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A challenging and unfortunate case of carotid stenosis

Head/neck radiation and CAS

- Patients with head and neck radiation are at high risk for delayed atherosclerotic carotid stenosis/occlusion
- 10-20% at 10 years after exposure to >40Gy
- More diffuse lesion, CCA involvement, and occlusions
- NPC is endemic in south-east Asia

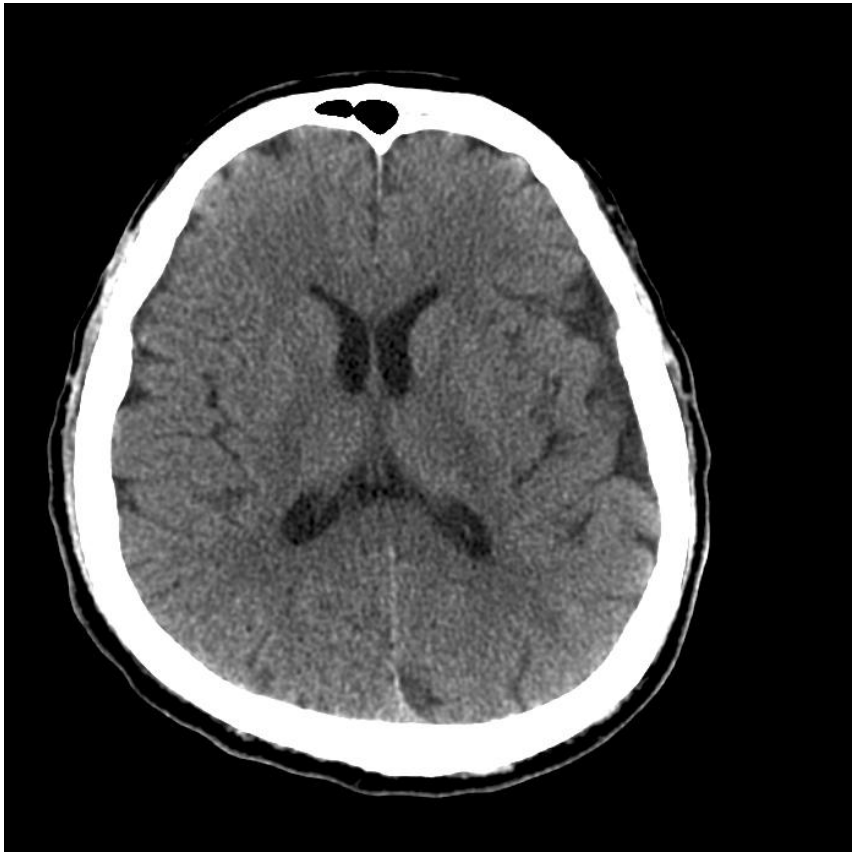
Case history

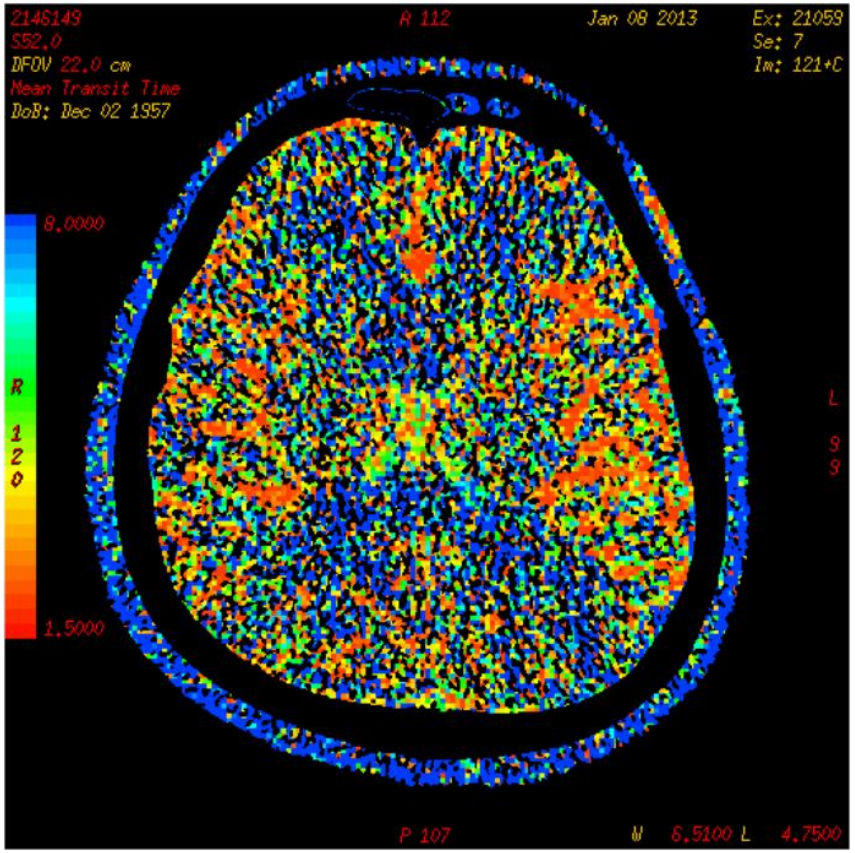
- 56M dentist
- NPC noted 10 yrs ago, with R/T and cured
- Neuroendocine tumor of left maxillary sinus 2 yrs ago, with C/T+R/T and good tumor control
- Total dosage 130Gy
- CNI, dry mucosa, sclerotic neck, cachexia, gastrostoma for feeding

Current problem

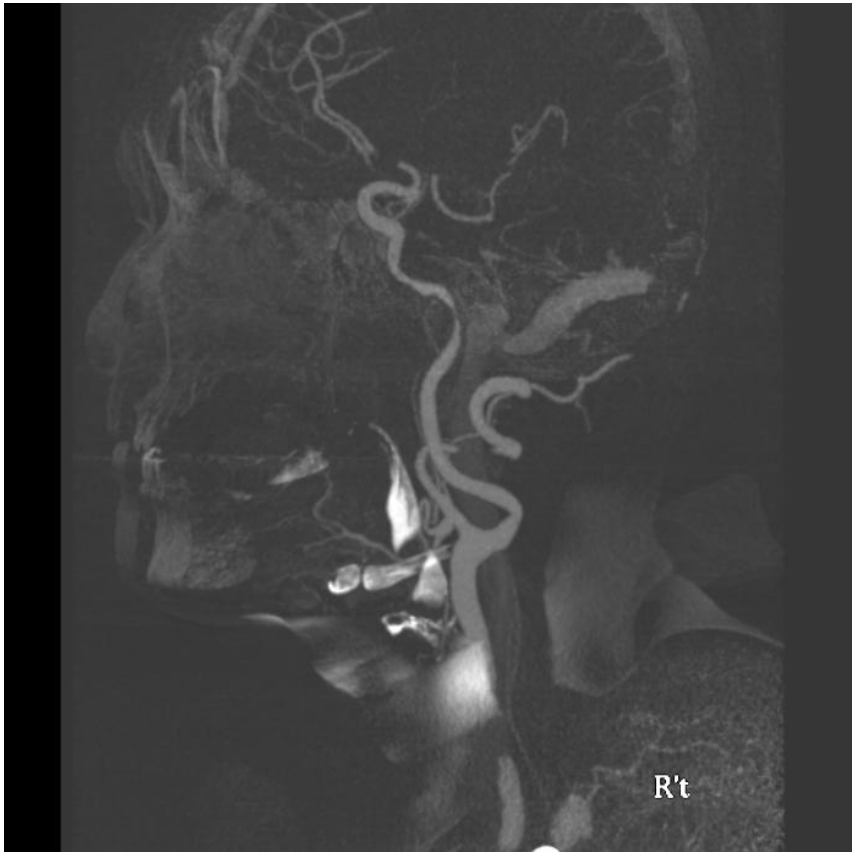
- Frequent TIA of left limbs (1-2 time per week) starting 3 months ago
- Neck Duplex showed left ICA occlusion (distal cervical) and possibly distal right ICA stenosis
- CTA confirmed

Decreased border zone perfusion





RICAS and LICAO



Treatment options?

