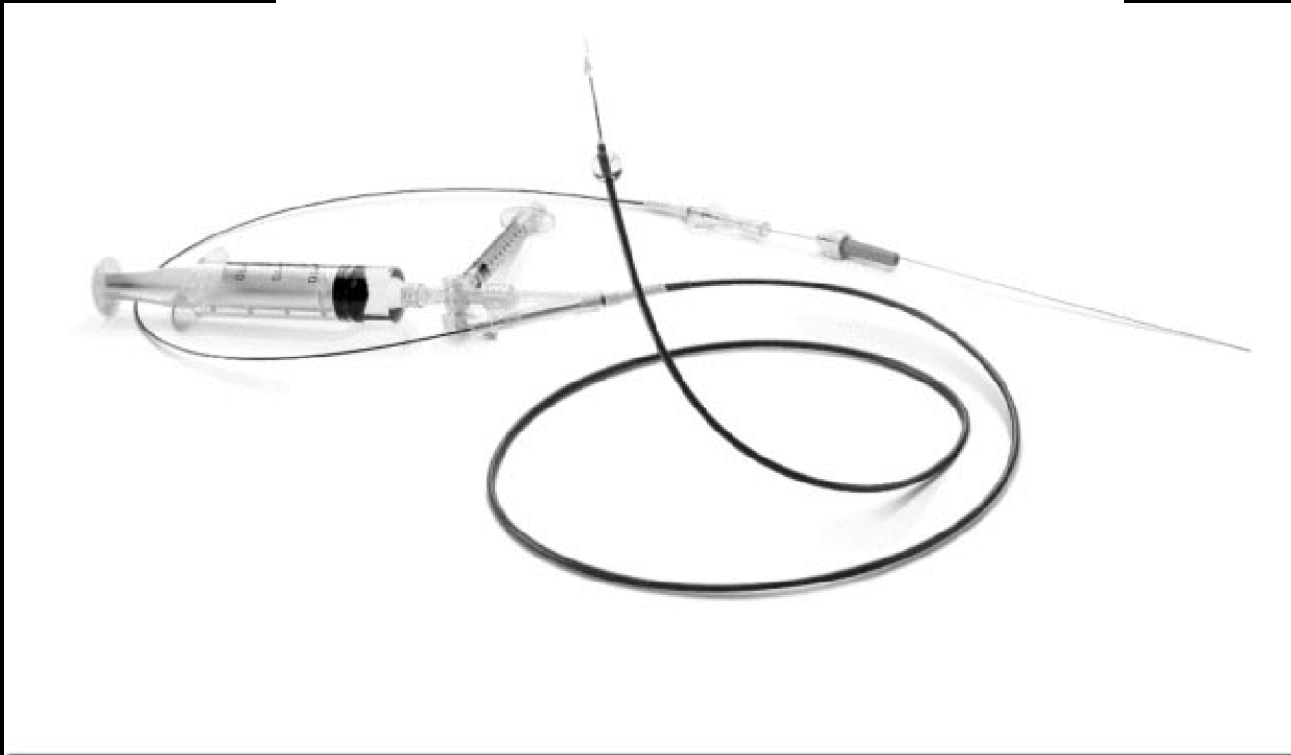
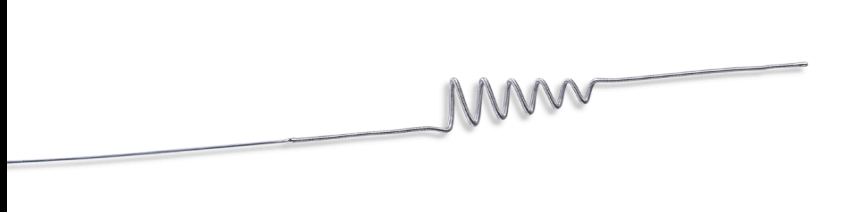


# Clot Extraction Devices



**TABLE 1. Patient Demographics, Baseline Stroke Score, Site of Vascular Occlusion, and Primary Outcomes**

Age, mean $\pm$ SD, y	67.0 $\pm$ 15.5
Female, %	46
Baseline NIHSS, mean $\pm$ SD	20.1 $\pm$ 6.6
Site of vascular occlusion, %	
ICA	19
ICA terminal bifurcation	14
Middle cerebral artery	57
Vertebral artery	1
Basilar artery	9
Revascularization (%; 95% CI)	48 (40–57)
Procedural complications (%; 95% CI)	
All	13 (7.3–18)
Clinically significant	7.1 (2.9–11)
Symptom onset to groin puncture, mean hr $\pm$ SD	4.3 $\pm$ 1.7
Procedure duration, mean hr $\pm$ SD, (range)	2.1 $\pm$ 1.0 (0.3–5.9)
Attempts to remove clot (n $\pm$ SD)	2.9 $\pm$ 1.5
Enrolled <3 hours of symptom onset, no. (%)	38 (27)

Big strokes

Proximal disease

3-8 hr time window

**TABLE 3. NIHSS, Recanalization and Outcomes by Site of Vascular Occlusion**

	Site of Occlusion		
	Posterior n=14	Internal Carotid n=47	Middle Cerebral n=80
Baseline NIHSS, mean $\pm$ SD	27 $\pm$ 11	19 $\pm$ 4	20 $\pm$ 6
Revascularization, %	50	53	45
Favorable outcome, 90 d, %			
Modified Rankin score	36	24	29
NIHSS score	50	33	29
Mortality, 90 d, %	43	51	39
Symptomatic Hemorrhage, %	7	15	4

