Paul Hsien-Li Kao, MD
Associate Professor
National Taiwan University Hospital

Predictors of success in recanalising carotid artery chronic total occlusion

Carotid artery occlusion (CAO)

- CAO leads to cerebral ischemia and poor prognosis

- Endovascular CAO recanalization is feasible and safe

JACC 2007;49:765-771
Circ Cardiovasc Intervent 2008;1:119-125

- Successful CAO recanalization improves cerebral perfusion and cognitive function

Stroke 2011;42:2850-2854
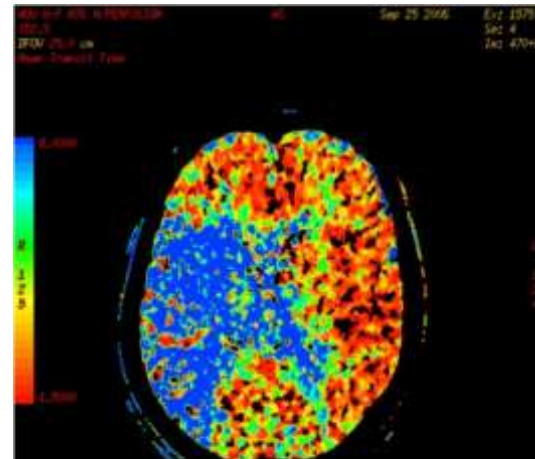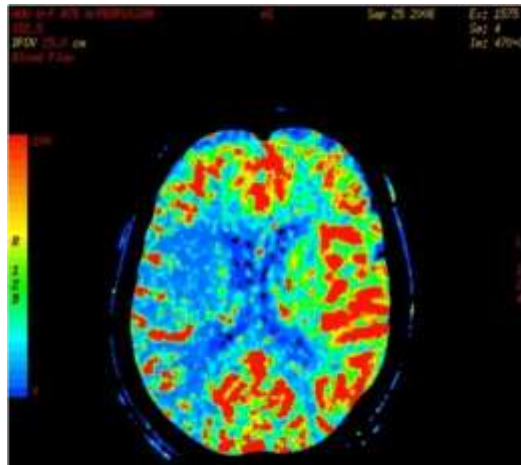Int J Cardiol 2012;157:104-107
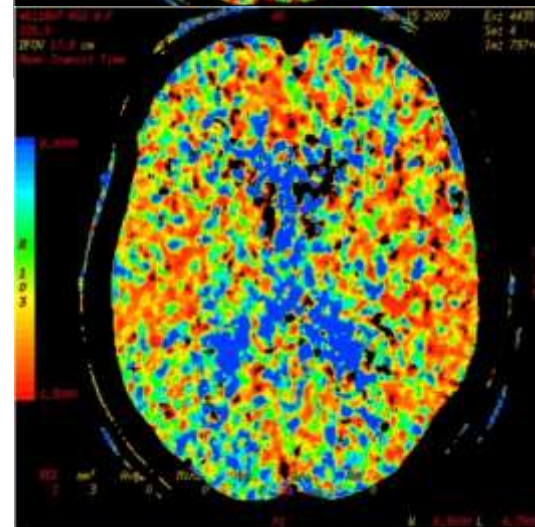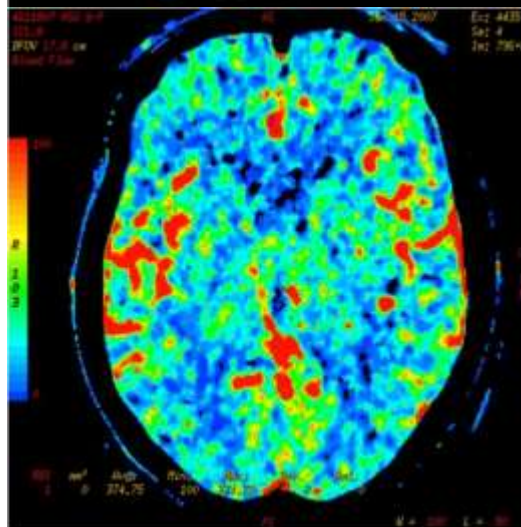JACC 2013;61:2503-2509

