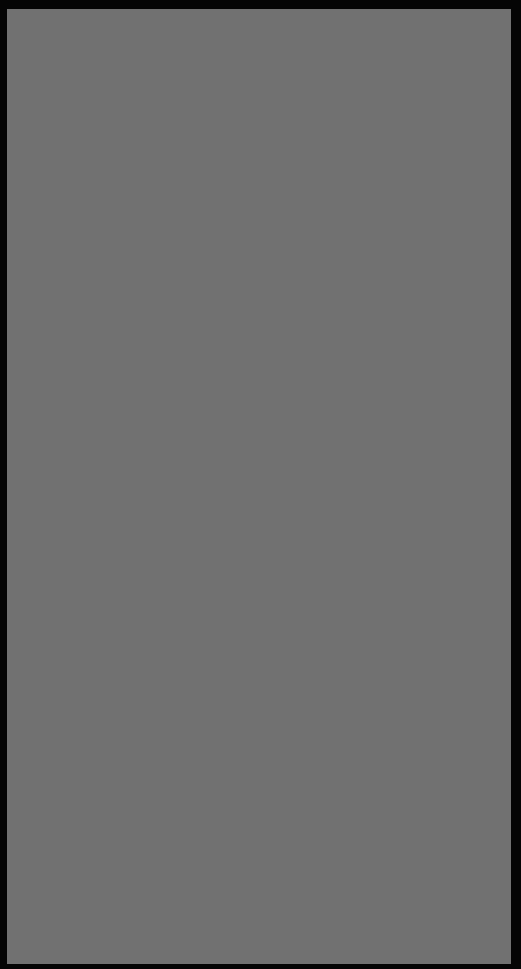
Right carotid angiogram

Warfarinization for 6 weeks



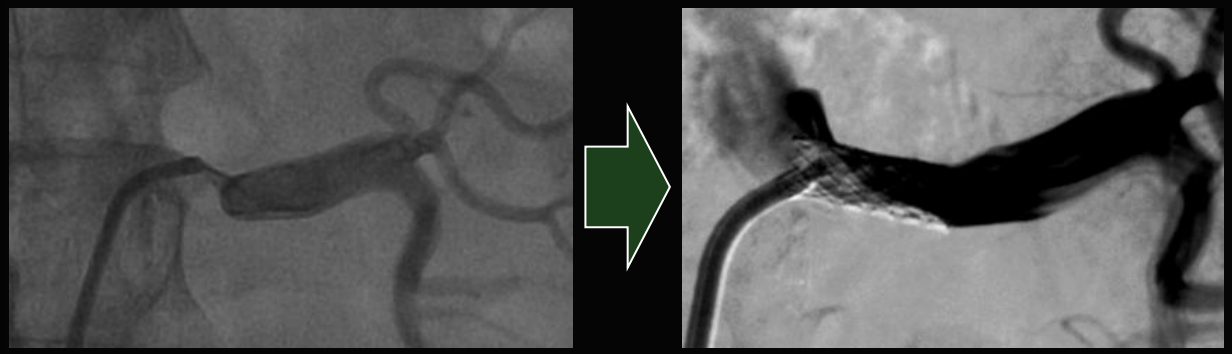






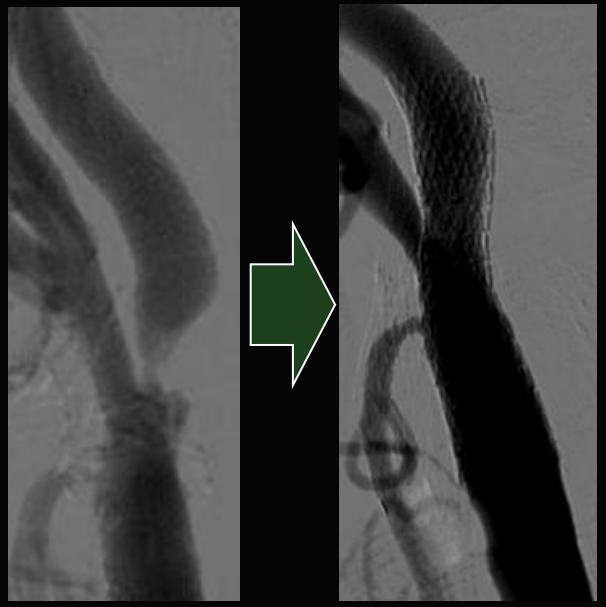
CAS with Filter

Renal / LMCA / Left carotid stenting