- Neck radiation has been considered to increase the procedural risk for CE
- But also a procedural risk factor for CS
- Long-term outcome?

- No RCT ever

Early (0-30d) outcome

CAS Group	N, P	Success Rate, %	Stroke, No.	TIA, No.	Procedure-Specific Outcome, No.
Tallarita et al[21]	33, 37	100	2	0	0
Dorresteijn et al[22]	24, 24	100	1‖	2	0
Sadek et al[23]	19, 19	NA	0	0	Hematoma: 1
Favre et al[24]	135, 149	98	2	1	Hematoma: 4 Technical problems: 13 Seizure: 1
Younis et al[25]	35, 35	NA	NR	NR	NR
Protack et al[26]	23, 23	96	2*	*	Hematoma: 1 Vasospasm: 2 Bradycardia: 2
Ecker et al[27]	5, 5	100	0	0	0
Harrod-Kim et al[28]	16, 19	100	1‖	0	Hematoma: 1
Hassen-Khodja et al[29]	13, 13	100	0	0	NA
McKevitt et al[30]	17, 17	NA	0	0	NA
Ting et al[20]	16, 18	94	1¶	1	Hematoma: 1 Hypotension: 1
Alric et al[31]	4, 5	80	0	0	0
Houdart et al[17]	7, 10	100	0	0	Seizure: 1
Al Mubarak et al[19]	14, 15	100	1‖	0	0

CEA Group	N, P	Stroke, No.	TIA, No.	CNI Initial, No./ Permanent, No.	Procedure-Specific Outcome, No.
Tallarita et al[21]	27, 29	1	0	6/NA	Wound complications: 3
Frego et al[4]	8, 8	0	0	1/0†	0
Boules et al[32]	9, 9	NA‡	NA‡	NA	0
Mozes et al[33]	6, 6	NA§	NA§	NA ‖	0
Leseche et al[34]	27, 30	1§	1	0	Hematoma: 2
Cazaban et al[35]	11,11	0	0	2/1	0
Friedell et al[9]	10, 11	0	0	0	0
Hassen-Kodja et al[36]	17, 18	0	0	2/0	Hematoma: 1
Kashyap et al[37]	24, 26	0	0	6/0	Infection: 2
Rockman et al[38]	10, 14	0	0	0	0
Andros et al[18]	4, 4	0	0	0	0
Atkinson et al[39]	7, 9	0	0	2/0	0
Francfort et al[40]	5, 6	0	1	0	Respiratory problems: 2
Silverberg et al[41]	7, 9	0	0	0	Postoperative thrombosis: 1

- Both feasible with acceptable result: CS 3.9% vs. CE 3.5% CVE
- CE is associated with more CNI (9.2%)

Fokkema M, et al. Stroke 2012;43:793

Late (>30d) outcome

CAS Group	Mean Follow-Up (Range), Mo	TIA, No.	Stroke, No.	Death, No.	Restenosis, No./ Occlusion, No.
Tallarita et al[21]	58 (1–132)	0	3	11	6/2
Dorresteijn et al[22]	39.6 (3.6–132)	2	2‡	7	7/0
Sadek et al[23]	9 (0.5–45)	NA	NA	NA	1/0
Favre et al[24]	30 (3–95)	3	3	30	18/9
Younis et al[25]	24 (6–99)	NA	NA	NA	7/0
Protack et al[26]	14.4 (NA)	0	2	2	9/2
Ecker et al[27]	9.3 (1–24)	0	0	0	0
Harrod-Kim et al[28]	28 (5–78)	0	0	1	4/2
Hassen-Khodja et al[29]	18 (NA)	0	0	0	1/0
McKevitt et al[30]	1	NR	NR	NR	NR
Ting et al[20]	30 (5–55)	0	0	2	3/0
Alric et al[31]	10 (3–18)	0	0	0	1/0
Houdart et al[17]	8 (3–24)	0	0	0	0
Al Mubarak et al[19]	8 (NA)	0	0	3	0*

CEA Group	Mean Follow-Up (Range), Mo	TIA, No.	Stroke, No.	Death, No.	Restenosis, No./ Occlusion, No.
Tallarita et al[21]	58 (1–132)	0	0	3	4/0
Frego et al[4]	40 (0–156)	0	0	0	0†
Boules et al[32]	1	NR	NR	NR	NR
Mozes et al[33]	1	NR	NR	NR	NR
Leseche et al[34]	40 (3–99)	0	0	12	3/0
Cazaban et al[35]	1	NR	NR	NR	NR
Friedell et al[9]	37 (12–60)	0	0	0	0/1
Hassen-Kodja et al[36]	52 (12–108)	1	0	4	2/0
Kashyap et al[37]	13 (1–156)	0	0	0	2/1
Rockman et al[38]	NA	NA	NA	NA	NA
Andros et al[18]	24.9 (NA)	0	0	1	0
Atkinson et al[39]	49 (NA)	0	0	1	0
Francfort et al[40]	26 (6–48)	0	0	2	0
Silverberg et al[41]	NA	NA	NA	NA	NA

- More CVE in CS (4.9/100 pt-yr) vs. CE (2.8/100 pt-yr), p=0.014
- More restenosis in CS (5.4/100 pt-yr) vs. CE (2.8/100 pt-yr), p<0.003

Fokkema M, et al. Stroke 2012;43:793

But I quote the authors:

- "We were not informed about the exact pre-operative tissue condition"
- "Patient selection must have resulted in differences in outcome, which favored CE, probably because less appropriate surgical candidates were excluded"
- "These results do not indicate a preferred revascularization treatment and therefore, in patients with previous cervical radiation, the choice for revascularization therapy should be considered on a individual basis"

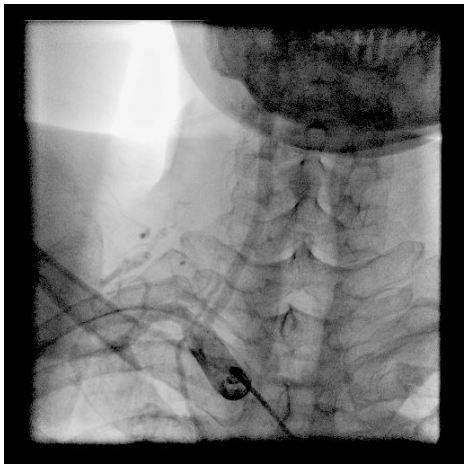
Fokkema M, et al. Stroke 2012;43:793

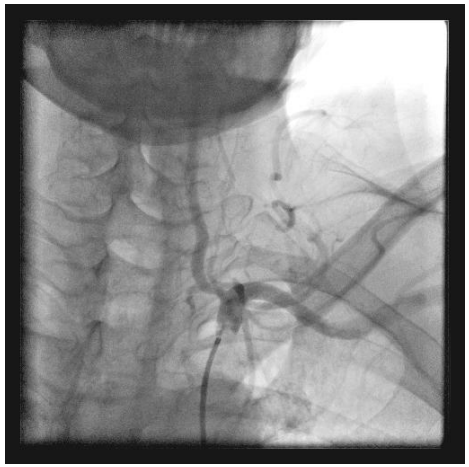
For the present patient

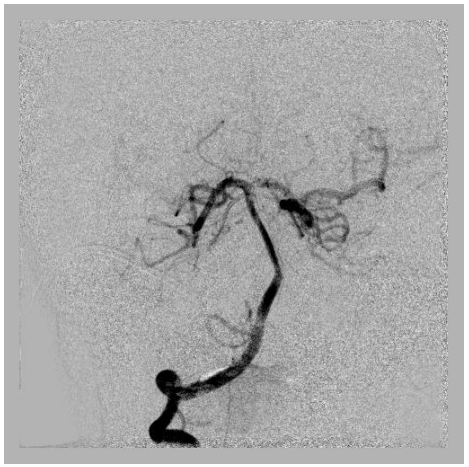
- Very poor tissue condition
- Contralateral occlusion
- Very high lesion location (petrous ICA)