Recanalized CAO

Changes in CTP

baseline

post stenting

stress blood flow   stress mean transit time

Difficulty in generalization

- Myths surrounding CAO:
    - No indication
    - No benefit

- Technical difficulties (vs. coronary CTO):
    - Lack of collaterals/retrograde possibility
    - Long lesion with variable vessel course
    - Consequence of complication

Purpose of study

- Investigate predictors for successful endovascular recanalization in chronic CAO

- Create a scoring system to help identify CAO with higher success rate

Methods

- Retrospective review of chronic CAO recanalization attempts in 134 consecutive patients in NTUH Cardiovascular Center (2002-2011), overall success rate 64%

- Indication of recanalization based on CT perfusion scan showing ipsilateral viable ischemia

Key variables analyzed

- Carotid symptoms
  - Present or not; duration from occurrence to intervention

- Stump morphology
  - Presence; calcification; blunt vs. tapered, angulation

- Distal vessel visibility
  - Ipsi IC ICA; ipsi OA

- Lesion length

- Wiring technique
  - Intraluminla vs. STAR

Patient variables

	N (%) in overall cohort	N (%) being successful	P Value
Male	116 (87)	75 (65)	0.770
HTN	108 (81)	69 (64)	0.886
DM	35 (26)	27 (77)	0.063
HLP	51 (38)	39 (77)	0.020
Smoking	37 (28)	29 (78)	0.034
Renal impairment	31 (29)	20 (65)	0.493
Significant CAD	73 (54)	51 (70)	0.257
NASCET Symptom	72 (54)	54 (75)	0.005
Duration from lase event ≤6m	37 (46)	31 (84)	0.009

Lesion variables

	N (%) in the overall cohort	N (%) being successful	P Value
Calcification	51 (38)	36 (71)	0.225
Stump present	127 (95)	80 (63)	0.222
Tapered stump	108 (81)	70 (65)	0.754
Stump angulation $\leq 45^\circ$	112 (87)	75 (67)	0.040
Visible distal ICA via ipsi injection	104 (77)	74 (71)	0.006
Visible ipsi OA	88 (66)	46 (85)	0.013
Occlusion length ≤ 30mm	54 (40)	46 (85)	0.000
Intraluminal wiring	93 (69)	65 (70)	0.013

Multivariate analysis

	Coefficient	OR	P value	95% CI
Age	-	1.00	0.947	0.964-1.050
Sex	-	0.36	0.246	0.223-2.695
Duration from last event	-0.807	0.45	0.004	0.256-0.778
Stump angulation	-1.451	0.23	0.023	0.067-0.821
Visible distal ICA	-1.013	0.36	0.007	0.173-0.761
Occlusion length	-1.875	0.15	0.000	0.057-0.411
Constant	3.817	-	0.000	0.141-6.343

Kao-Liang score

- The scoring system was created in proportion with the respective coefficient

- Each coefficient was divided with the smallest coefficient and the results rounded to 1.0

KL scoring

Independent variables	Status	Coefficient	Score point
Symptom from last event	≤6m		0
	>6m	0.807	1
	Insidious onset		2
Stump angulation	≤45°	1.451	0
	>45°		2
Visible dstal ICA	via ipsi	1.013	0
	via contra		1
	not visible		3
Occlusion length	≤30mm	1.875	0
	>30mm		2