# MERCI Recanalization

## Recovery

Independent

Dependent

Death

recan n=85

40

28

32

Non-recan n=56

4

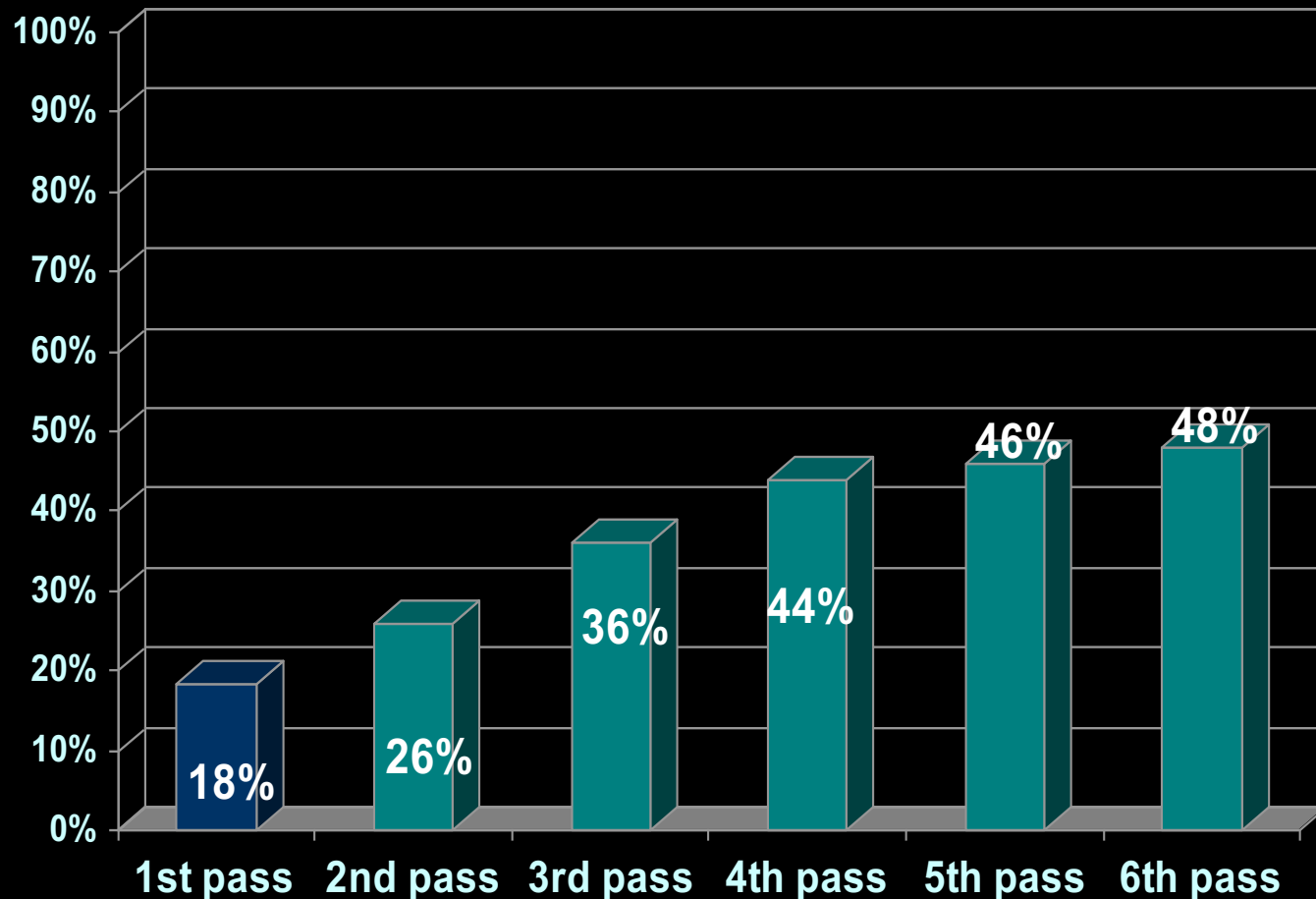
38

59



# Successful Revascularization by Number of Passes

Stroke 2005;36:1432-1440



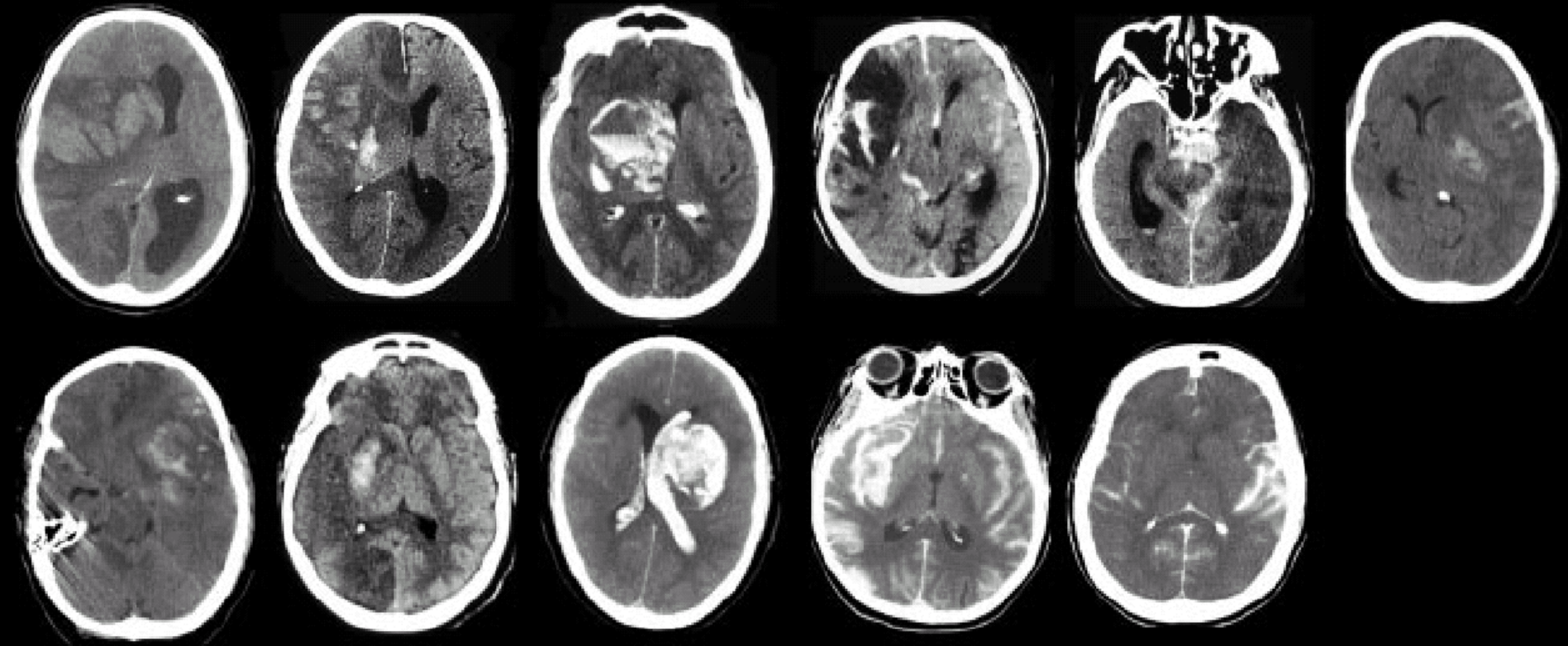
# Unusual SAH Bleeding with Device

HI-2

PH-1

PH-2

SAH



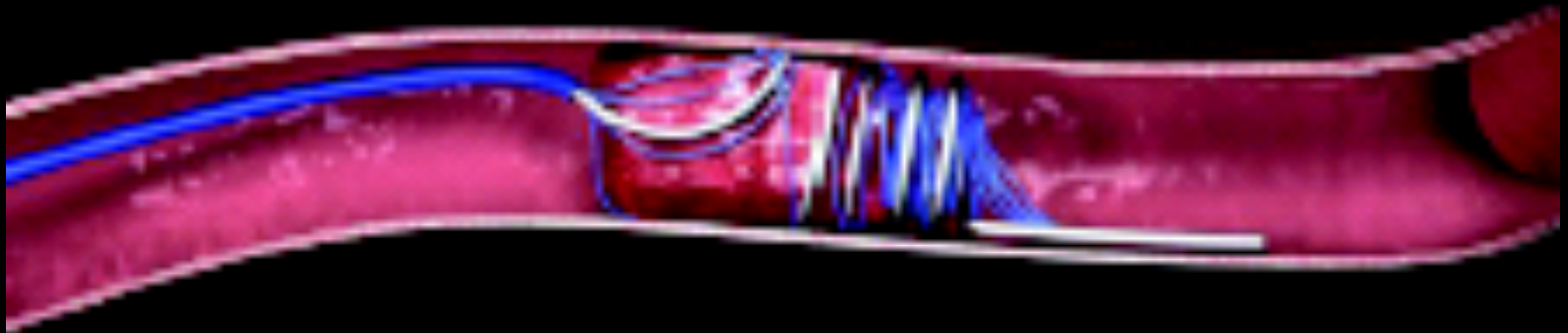
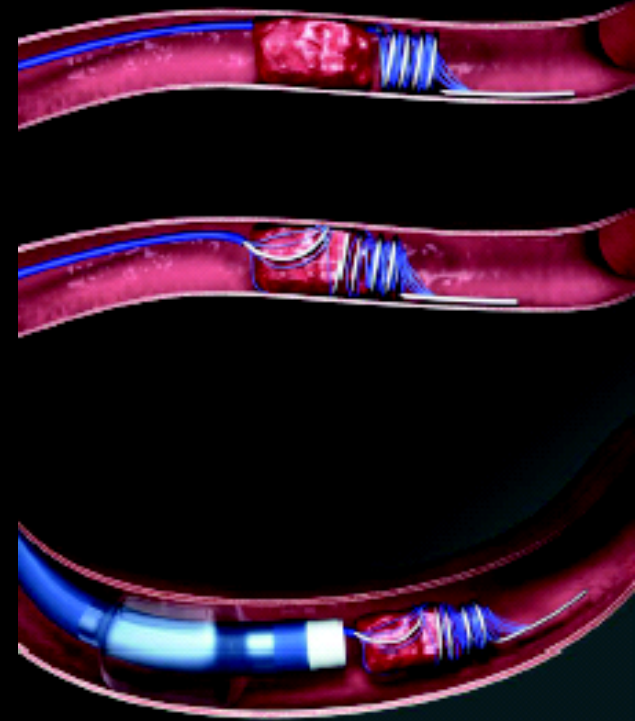
# Mechanical Devices