- CS was selected after discussion

Diagnostic images



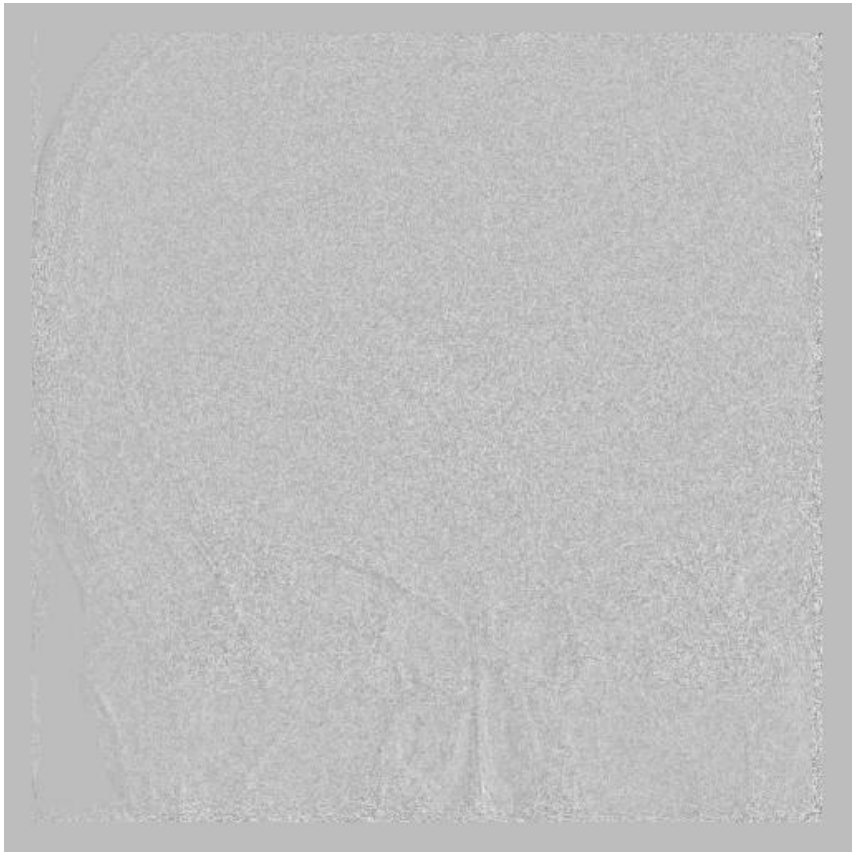


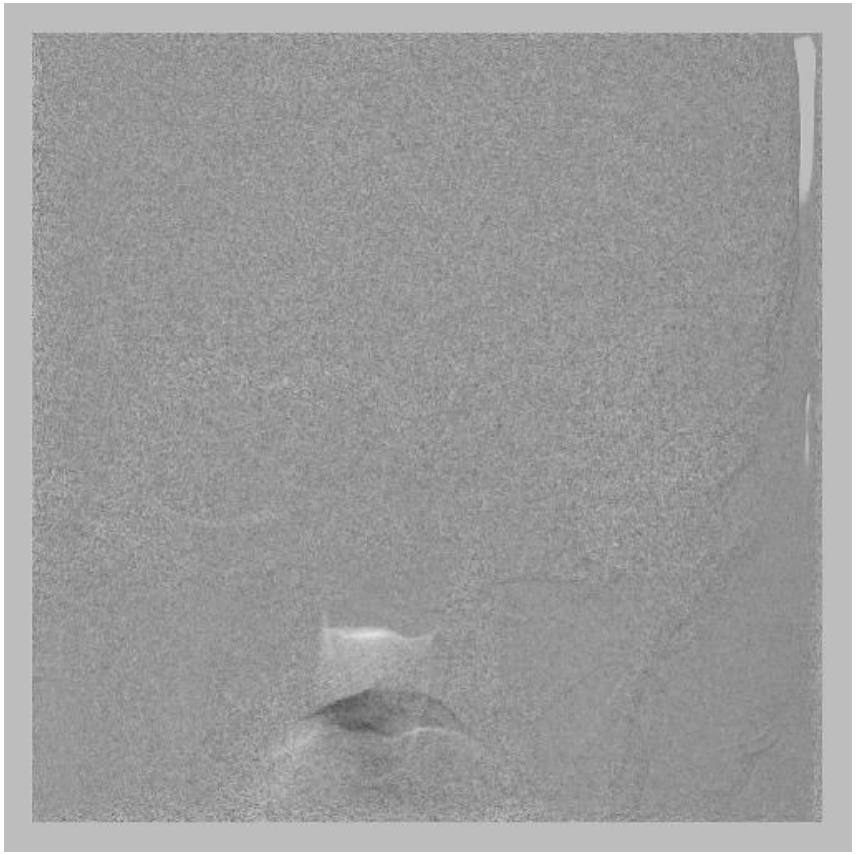


Procedure plan

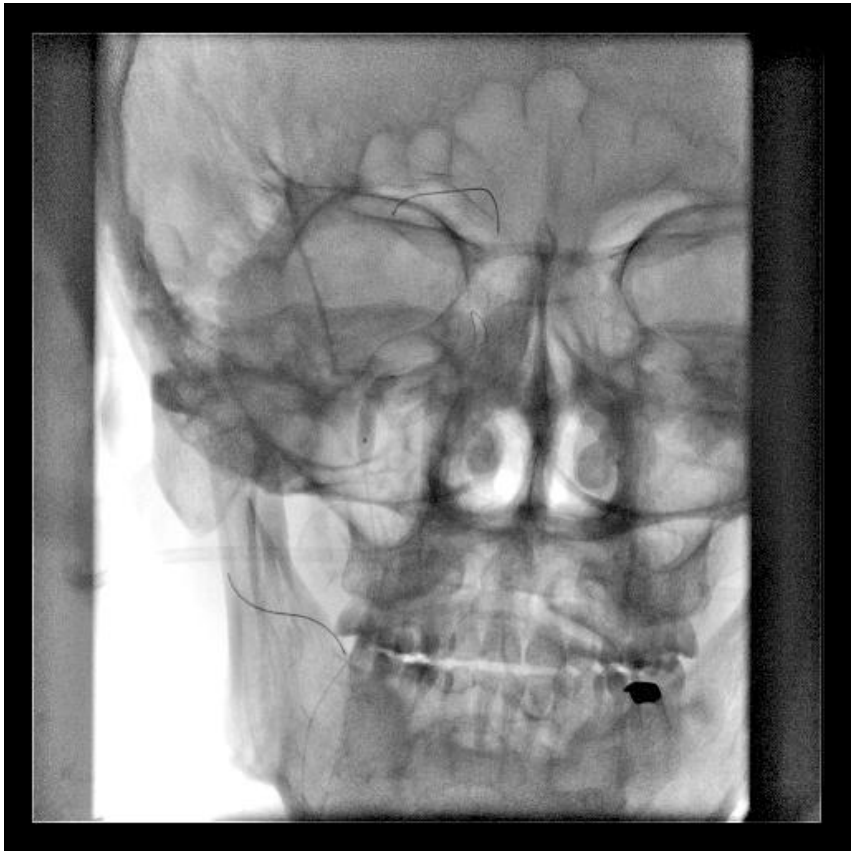
- 5F ST01 through 8F JR4 guide into RICA from right femoral access
- Distal filter EPD
- Open-cell self-expanding stent
- Routine anticoagulation and DAPT