KL score and success rates

KL score	Success rate
0,1	100%
2	87%
3	77%
>4	34%

If Kao-Leong score >4, the chances of successful recanalization is <50%

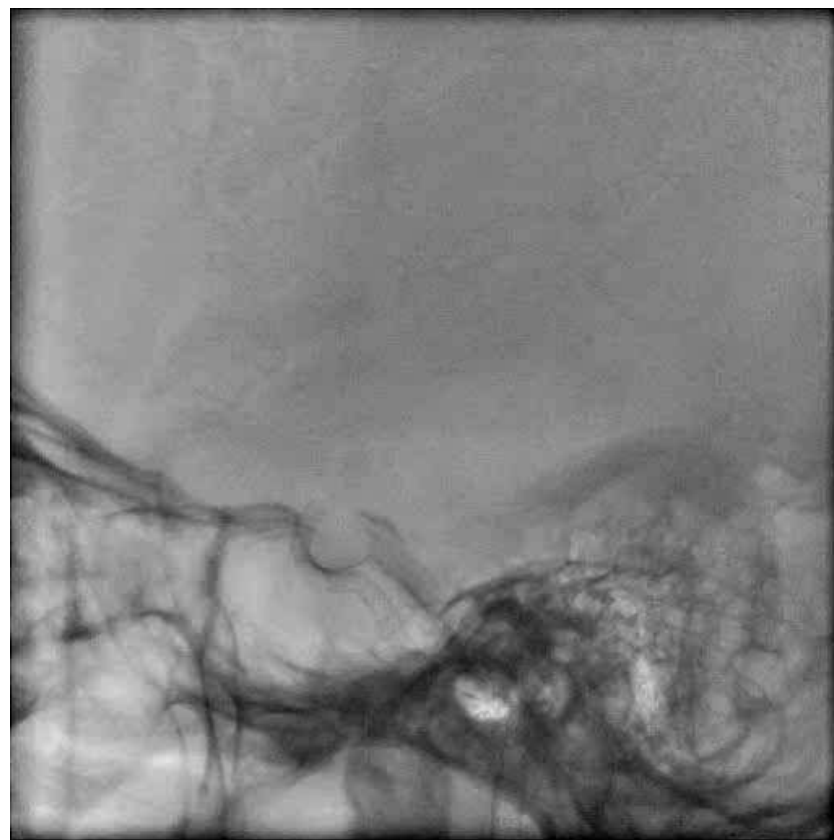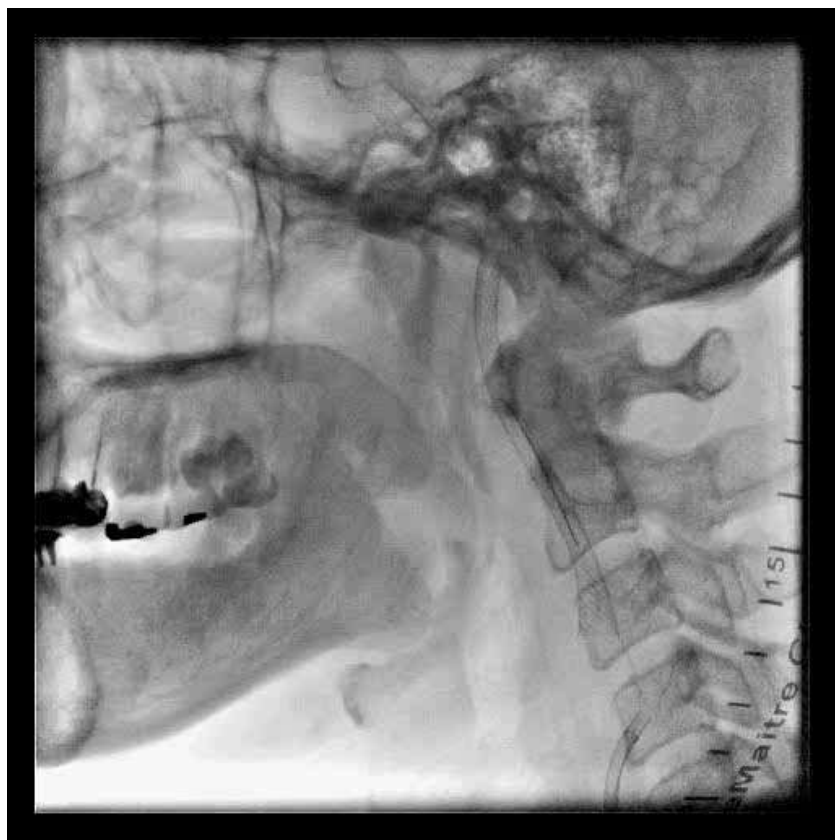But if Kao-Leong score ≤2, successful recanalization is almost guaranteed