Renal stenting with Filter protection

RCA occlusion, Left main stenting



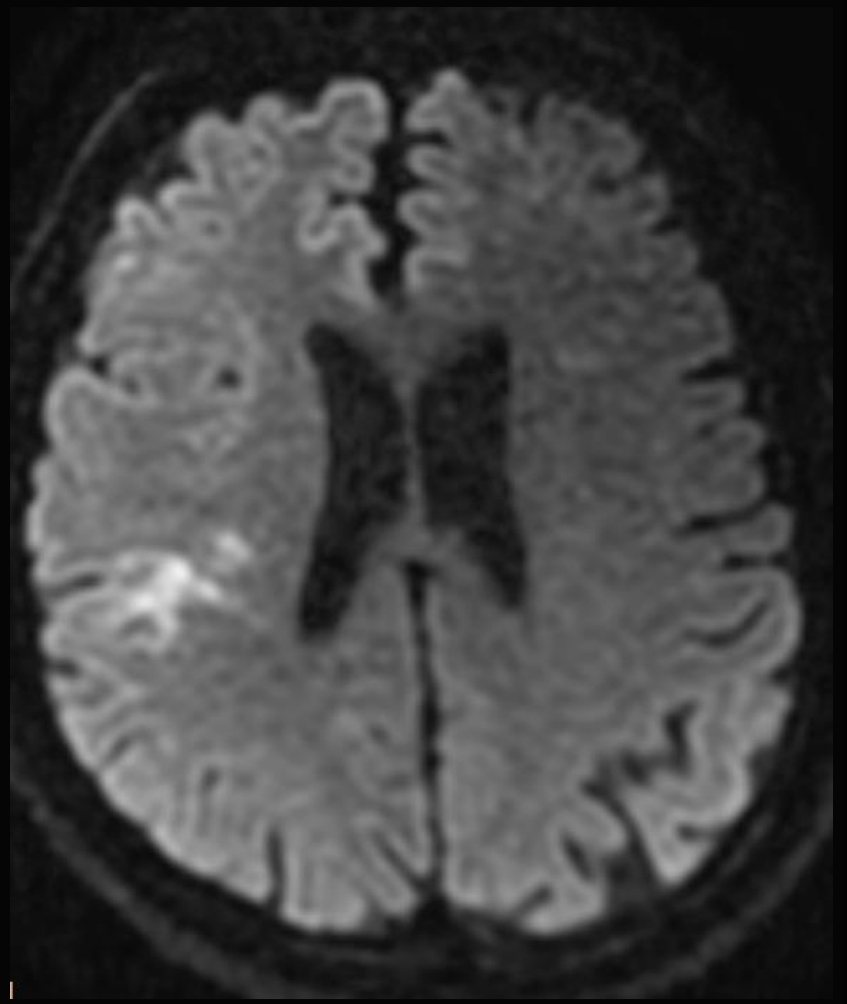
Rt. CAS with Filter

Case 2

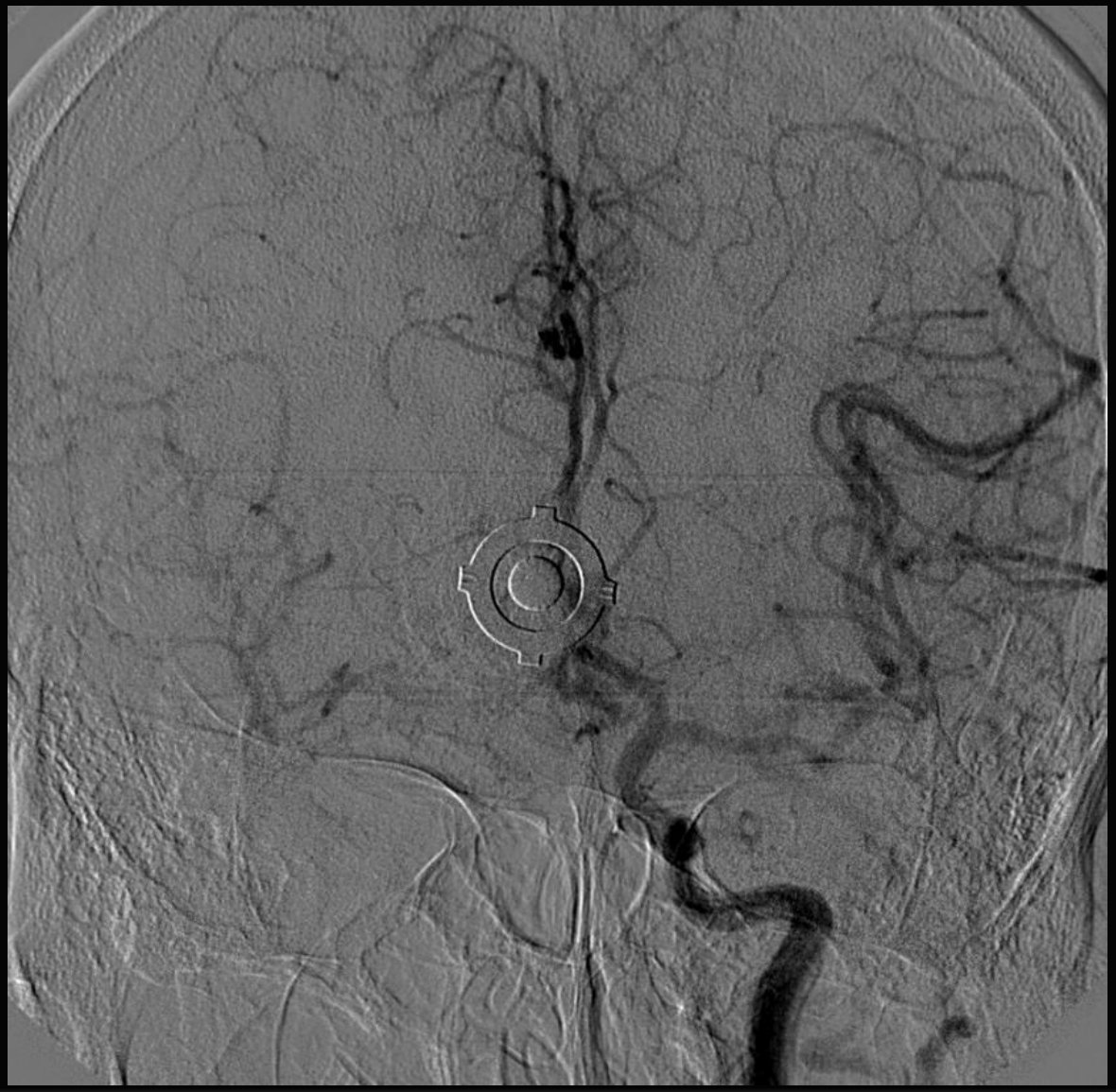
69 years old man

DM, Exsmoker