## **Approval of the MERCI Clot Retriever A Critical View**

Kyra J. Becker, MD; Thomas G. Brott, MD

Multi-MERCI

L5 system

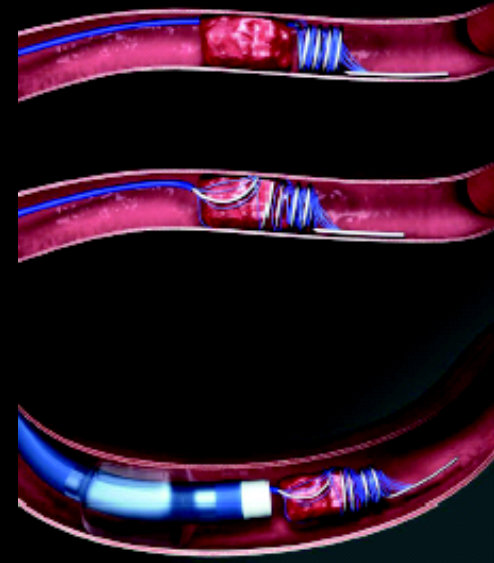


# Multi-MERCI

Number of Patients	164
Age, mean $\pm$ SD (yr)	68.0 $\pm$ 16.0
Female	57%
Baseline NIHSS, mean $\pm$ SD	19.3 $\pm$ 6.4
Site of vascular occlusion	
ICA/ICA-T (n=52)	32%
Middle cerebral artery (N=98)	60%
Vertebrobasilar artery (N=14)	8%
Symptom onset to groin puncture, hr (median [IQR])	4.2 [3.2-5.3]
Procedure duration, hr (median [IQR])	1.6 [1.2-2.3]
Attempts to remove clot (mean $\pm$ SD)	2.9 $\pm$ 1.6
IV t-PA pretreatment, % (n)	29% (48)

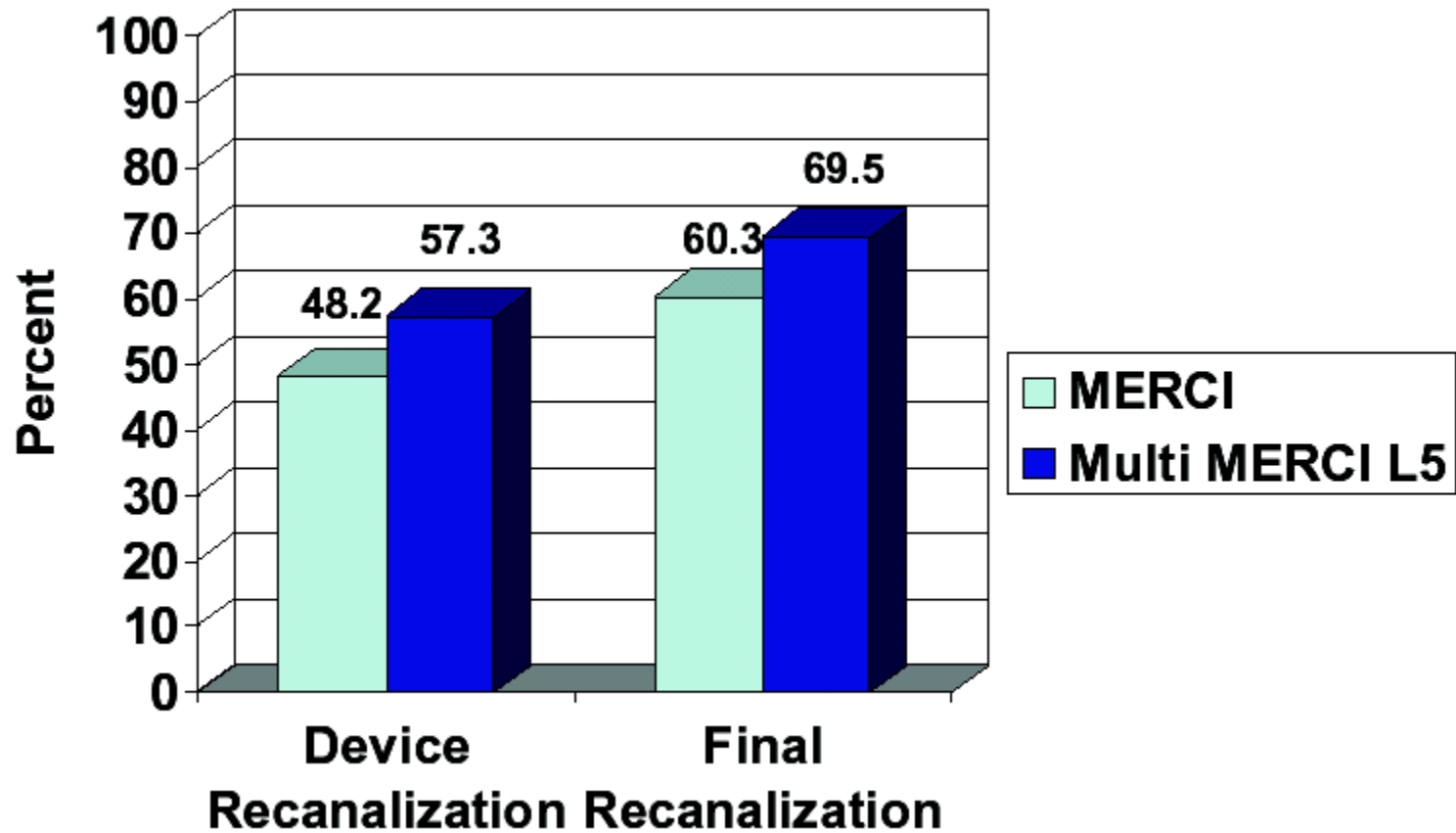


# Multi-MERCI



Vessel	Overall		L5	
	Revascularization		Revascularization	
Intracranial Carotid	65%	(34/52)	71%	(29/41)
MCA	67%	(66/98)	66%	(54/82)
Vertebrobasilar	86%	(12/14)	100%	(8/8)