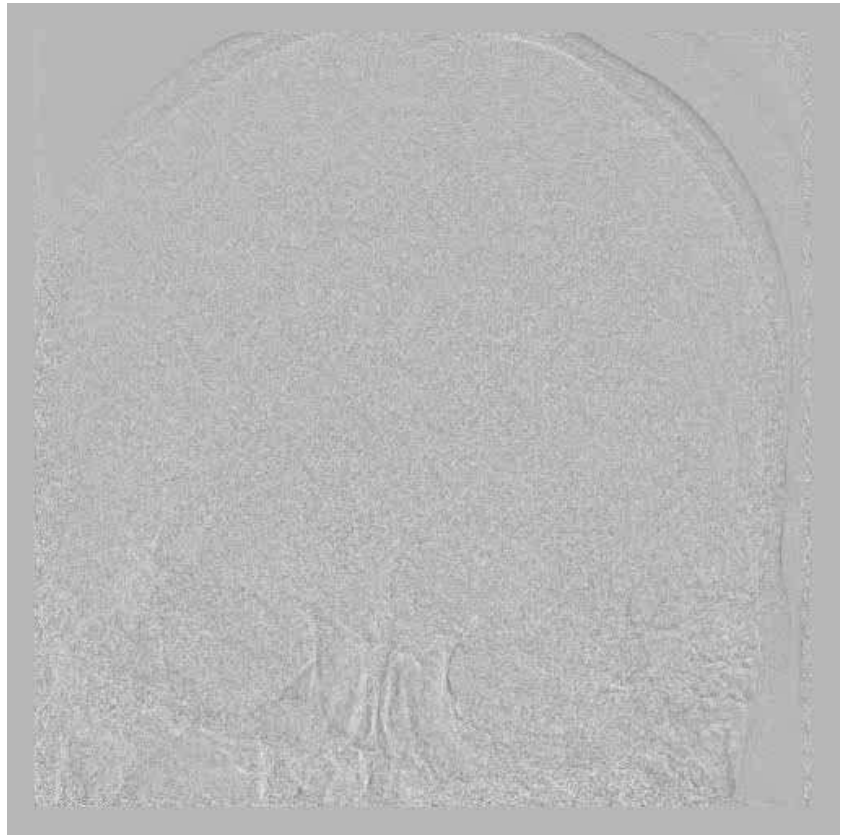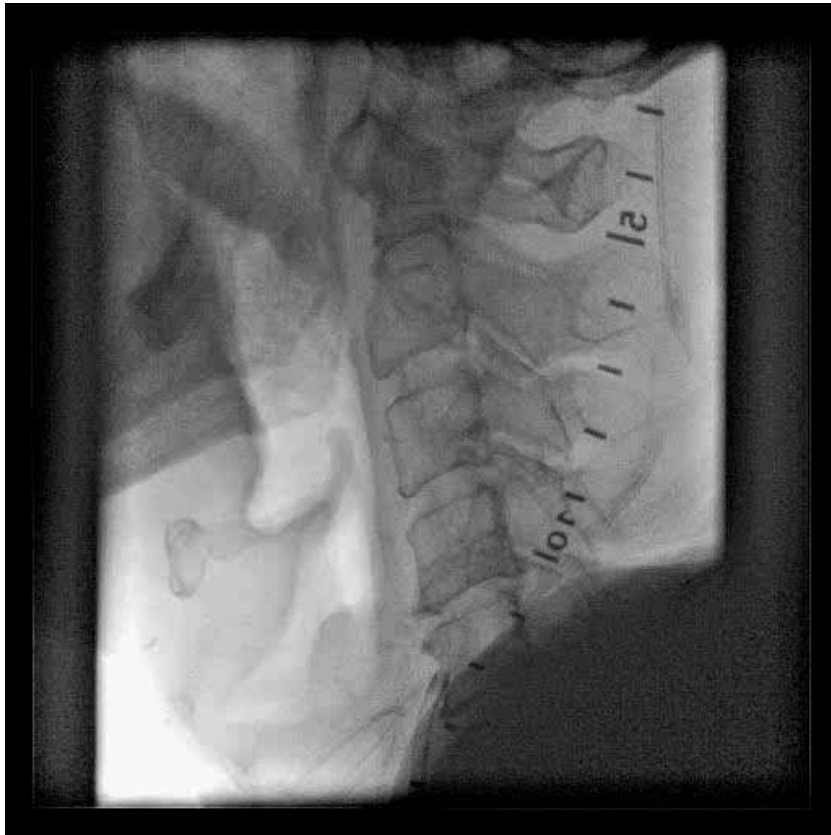# Sx<6m (0), ≤45° (0)
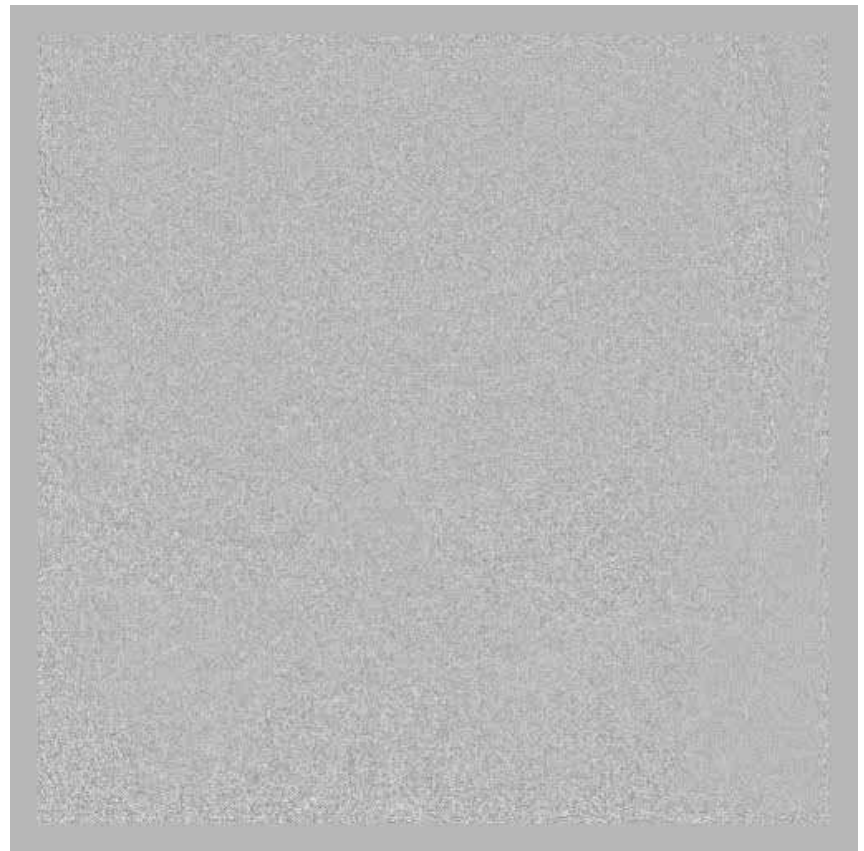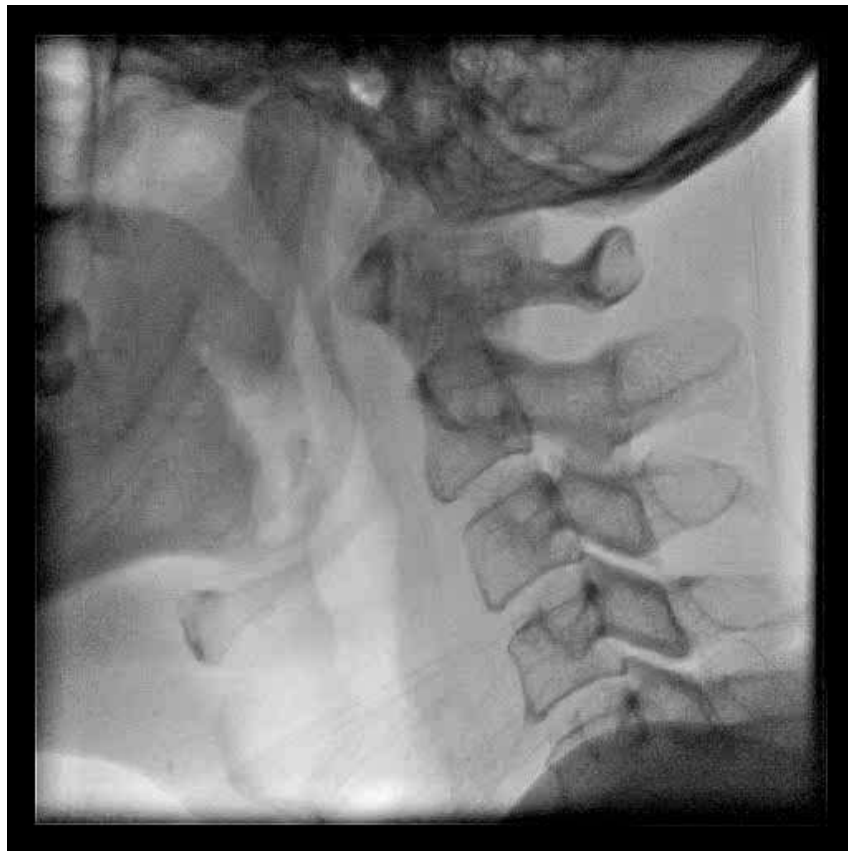
