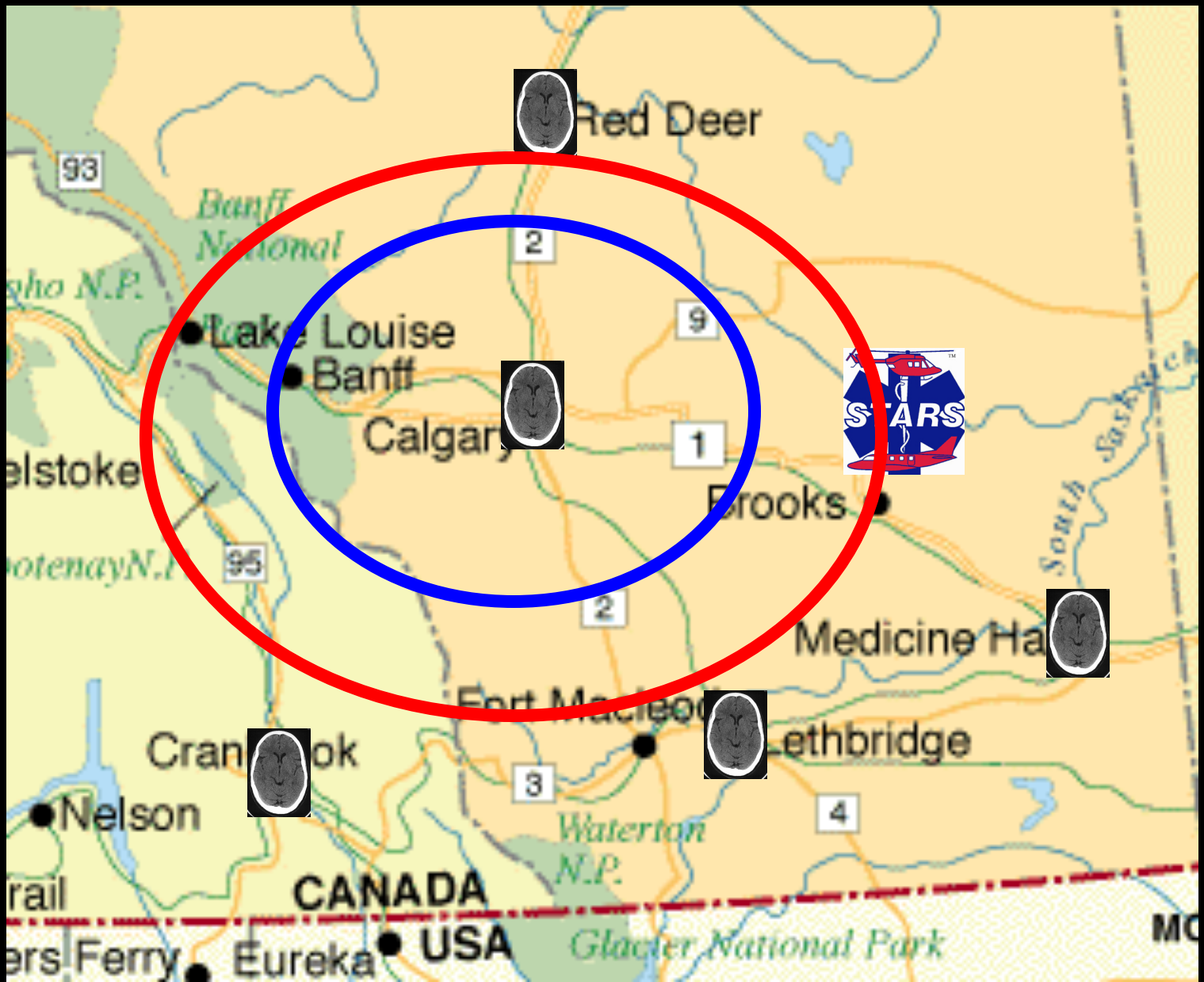