# Multi-MERCI



# Multi-MERCI Recanalization

## Recovery

Independent

Dependent

Death

recan n=112

**49**

**26**

**25**

Non-recan n=52

**10**

**38**

**52**



# Multi-MERCI Safety

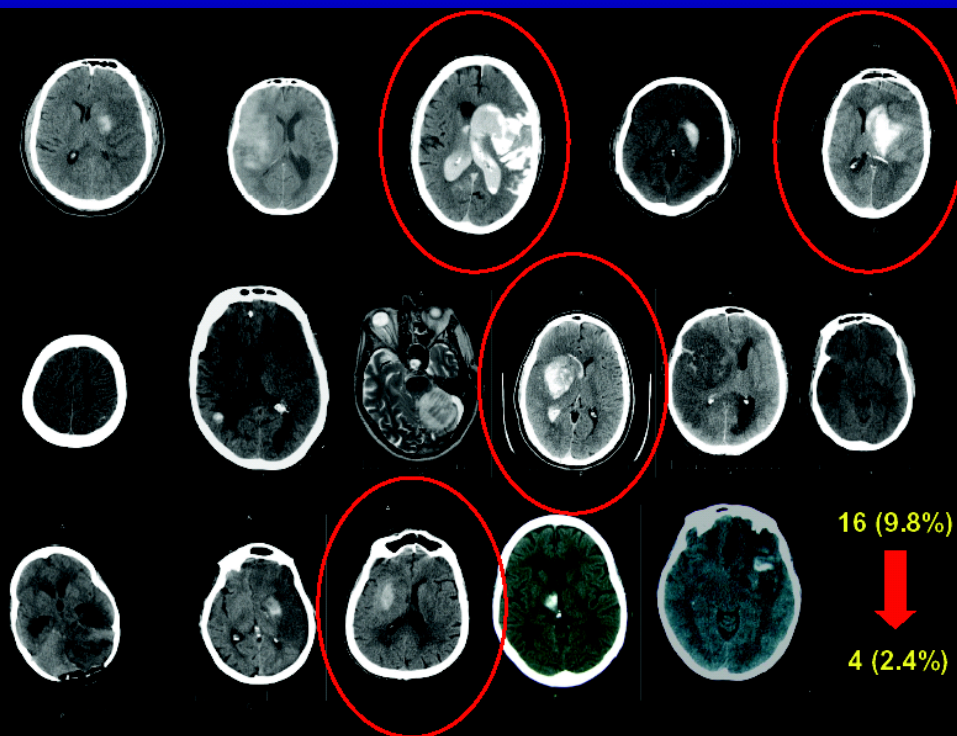
Clinically Significant Procedure Complications, % (n) 5.5% (9)

Non-clinically significant device complication, % (n) 0.6% (1)

Symptomatic ICH\*, % (n) 9.8% (16)

Asymptomatic ICH, % (n) 30.5% (50)

Asymptomatic Isolated HI-1, % (n) 11.0% (18)

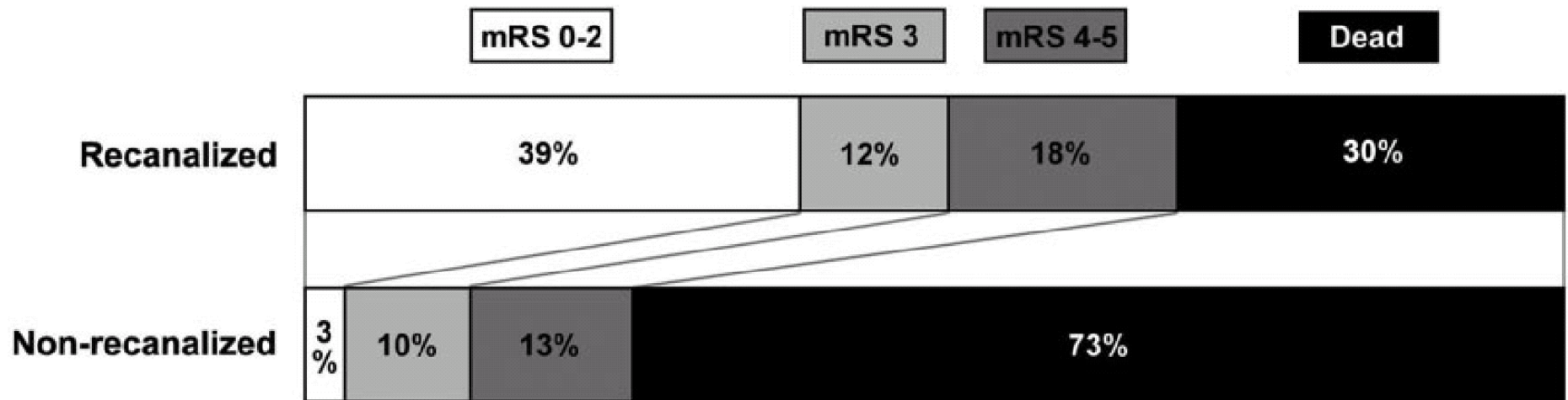


16 (9.8%)



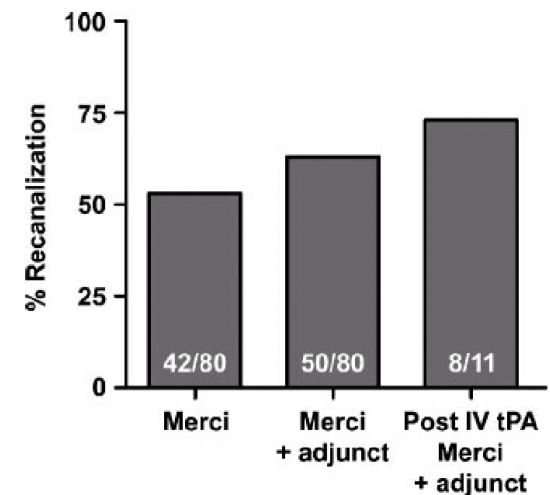
4 (2.4%)