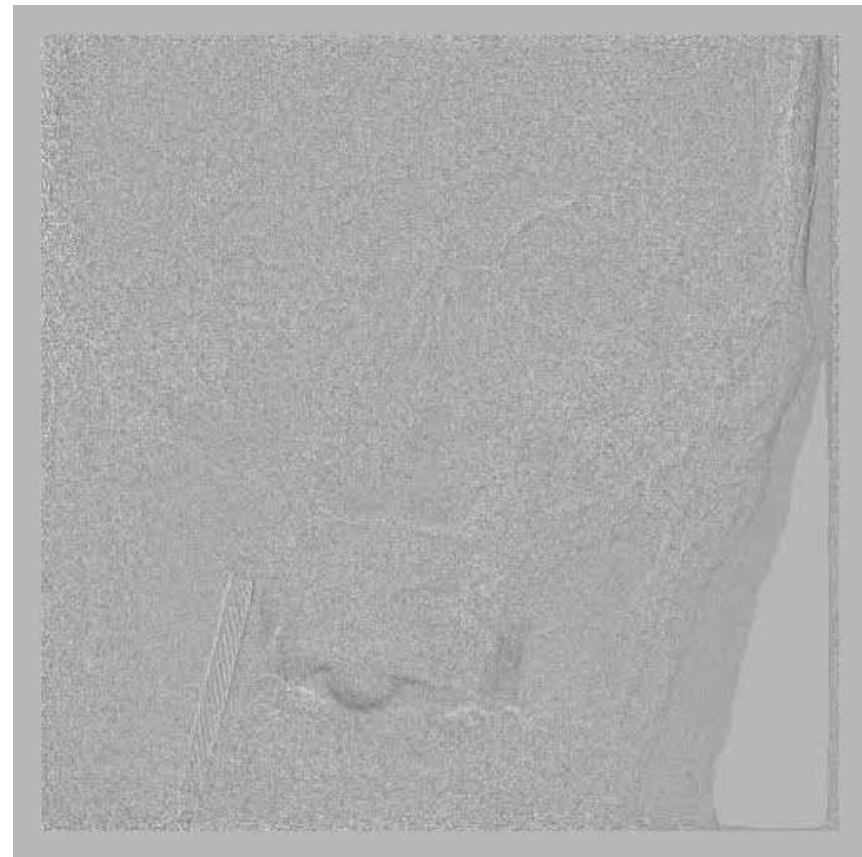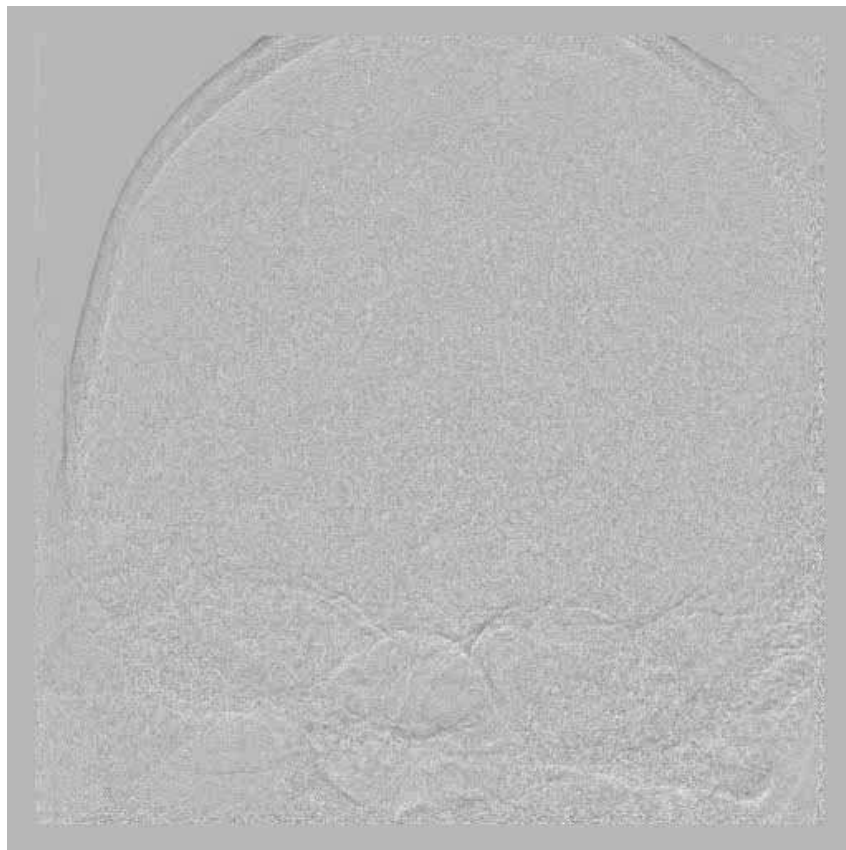# Contra IC (1), lesion >30mm (2)
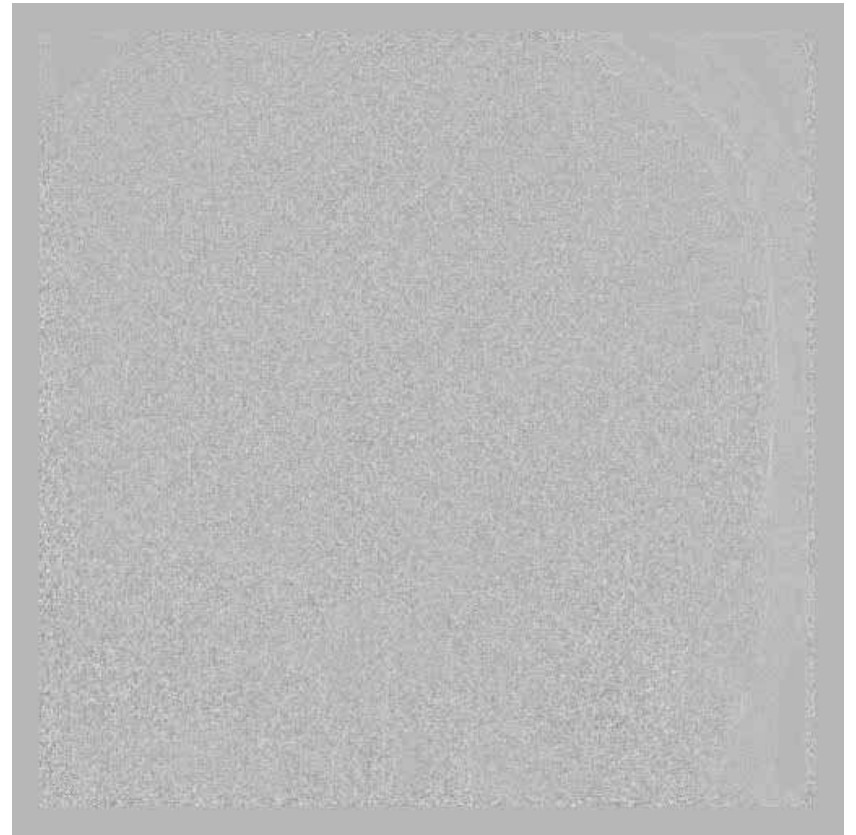