Baseline

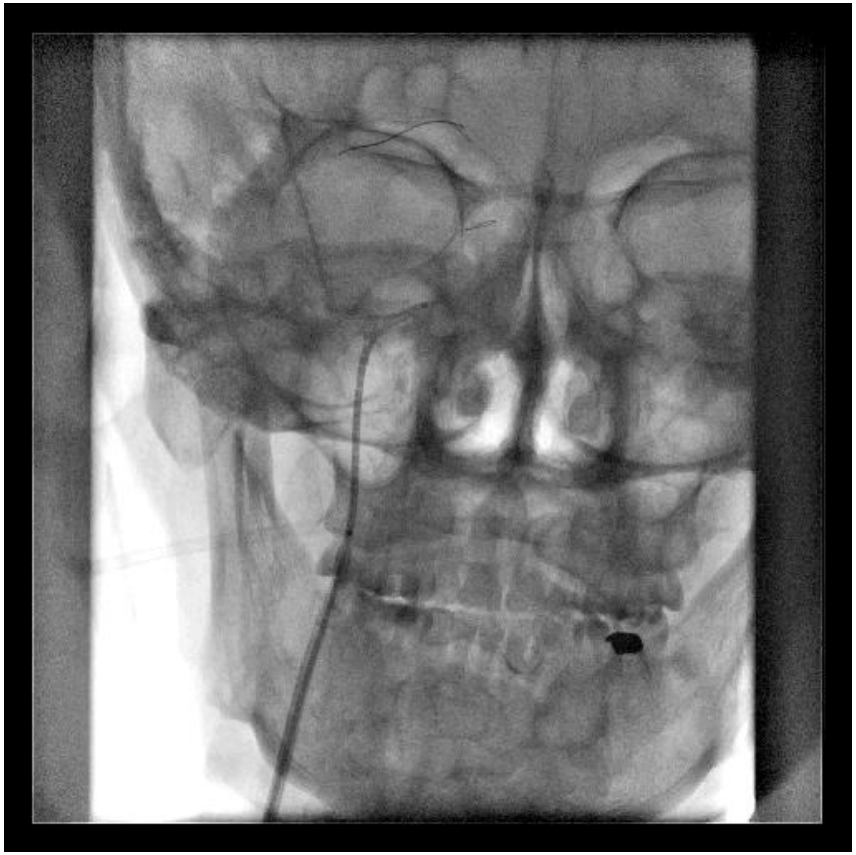


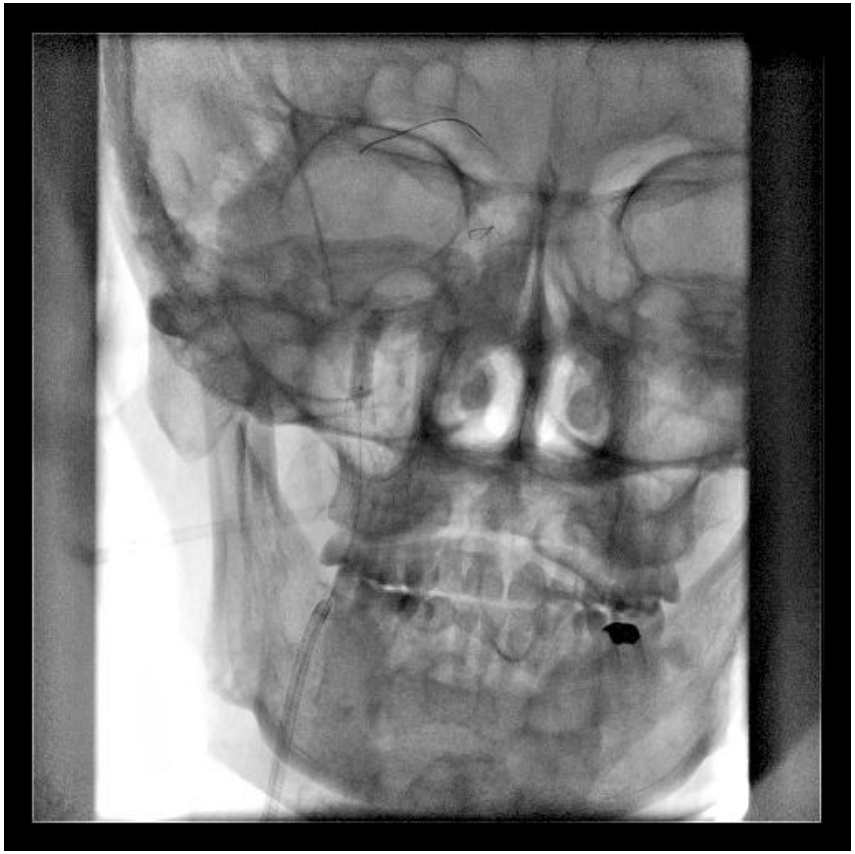


Pre-dilatation under EPD

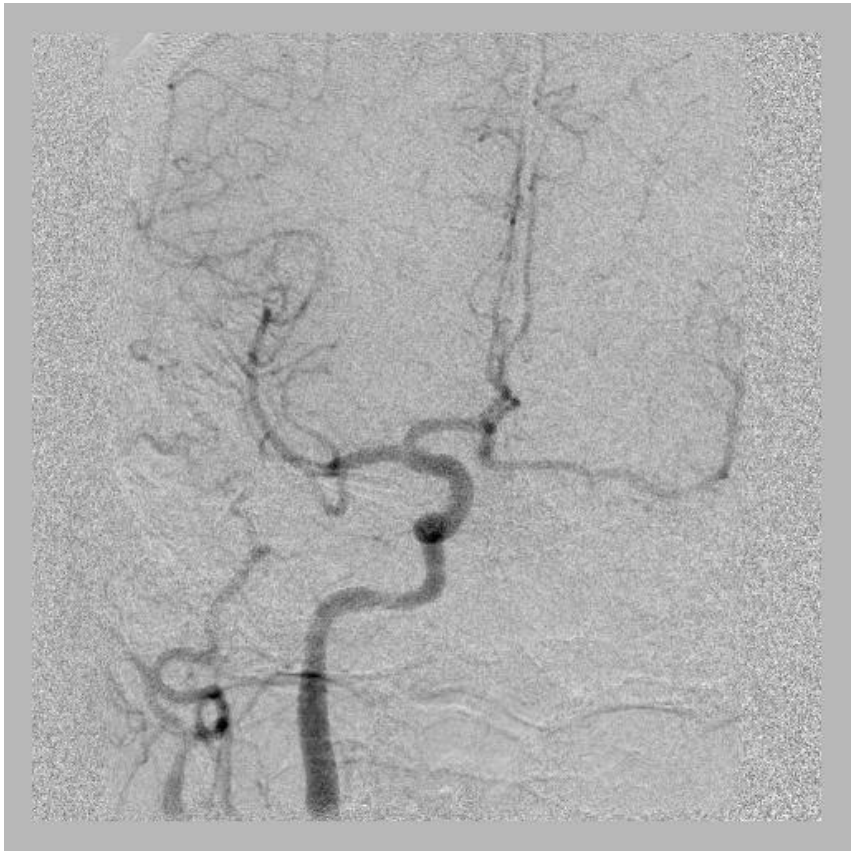


Stenting and post-dilatation





Final



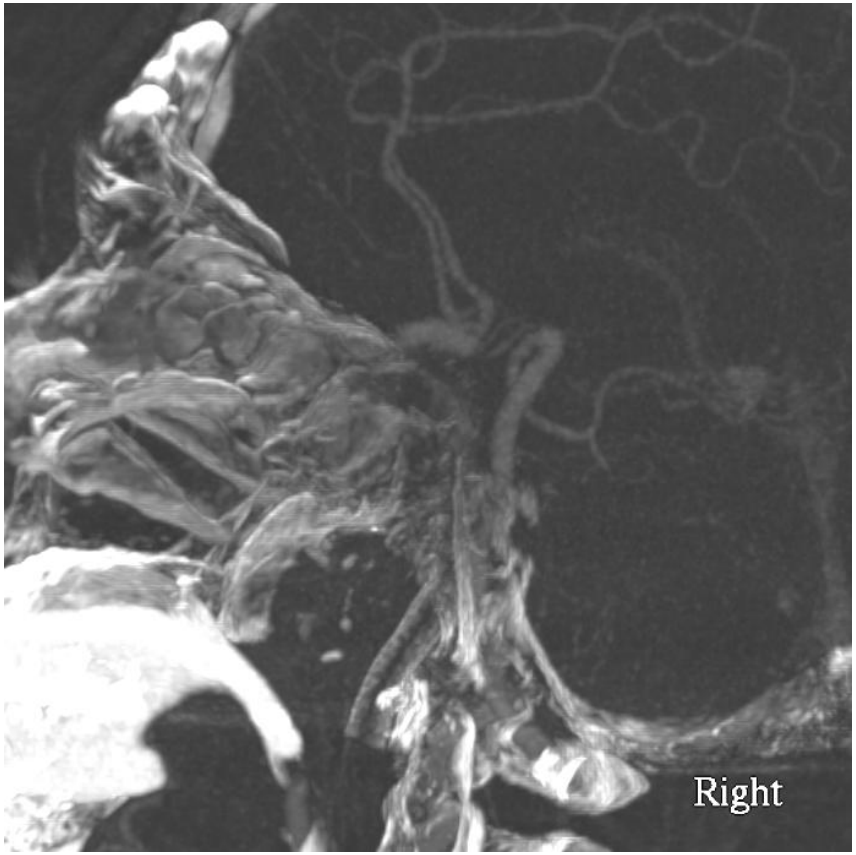
Post-stenting course

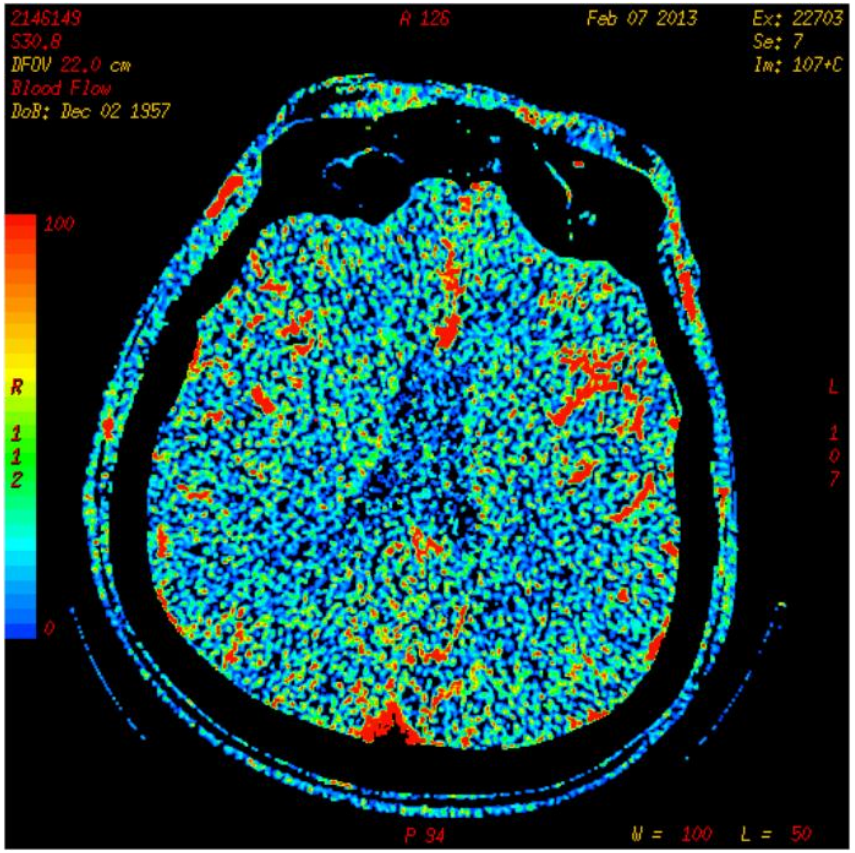
- No more TIA
- DAPT with good compliance
- Groin wound OK
- CTA/P scheduled to see if LICAO recanalization indicated

3 weeks post-stenting

- Left leg weakness recurred
- No definite recovery at ER 3 hours later
- Duplex and CTA showed stent thrombosis with ICA occlusion

RICA ST with decreased perfusion





Treatment options?

- Acute ICA occlusion is associated with extremely poor prognosis, and is less responsive to lytics
- Sub-acute ICA stent thrombosis is rare
- Intra-venous lytic or endovascular?

- Again, no RCT ever

Overall outcome

Table 3. Overall Outcomes From Systemic Intravenous Thrombolysis vs Endovascular Intra-Arterial Treatment

Outcomes	IV Thrombolysis Group (n=385)	Endovascular Group (n=584)	*P*	OR (95% CI)
Favorable outcome, n(%)	96 (24.9%)	196 (33.6%)	0.004	0.66 (0.49–0.88)