# Terminal ICA Occlusion and MERCI

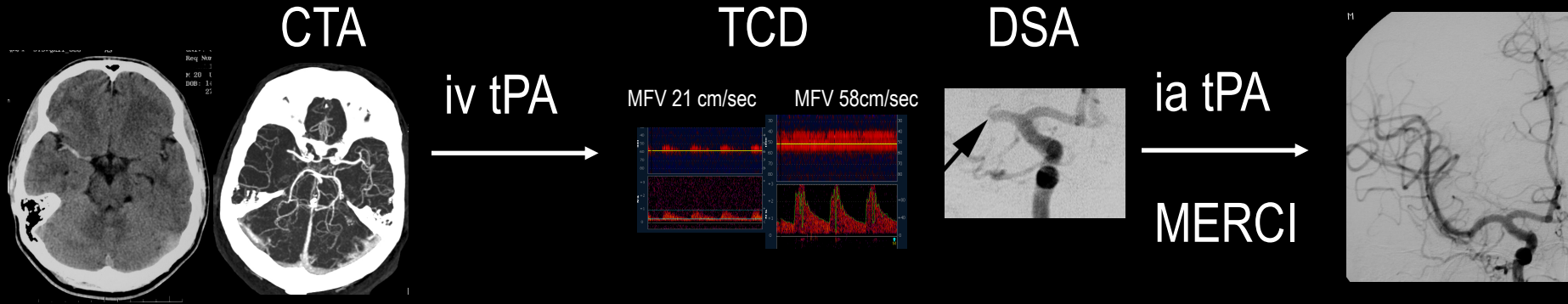


**TABLE 2.**

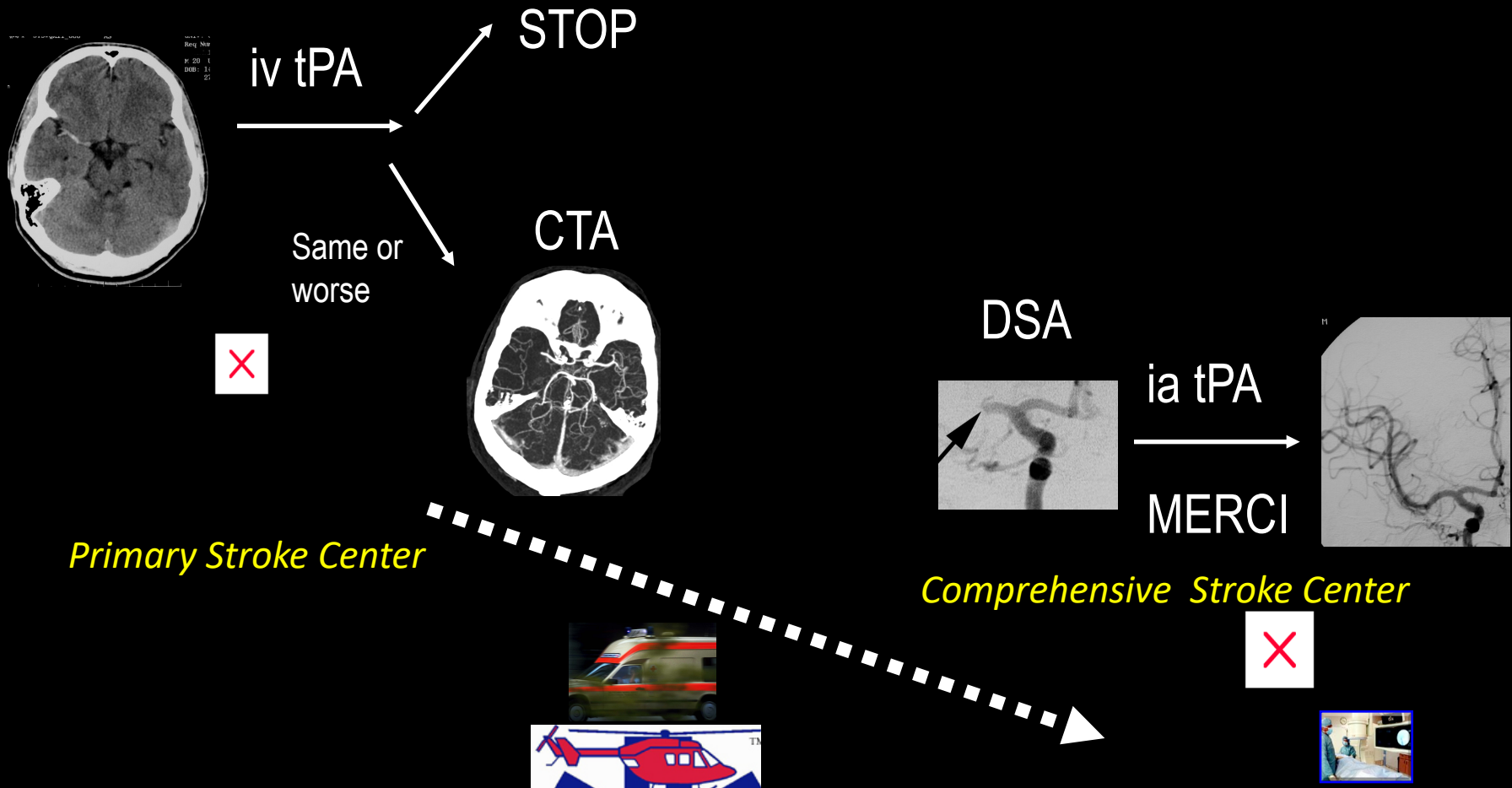
	Recanalized	Not Recanalized
Symptomatic hemorrhage	6% (3/50)	16.7% (5/30)



# Rescue ia therapy



# Rescue ia therapy



# IMS-3 Trial



NIHSS  $\geq 10$ ,  $< 3$  hours  
2/7  $< 2$  hours, 1:1 randomization NIHSS 10-19  
2:1 randomization NIHSS  $\geq 20$ , n=900

Start iv tPA – 0.09 mg/kg bolus

Start IV t-PA – 0.51 mg/kg infusion over 30 min, 60 mg max

Consent and randomize to one of 2 arms if eligible during this time frame

**IV tPA alone**

IV tPA 0.3 mg/kg over  
final 30 minutes

Stop

**IV+IA/mechanical**

Angiography

Prox target thrombus

At neurointerventionalist discretion

No clot  
– stop

IA Therapy: 2 mg-distal, 2 mg-intracot,  
9 mg/hr x 2 hrs, 22 mg max.)

Up to 1 FDA approved  
Mechanical device

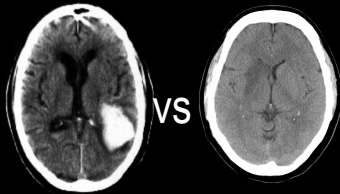
for clot extraction/lysis

# Choice of Imaging is when and how bad decision?

Time from onset

0 1h 2h 3h 6h 12h 24h 48h 72h ....

Severe  
mod  
resolving  
TIA  
Deficit



SPEED

Door to CT scan <30 minutes

# Quote Thrombolysis not a panacea for stroke. New Engl J Med 1997



“We think that patients are better served by accurate diagnosis and appropriate specific therapy than by a shotgun approach.”

“Vascular imaging tests are now widely available that can safely and quickly identify occlusive thrombi, and so ensure specificity.”

“Vascular and brain imaging should always precede thrombolysis.”

# CT bolus techniques

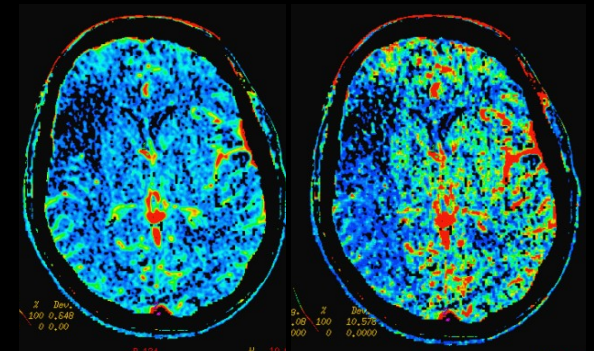
NCCT



CTA



Perfusion CT





# Stroke CT Angiography Renal Safety

A Krol et al. Stroke (abstract) ASA 2005

481 patients had stroke CTA.

None of these patients developed acute renal failure needing dialysis.

3.1 % of patients fulfilled the criteria for RCN (>25% in their creatinine levels) .

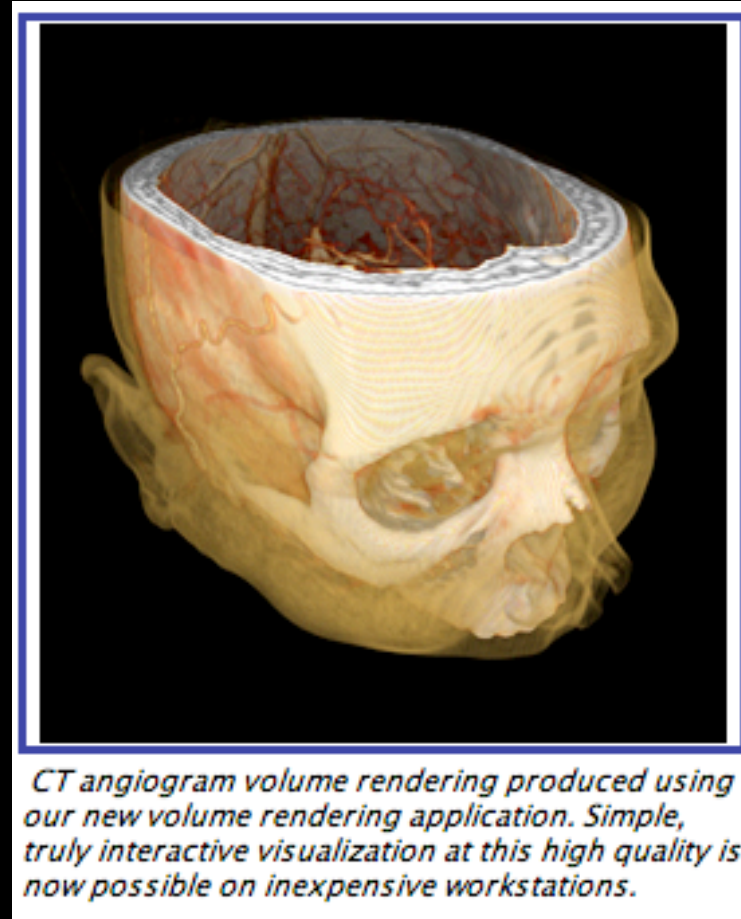
Patients who underwent emergent CTA without knowledge of creatinine, 2/93 developed RCN.

49 patients received an additional DSA and none of these developed subsequent RCN.