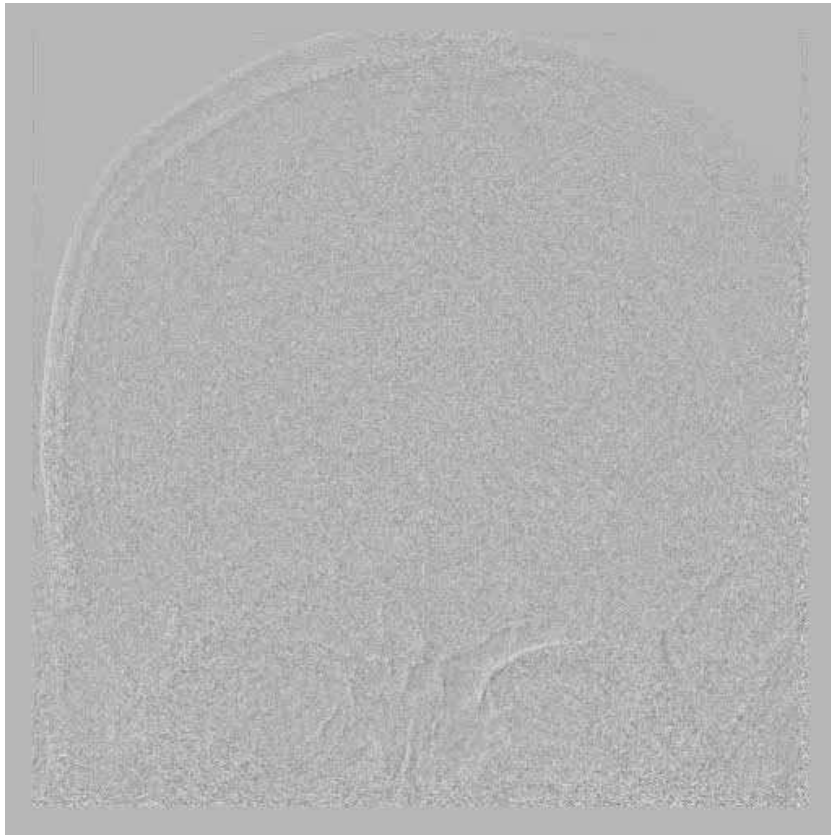
Final success (KL score 3, 77%)

Sx >6m (1), >45° (2), ipsi IC (0)

>30mm (2) (KL score 5, <34%)

Conclusions

- Recent symptom, straight stump, visible distal ICA, and short occlusion, predicts higher success rate in chronic CAO recanalization

- KL scoring system may be used to facilitate the generalization of CAO recanalization, especially for beginners

- More patients/operators are needed for validation

Thanks for your attention