Dysarthria and falling tendency in the morning

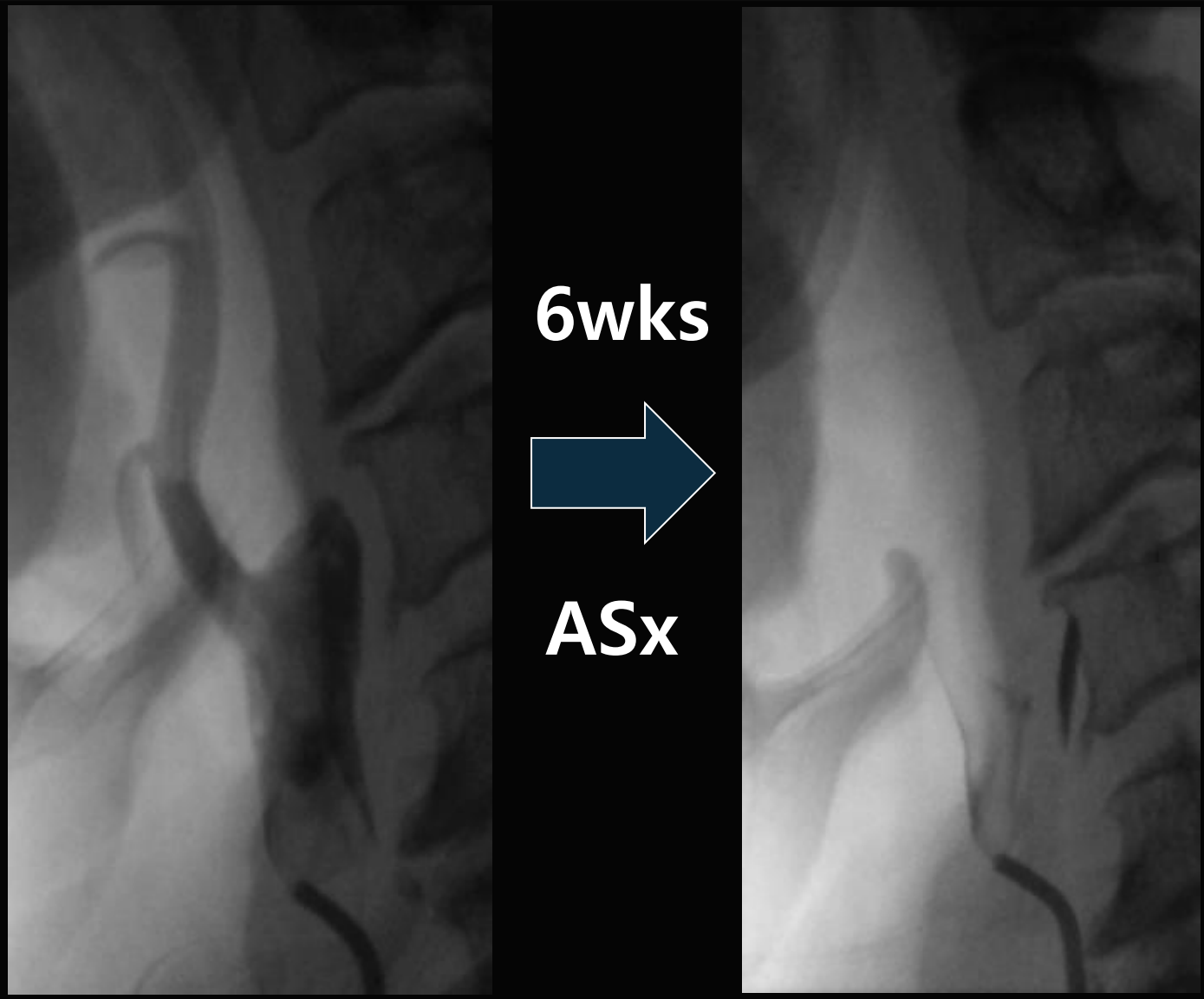


Left carotid angiogram



Right carotid angiogram

Warfarinization for 6 weeks



After MO.MA Available

since Jul. 2012

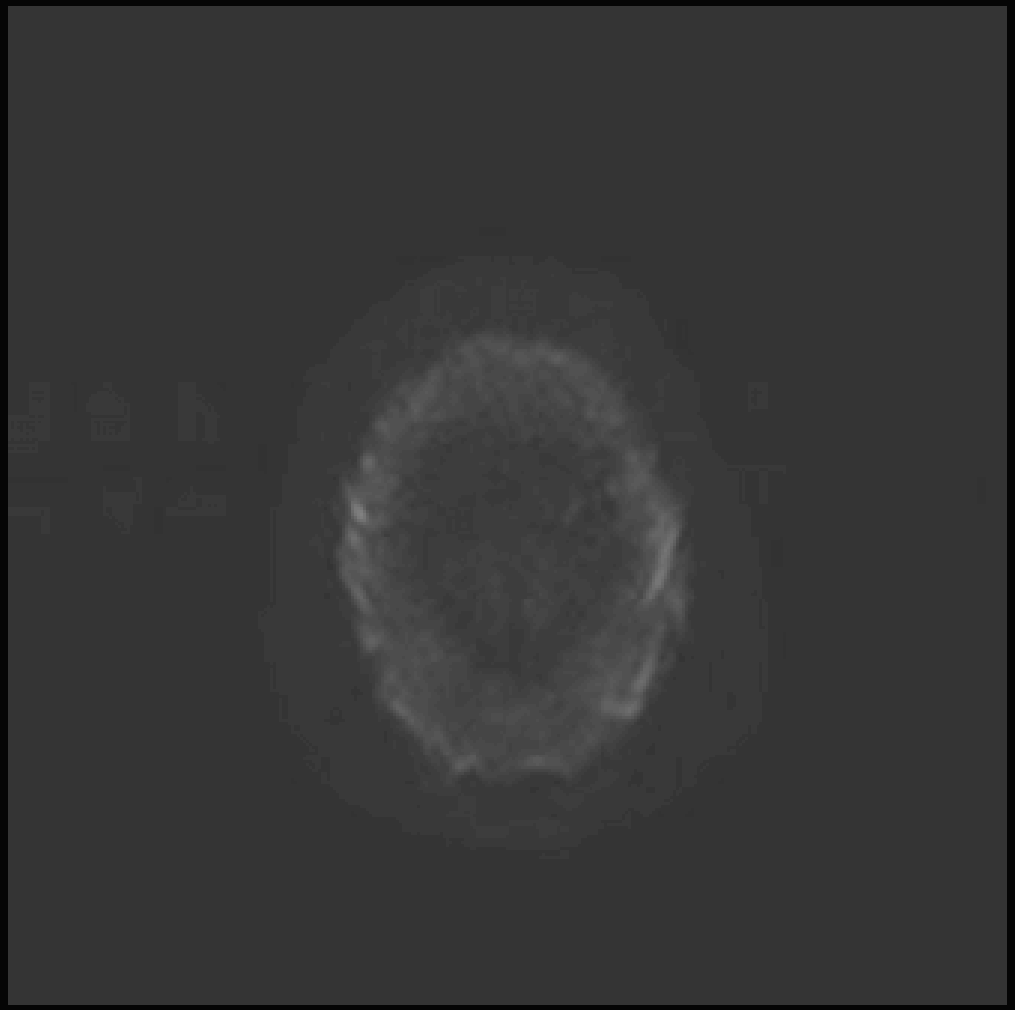