sICH, n(%)	19 (4.9%)	65 (11.1%)	0.001	0.42 (0.24–0.7)
Mortality, n(%)	105 (27.3%)	187 (32.0%)	0.12	0.8 (0.6–1.06)

- More favorable neurological outcome (mRS 0-2 at 3m) with endovascular approach, but more ICH
- Same mortality

Mokin M, et al. Stroke 2012;43:2362

Better if occlusion is proximal

Table 4. Outcomes From Systemic Intravenous Thrombolysis vs Endovascular Intra-Arterial Treatment in Patients With Cervical Internal Carotid Artery Occlusion

Outcomes	IV Thrombolysis Group (n=338)	Endovascular Group (n=193)	*P*	OR (95% CI)
Favorable outcome, n (%)	89 (26.3%)	84 (43.5%)	<0.0001	0.46 (0.32–0.68)
sICH, n (%)	13 (3.9%)	22 (11.4%)	0.0011	0.31 (0.15–0.63)
Mortality, n (%)	92 (27.2%)	51 (26.4%)	0.85	1.041 (0.7–1.56)

Table 5. Outcomes From Systemic Intravenous Thrombolysis vs Endovascular Intra-Arterial Treatment in Patients With Internal Carotid Artery Terminus Occlusion

Outcomes	IV Thrombolysis Group (n=26)	Endovascular Group (n=151)	*P*	OR (95% CI)
Favorable outcome, n(%)	5 (19.2%)	43 (28.5%)	0.34	0.6 (0.19–1.63)
sICH, n(%)	6 (23.1%)	15 (9.9%)	0.082	2.7 (0.87–7.71)
Mortality, n(%)	8 (30.8%)	45 (29.8%)	0.91	1.047 (0.4–2.58)