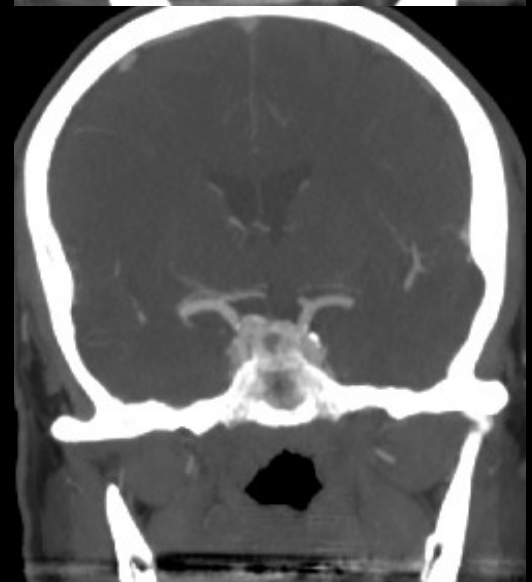
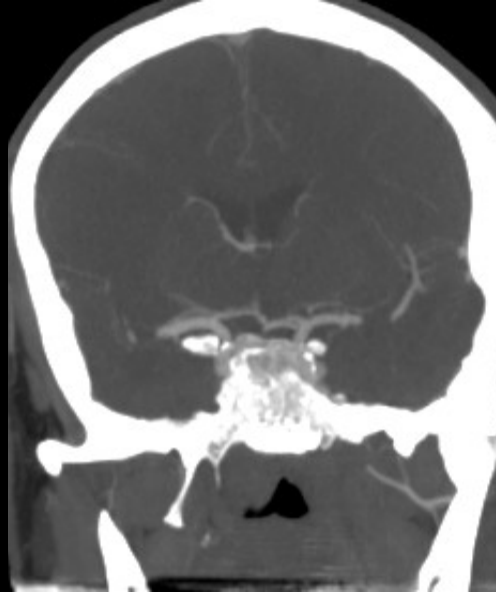
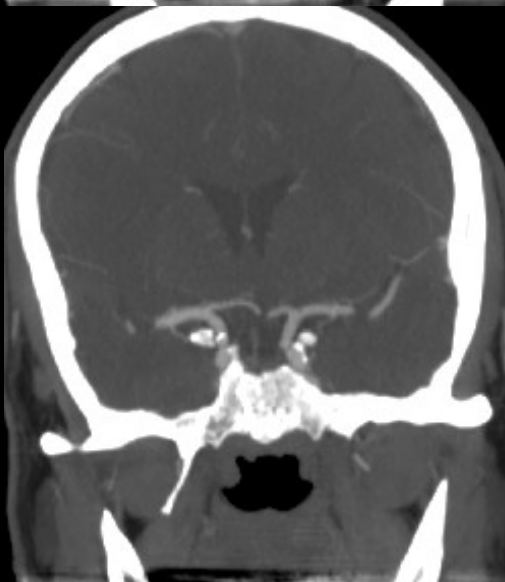
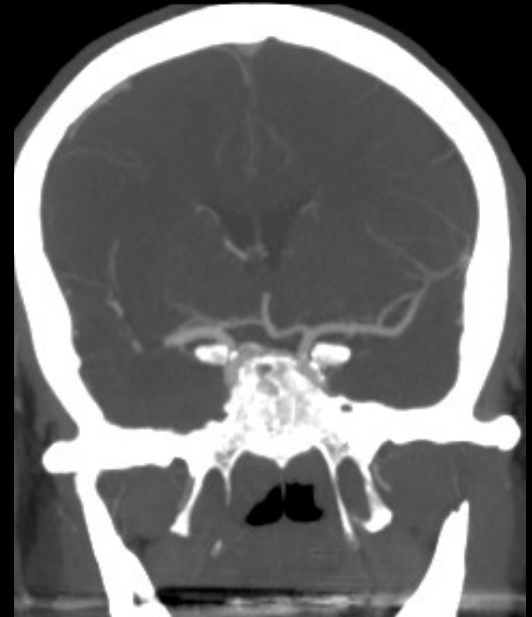
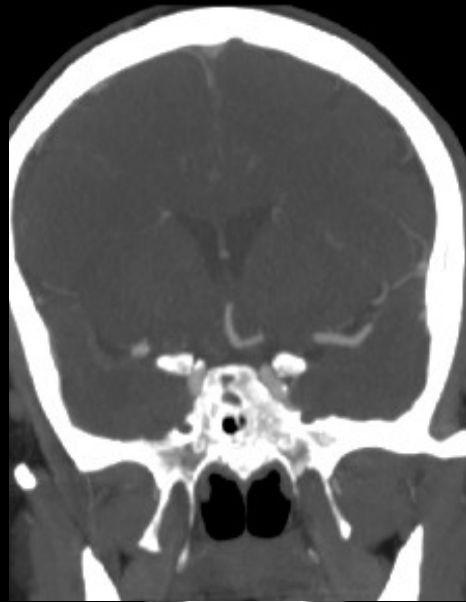
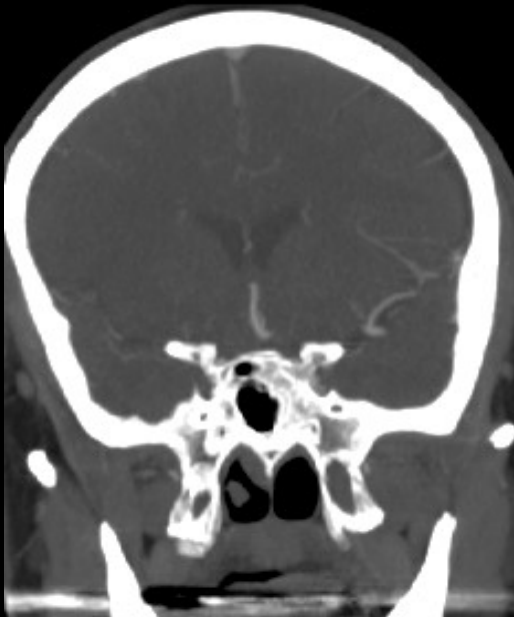
14/144 had a >25% in their creatinine levels at long term follow-up.