Case 3

73 years old man

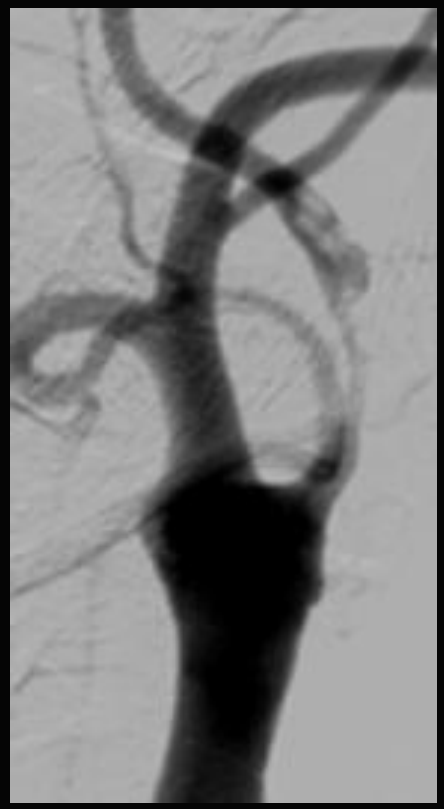
HT, Dyslipidemia

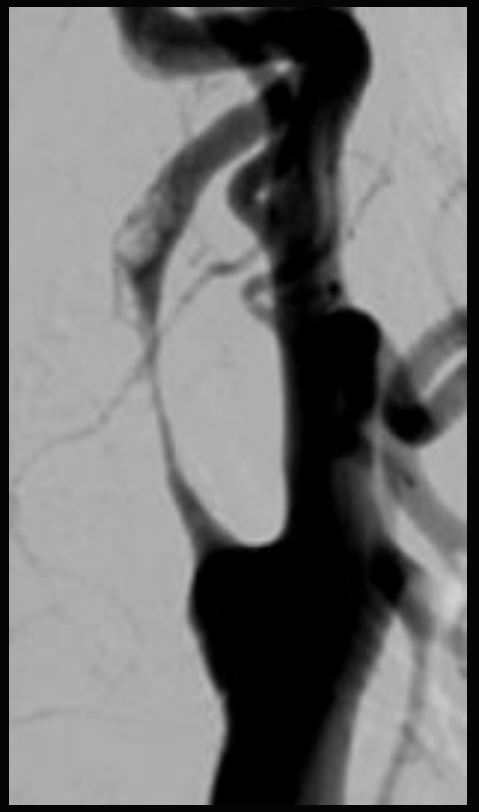
Right hemiparesis

and dysarthria



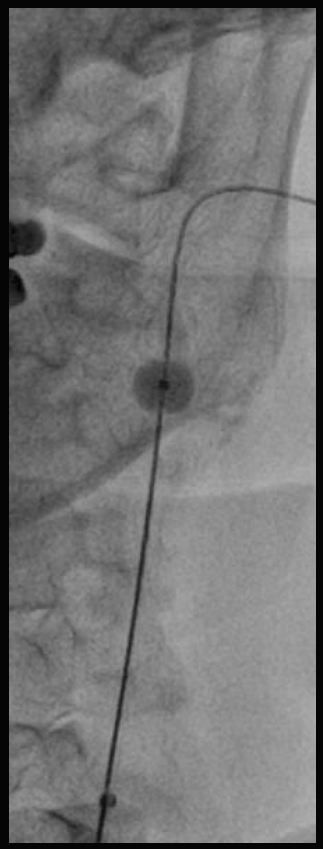
Left carotid angiogram in 7 days