Mokin M, et al. Stroke 2012;43:2362

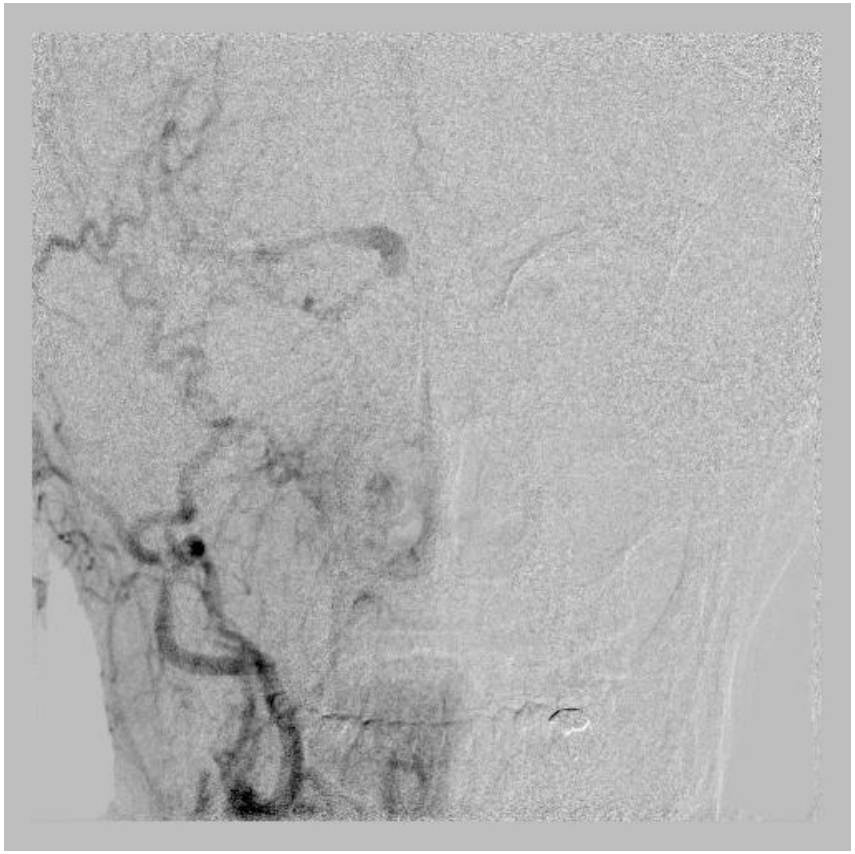
For the present patient

- Neurologist advised endovascular treatment
- Combination of mechanical (aspiration, thrombectomy, angioplasty, stenting) and local pharmacological (lytic, anti-thrombotic) modalities
- Balancing neurological outcome with bleeding

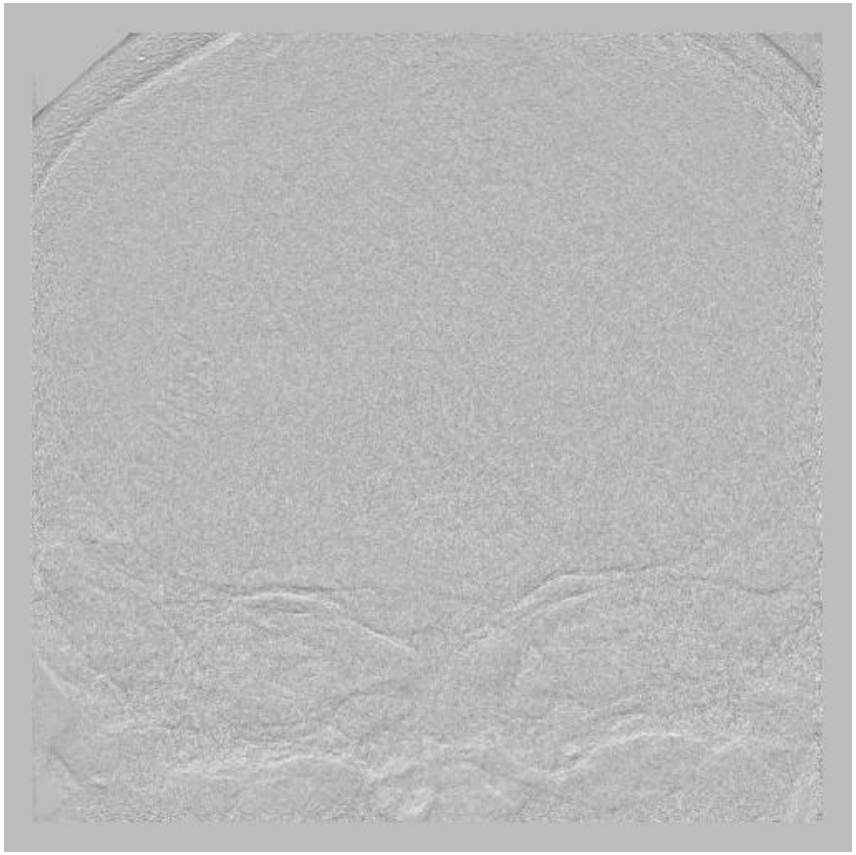
Procedure plan

- 8F JR4 into RCCA via femoral access
- Wire through micro-catheter across the occluded stent
- MC injection confirming distal true lumen
- Small balloon angioplasty
- Aspiration catheter
- Small dose rt-PA through MC
- Goal: TIMI 2 flow

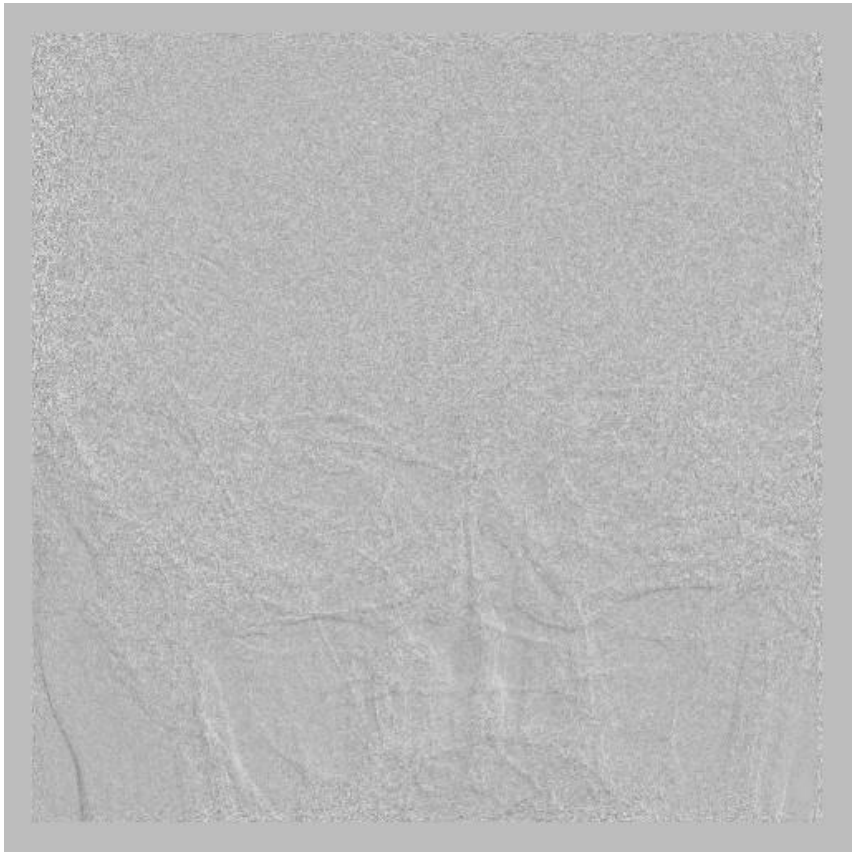
RICA occlusion (SST)