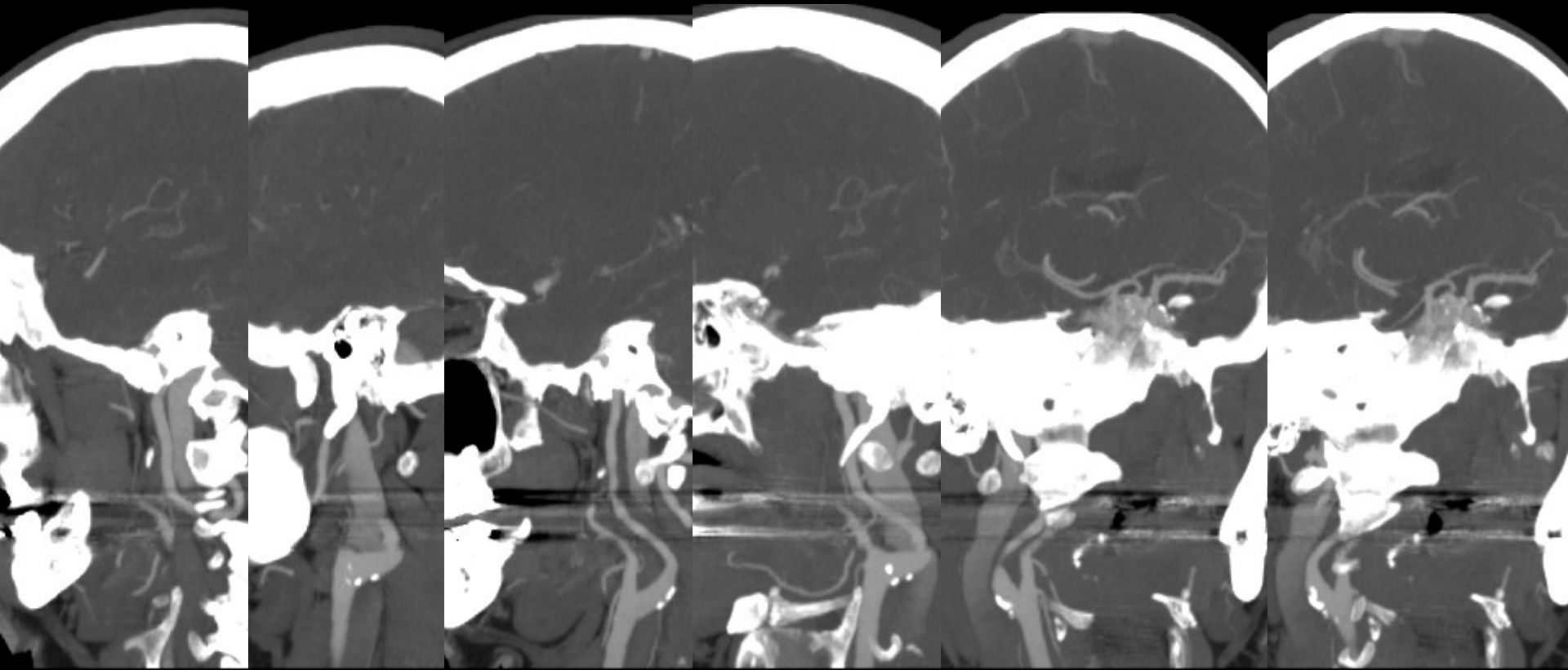
# CT Angiography Reconstructions



# CTA coronal reformats



# CTA sagittal & oblique reformats





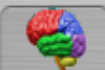
Histogram



Textured



MIP



Coloured



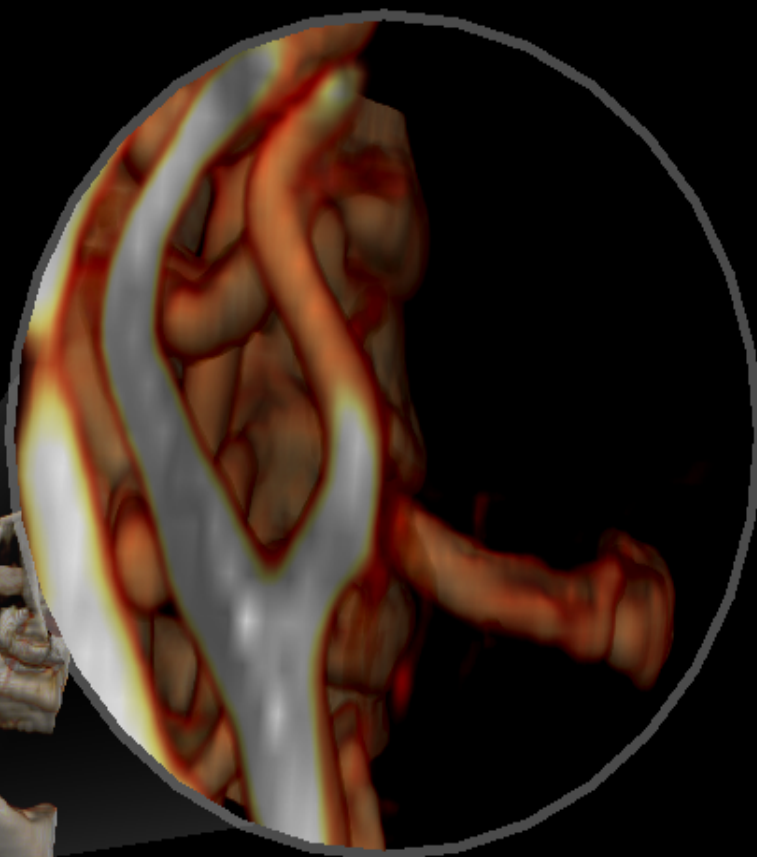
Lighting



Lens

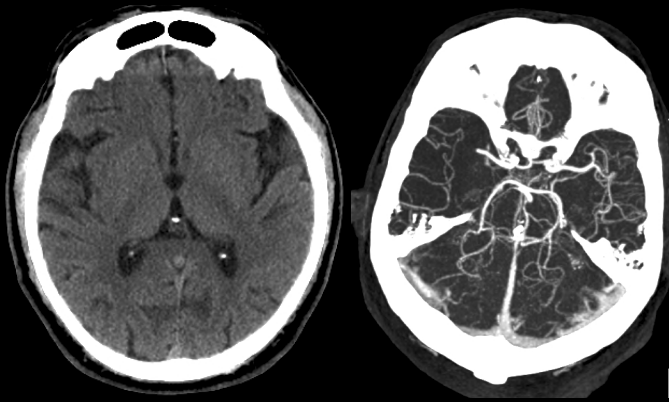


Silhouette

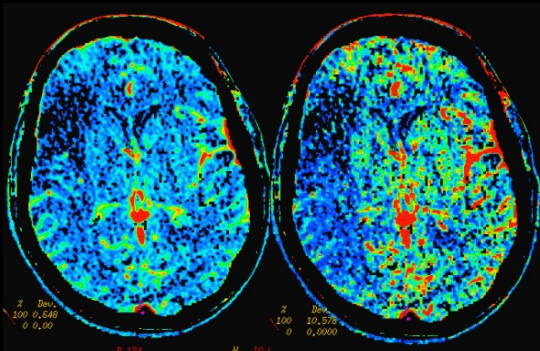




# When are the CT bolus techniques critical for hyperacute disabling stroke decision making?



Very early scans with high suspicion of intracranial occlusion



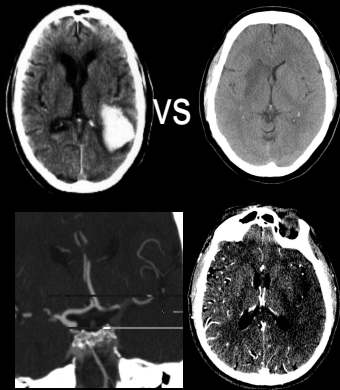
NCCT underestimates infarct size

# Choice of Imaging is when and how bad decision?

Time from onset

0 1h 2h 3h 6h 12h 24h 48h 72h ....

Severe  
mod  
resolving  
TIA  
Deficit



SPEED and SELECTION for iv/ia

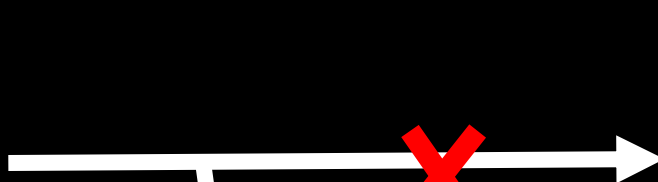




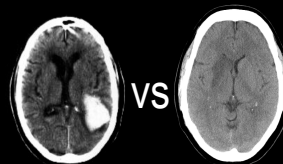
8 miles



*Local hospital  
No CT scanner*



40 miles



*CT scanner*



70 miles



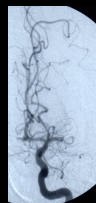
170 miles



VS

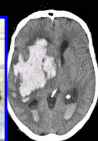
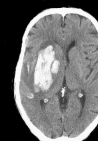
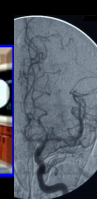
*Helical or multislice CT scanner 24h/365d coverage  
Primary Stroke Center*