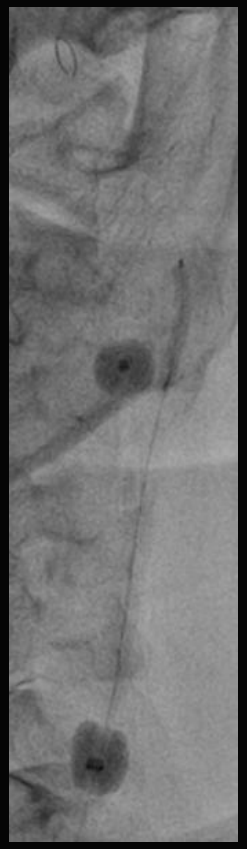


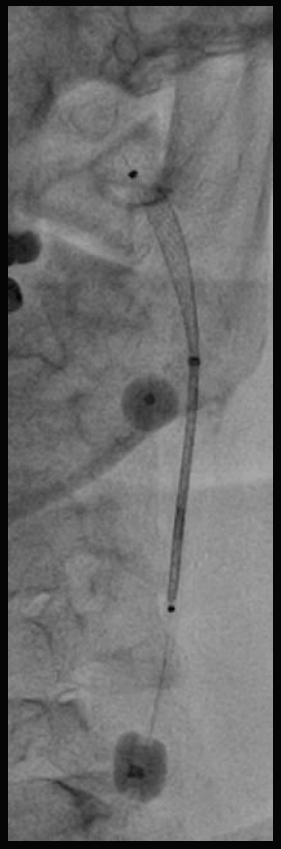
Visible intraluminal thrombi

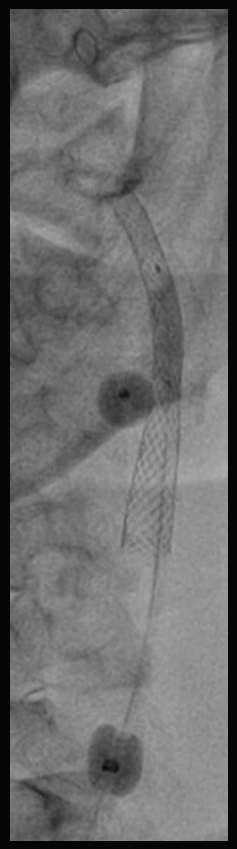
CAS with MO.MA and Filter protection


MO.MA

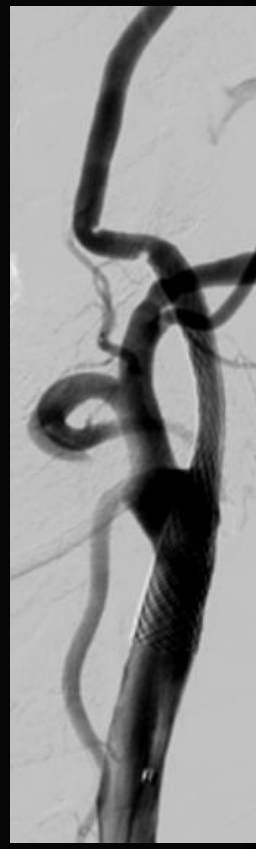