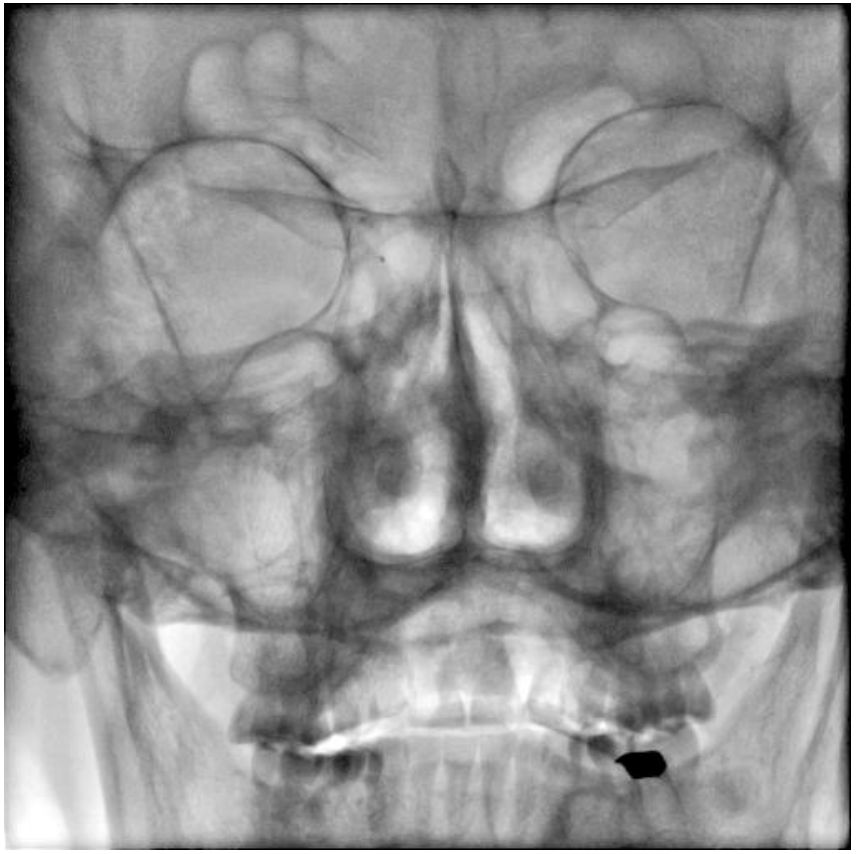
LICA occlusion (chronic)



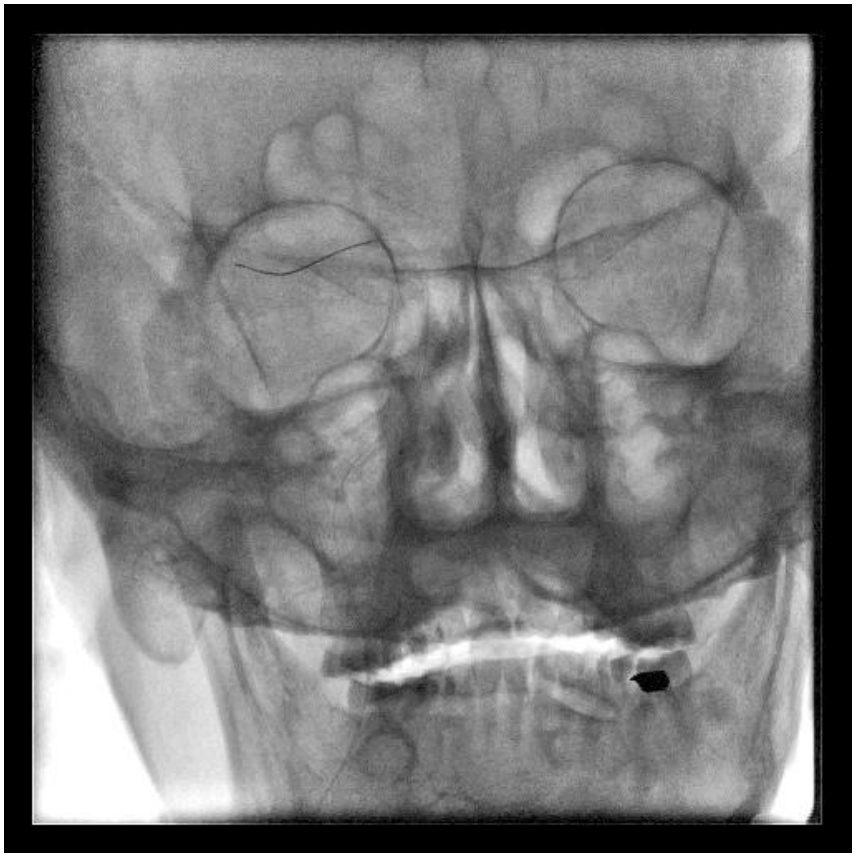
Wire crossing and MC injection

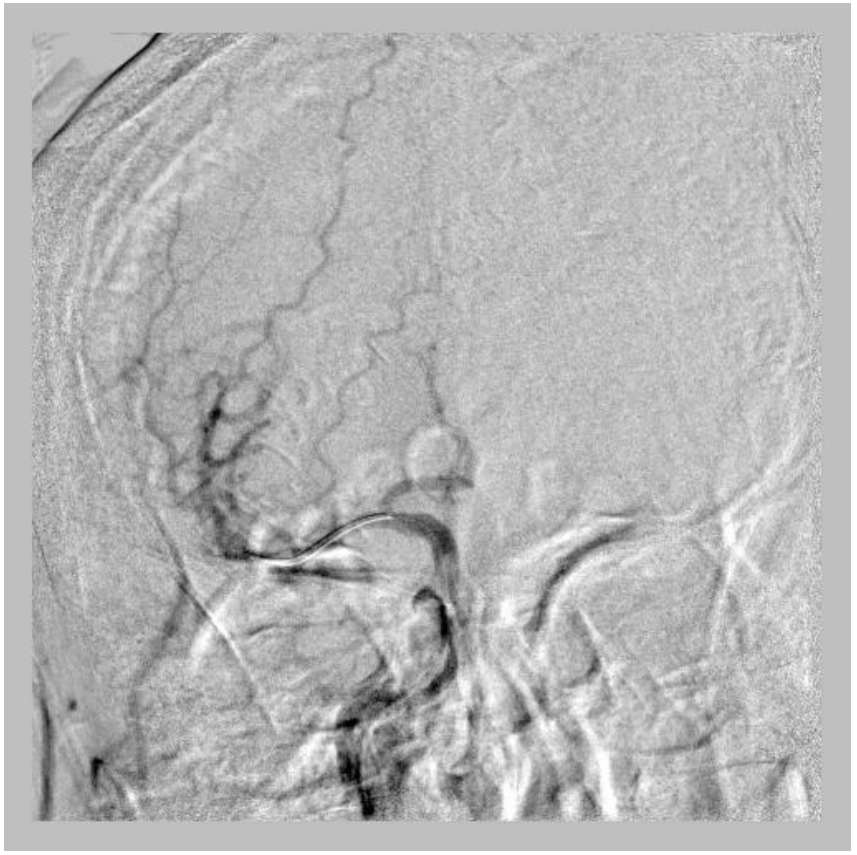


Aspiration and lytic



Flow restored!