intracot  
lysis



VS

ICH  
evacuation



*Early ICA  
revascularization*

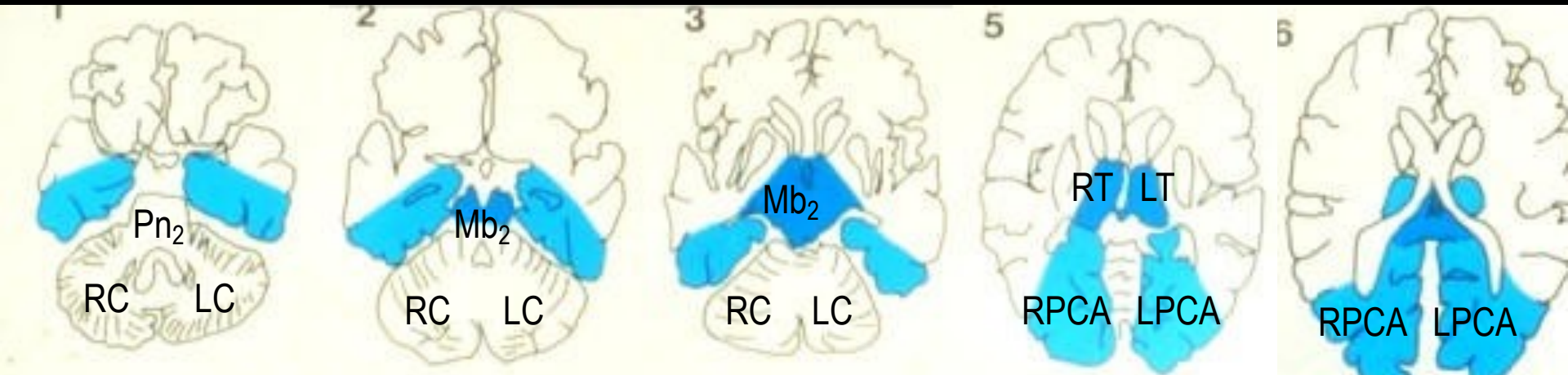
*Interventional Facilities-  
interventional neurorad, neurosurgery  
Comprehensive Stroke Center*

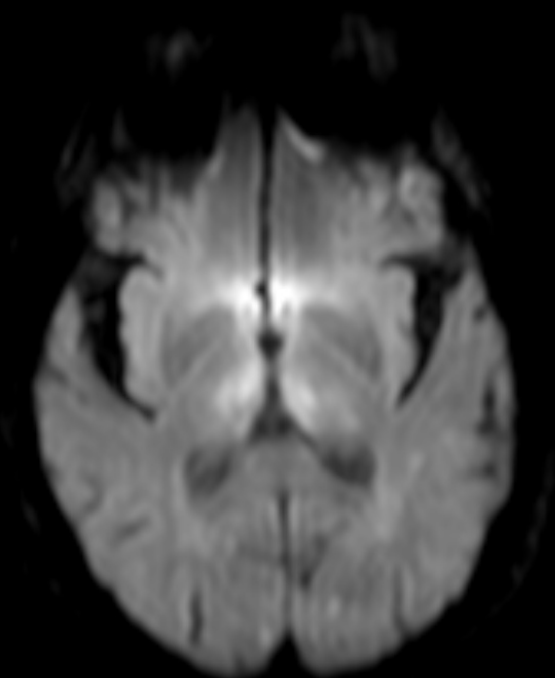
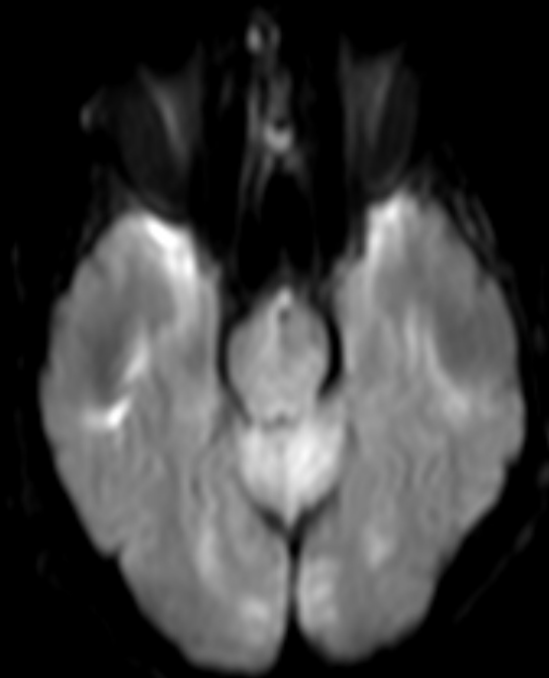
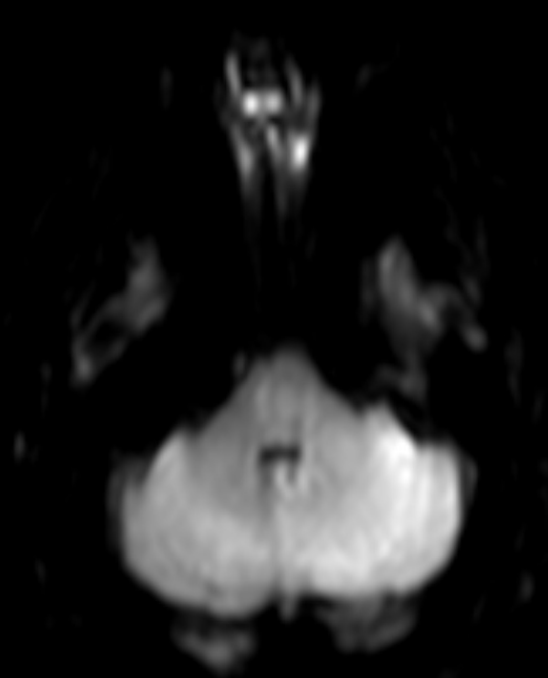
# Basilar Artery Prognosis

Length of thrombus  
LOC at presentation



# pc-ASPECTS





# Basilar artery occlusion and tPA dichotomized by pc-ASPECTS

n=31 basilar occlusions

Recovery

Independent

Dependent

Death

8-10 n=16

50

25

25

pc-ASPECTS

0-7 n=15

33

67



# Sweet Spot for tPA; bNIHSS 6-20

**Table 1: Three-month stroke outcomes in the NINDS tPA stroke trial by baseline stroke severity**

NIHSS score	Baseline		90-day NIHSS score of 0–1				90-day mRS score of 0–1				Unadjusted odds ratio for favourable outcome (95% CI)
	% of placebo patients (n = 312)	% of tPA patients (n = 312)	% of placebo patients	% of tPA patients	Absolute benefit, % (95% CI)	NNT	% of placebo patients	% of tPA patients	Absolute benefit, % (95% CI)	NNT	
0–5	5.1	13.5	62.5	69.1	6.6 (–20.9 to 34.1)	15	81.3	78.6	–2.7 (–25.5 to 20.1)	–37	1.12 (0.36 to 3.49)
6–10	26.6	21.8	34.9	51.5	16.6 (0.9 to 32.2)	6	45.8	67.7	21.9 (6.5 to 37.3)	5	2.33 (1.32 to 4.09)
11–20	43.6	44.6	16.9	27.3	10.4 (0.7 to 20.1)	10	21.3	34.5	13.2 (2.7 to 23.7)	8	1.68 (1.05 to 2.67)
> 20*	24.7	20.2	2.6	6.4	3.8 (–3.2 to 10.8)	26	3.9	9.5	5.6 (–2.8 to 14.0)	18	1.45 (0.64 to 3.33)

Note: NIHSS = National Institutes of Health Stroke Scale, mRS = modified Rankin scale, CI = confidence interval, tPA = tissue plasminogen activator, NNT = number needed to treat.

\*The 95% CI, derived using the normal approximation to the binomial distribution, for this group may not be valid owing to small number for each treatment group.

## 4.6% “truly symptomatic ICH” in NINDS

< 3 Hours from onset  
NINDS tPA Trial baseline NIHSS  $\leq$   
5 Parts A and B

n=58 NNH = 7!!!

Recovery

Complete      Incomplete      Poor      Death

Placebo



rt-PA



2% sympt ICH