Filterwire Passage


Predil

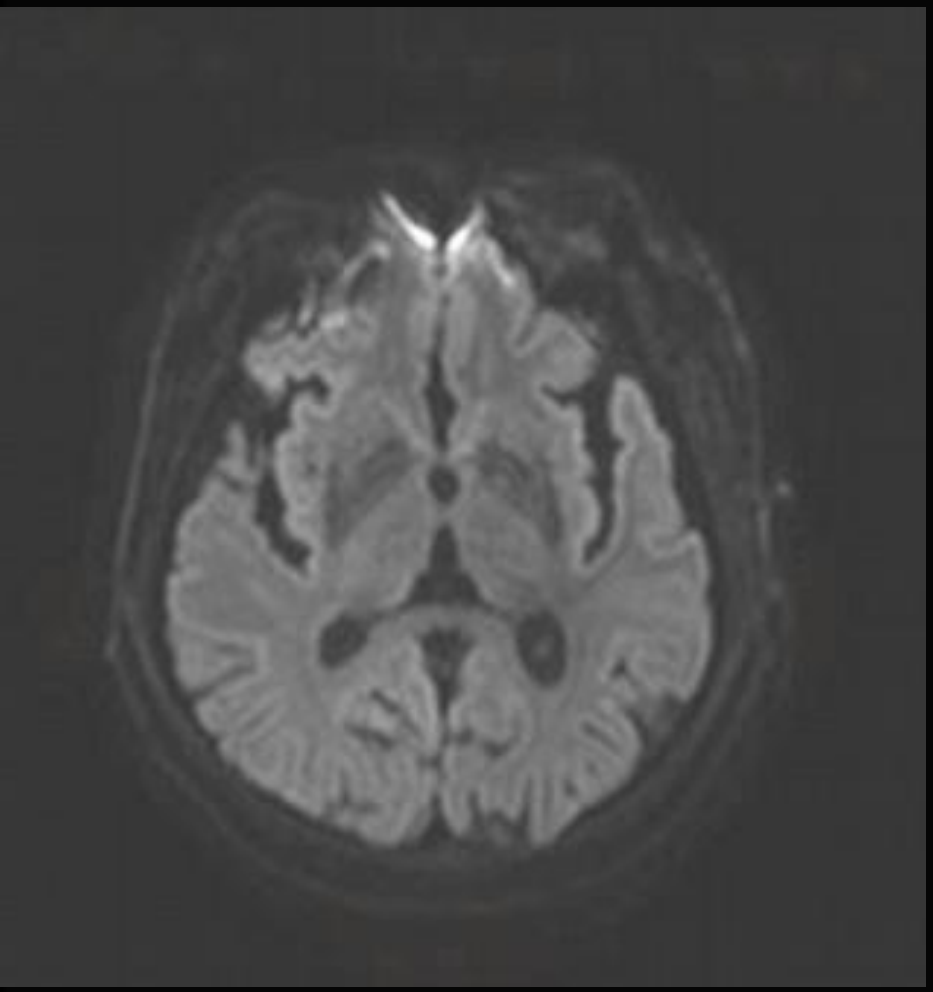

Wall stent

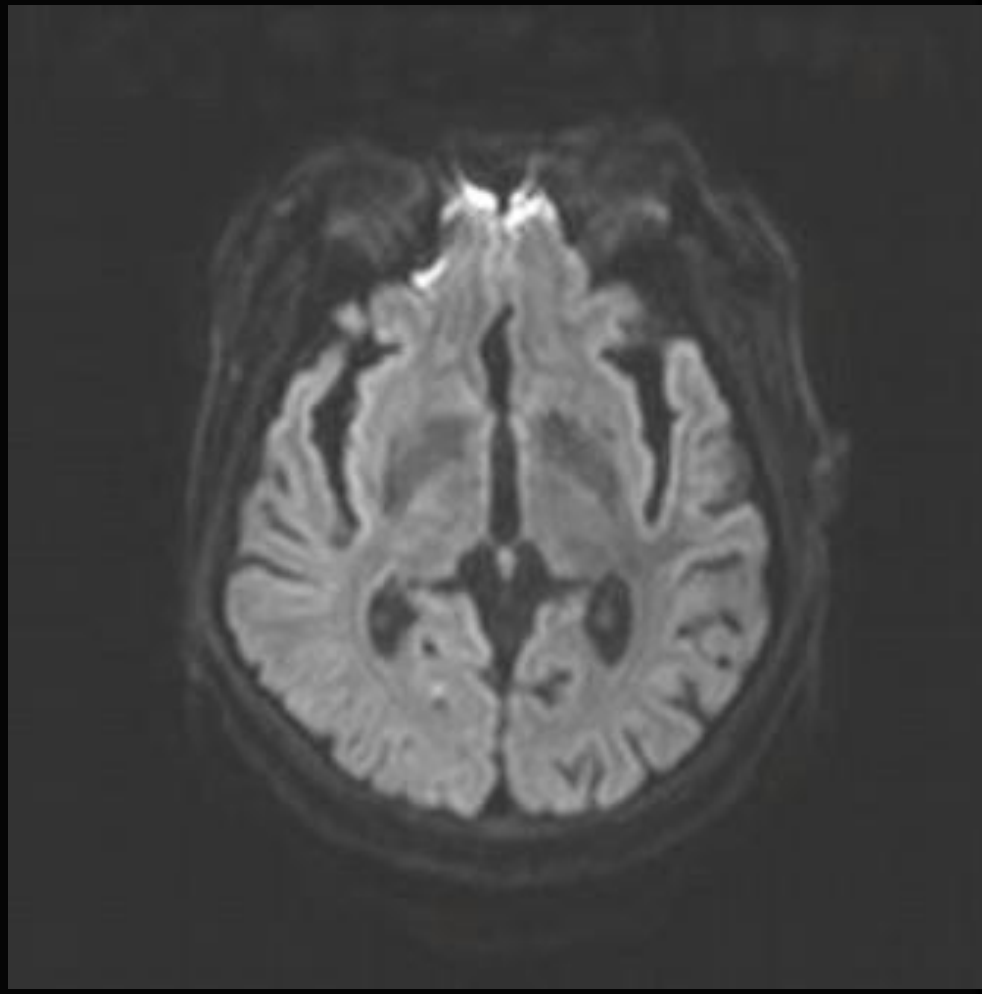

Postdil


1st Suction
Filter retrieval
2nd Suction



No New DW HSI after CAS





Case 4

70 years old man