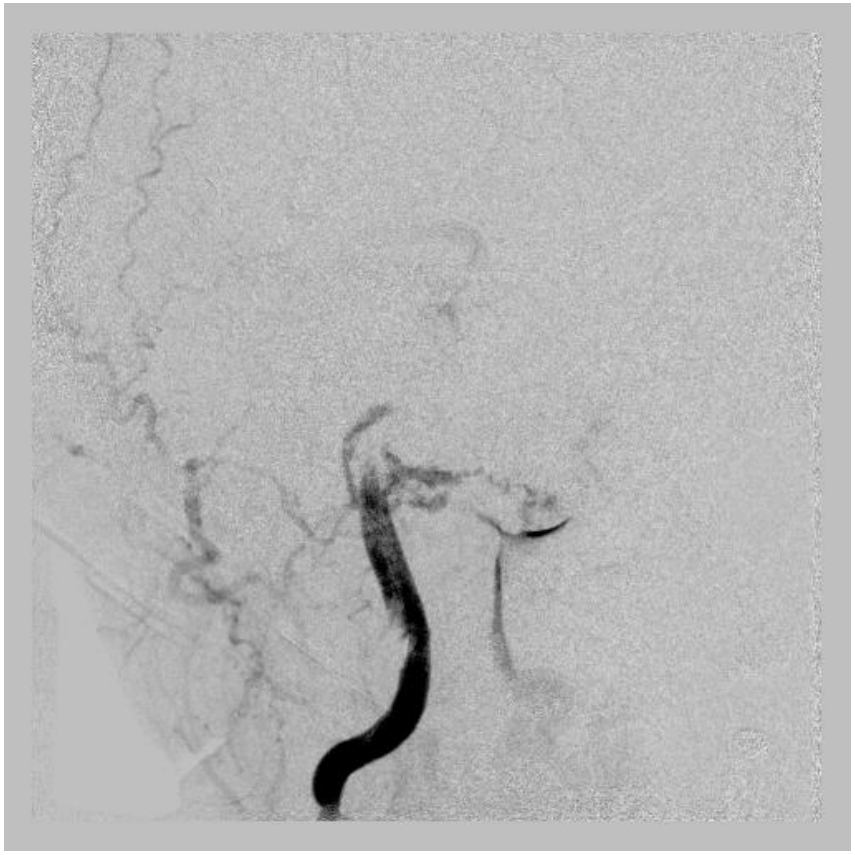




But ....

- Decreasing BP, HR, and SpO_2
- Consciousness changed from drowsy to unresponsive
- Copious bloody fluid from month and nose

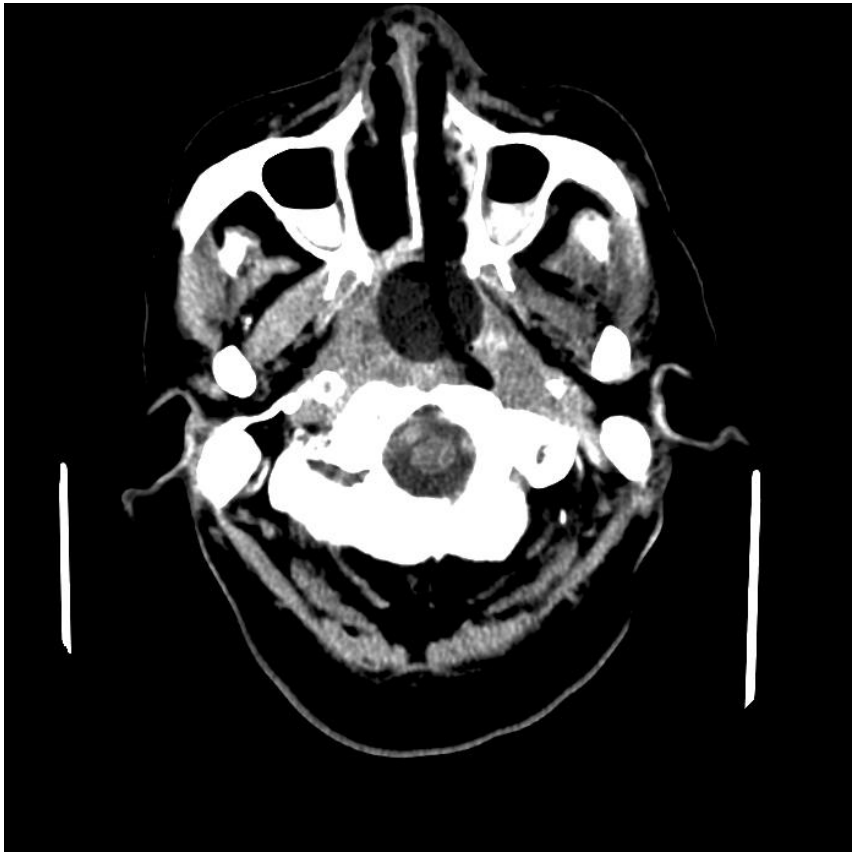
What is wrong ?!

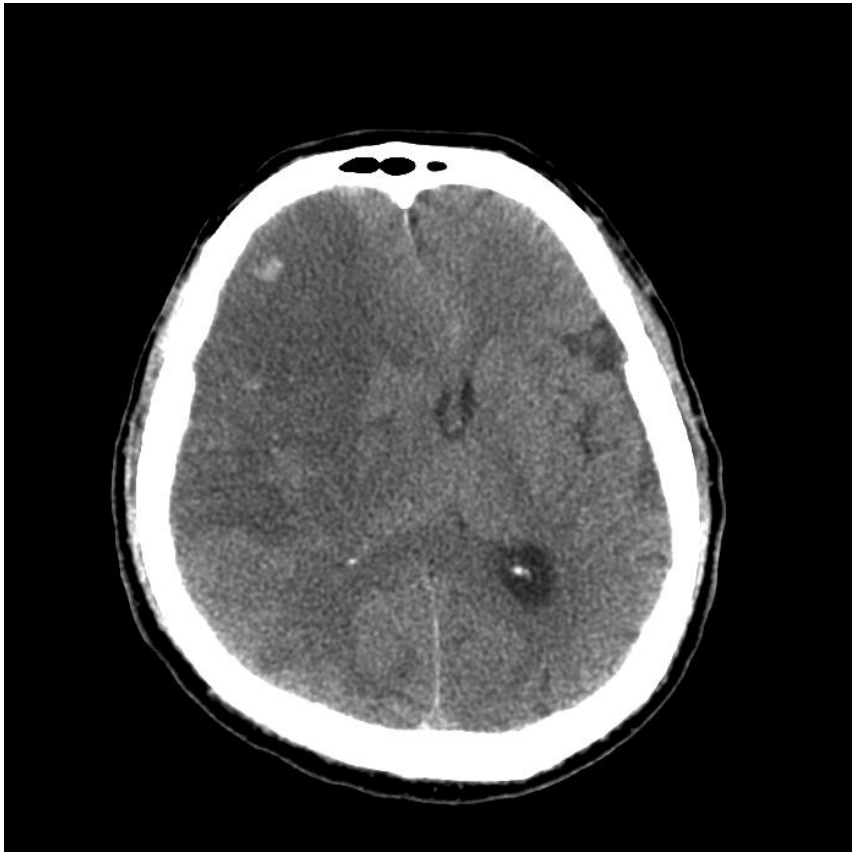


Final course

- Massive bleeding from left posterior pharynx jeopardizing airway
- Emergent intubation
- Heparin reversal and transfusion
- Balloon tamponade from left nostril
- Hemostasis achieved on D2, but large infarct ensued
- All in vain, and brain death at D5

Final CT





Take home message

- Post-radiation ICA disease is a clinical challenge both for surgeon and interventionist, and treatment decision should be tailored individually
- Acute/subacute stent trombosis is rare, but carries high morbidity/mortality
- Endovascular skills and knowledge should be mastered, but practiced with extreme caution and prudence