DM, HT

AAA → open repair, 7YA

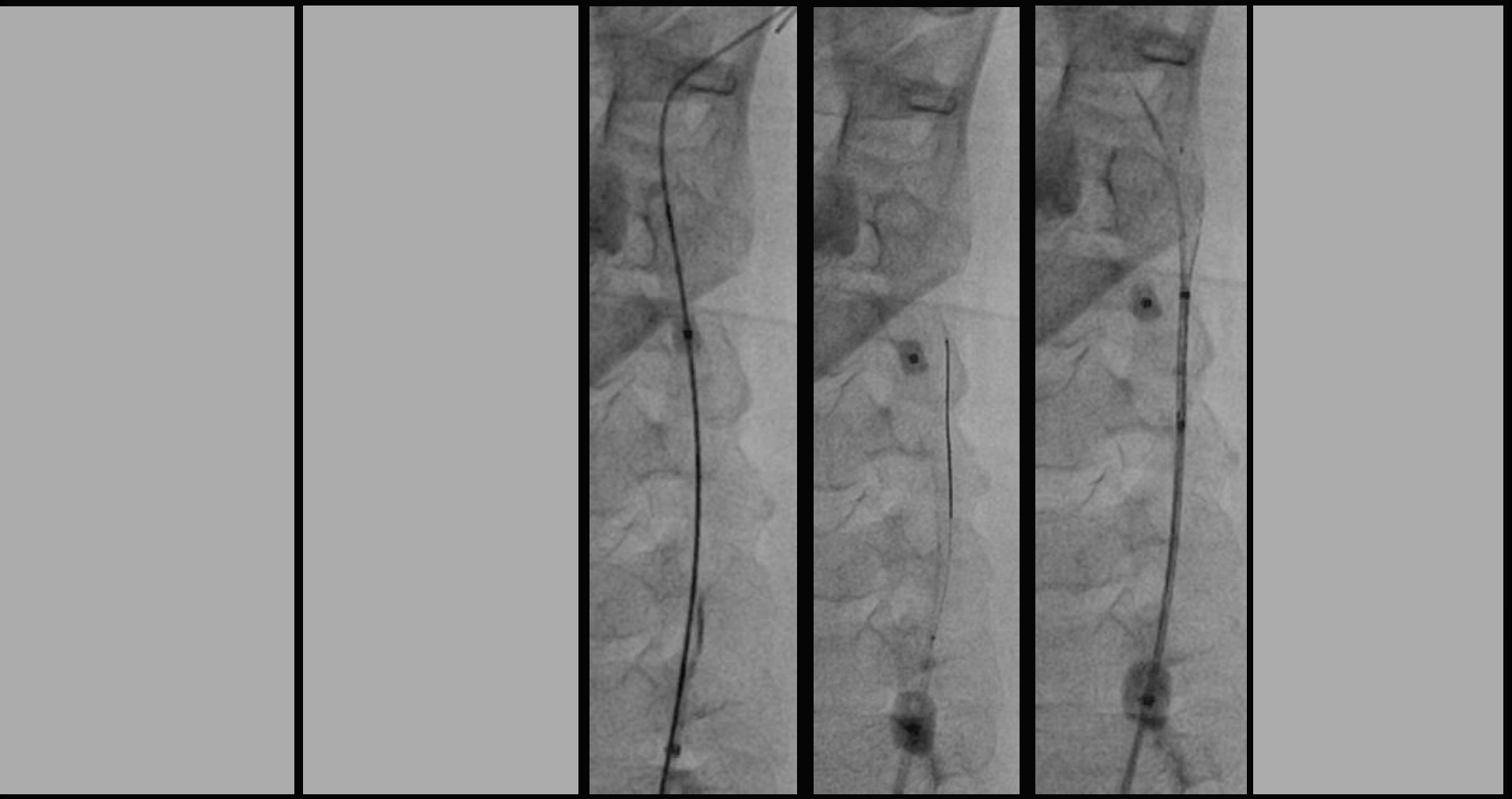
Rectal cancer → S/P LAR, 7YA

NSCLCa, stage I

→ S/P Wedge resection, VATS

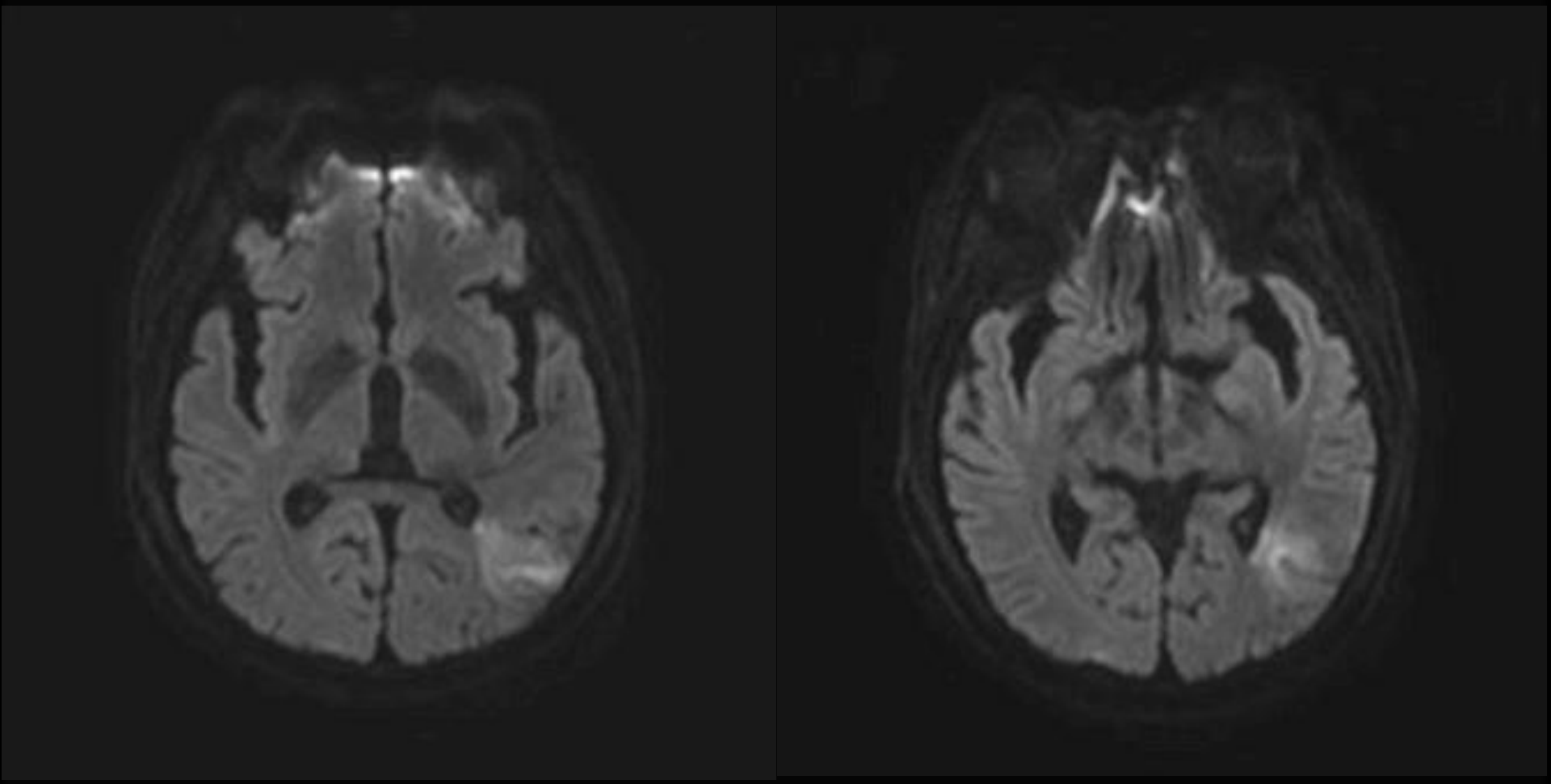
Right weakness and dysarthria, 3 days after op.

Left carotid angiogram in 10 days



Intraluminal thrombi | MO.MA | Wire passage | Cristallo stent | Thrombi prolapse

No New DW HSI after CAS



Case 5

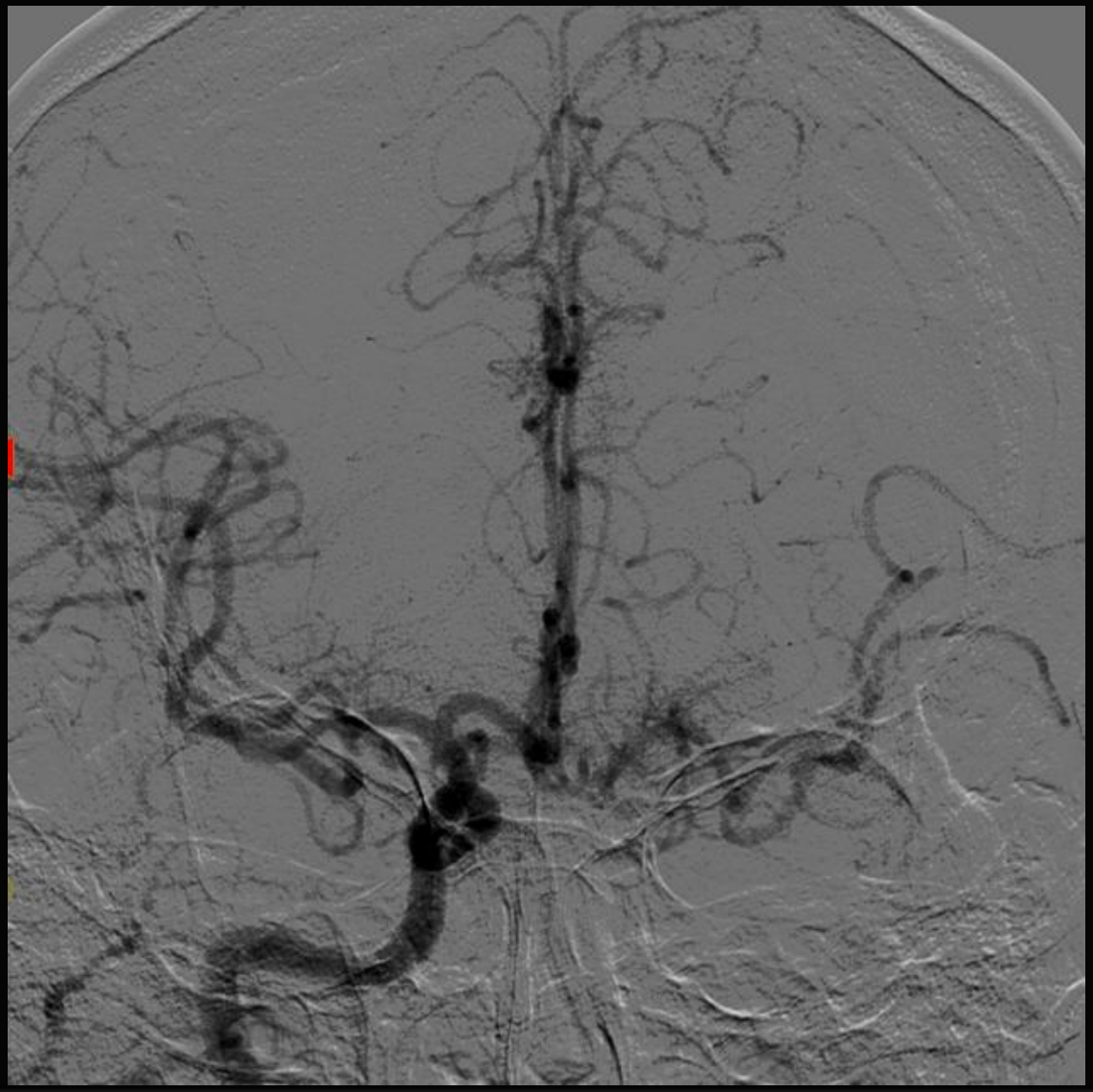
68 years old woman

DM, HT

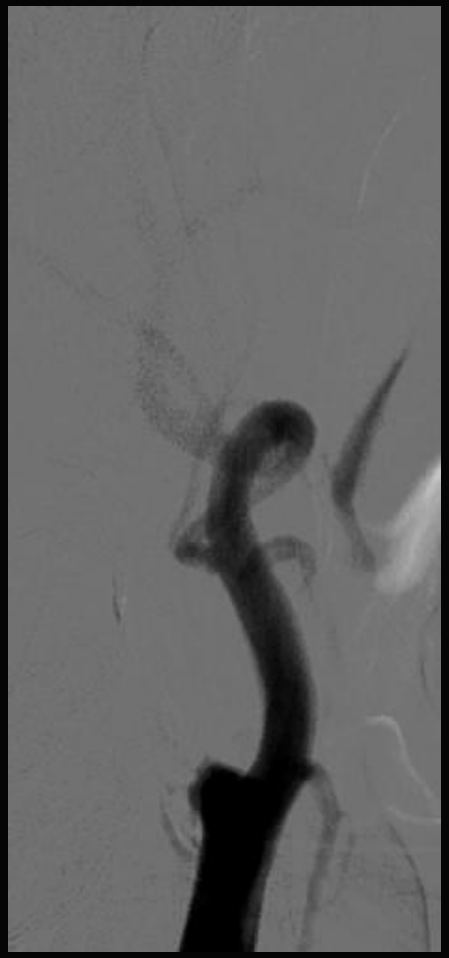
Lacunar CI, 1YA

Acute onset dysarthria and hearing difficulty for 1 hour

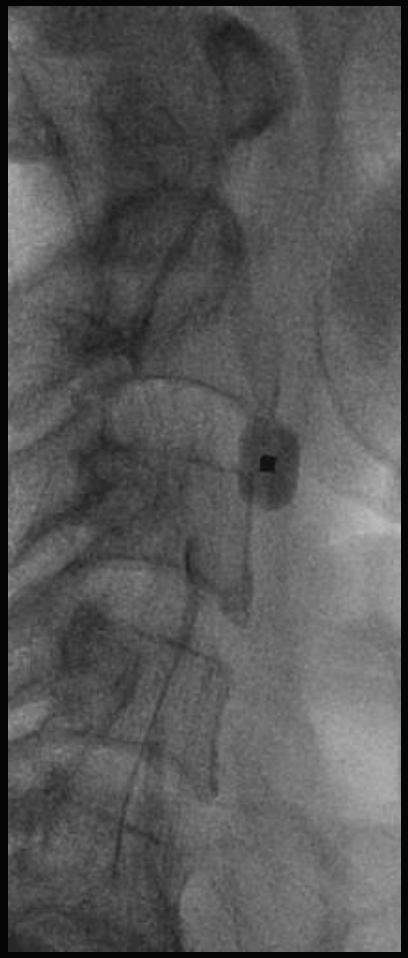
Right carotid angiogram



Left carotid stenting in 2.5 hrs



Occluded left ICA



MO.MA

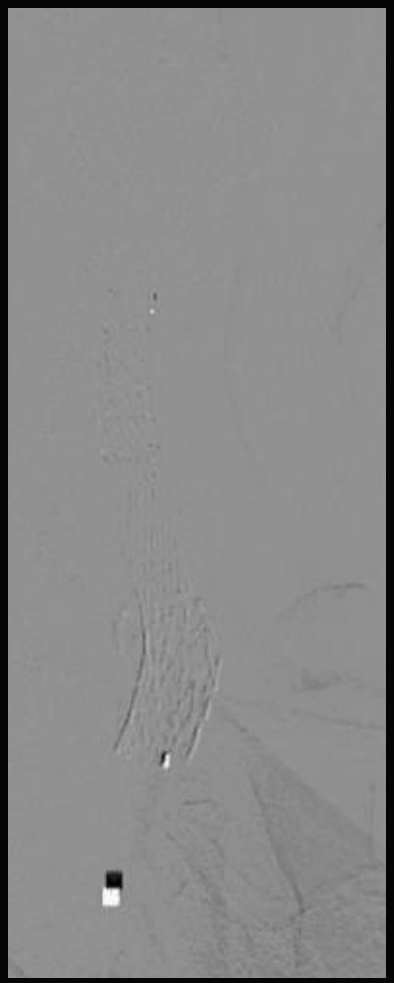
Difficult passage

Parallel wiring

Left carotid angiogram in 2.5 hrs

Predilation

Suction
Stenting
Postdilation



Completely recovered
neurologic function

Conclusion

- *Proximal Protection for CAS*
  - **Feasible in almost all CAS patients.**
  - **Effective in all phases of CAS procedures.**
  - **Debris captured in ≥50% procedures.**
  - **Clamping intolerance is transient and overcame easily.**
  - **Can be considered in symptomatic near-total occlusion or intraluminal thrombi containing lesions, but need more data.**