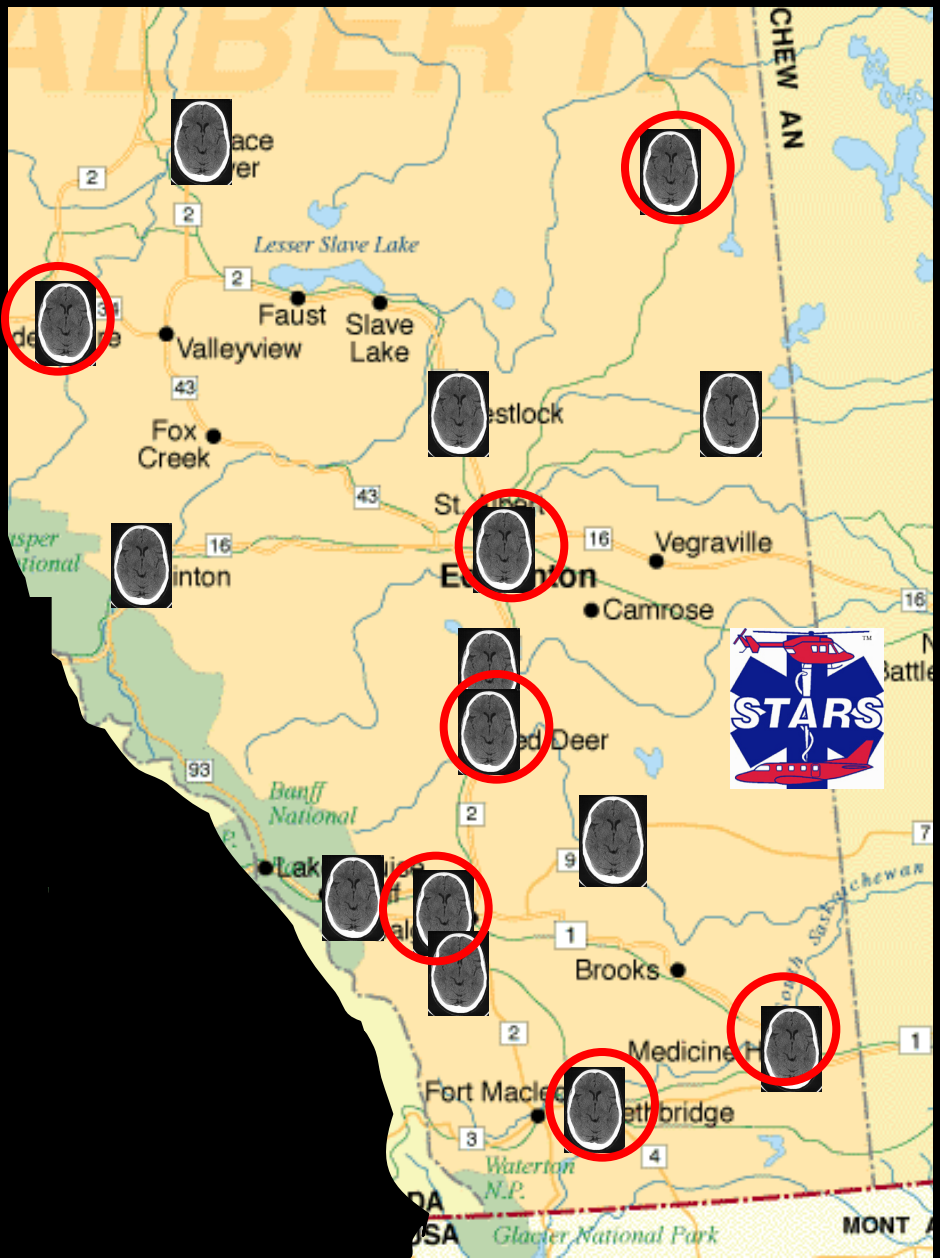
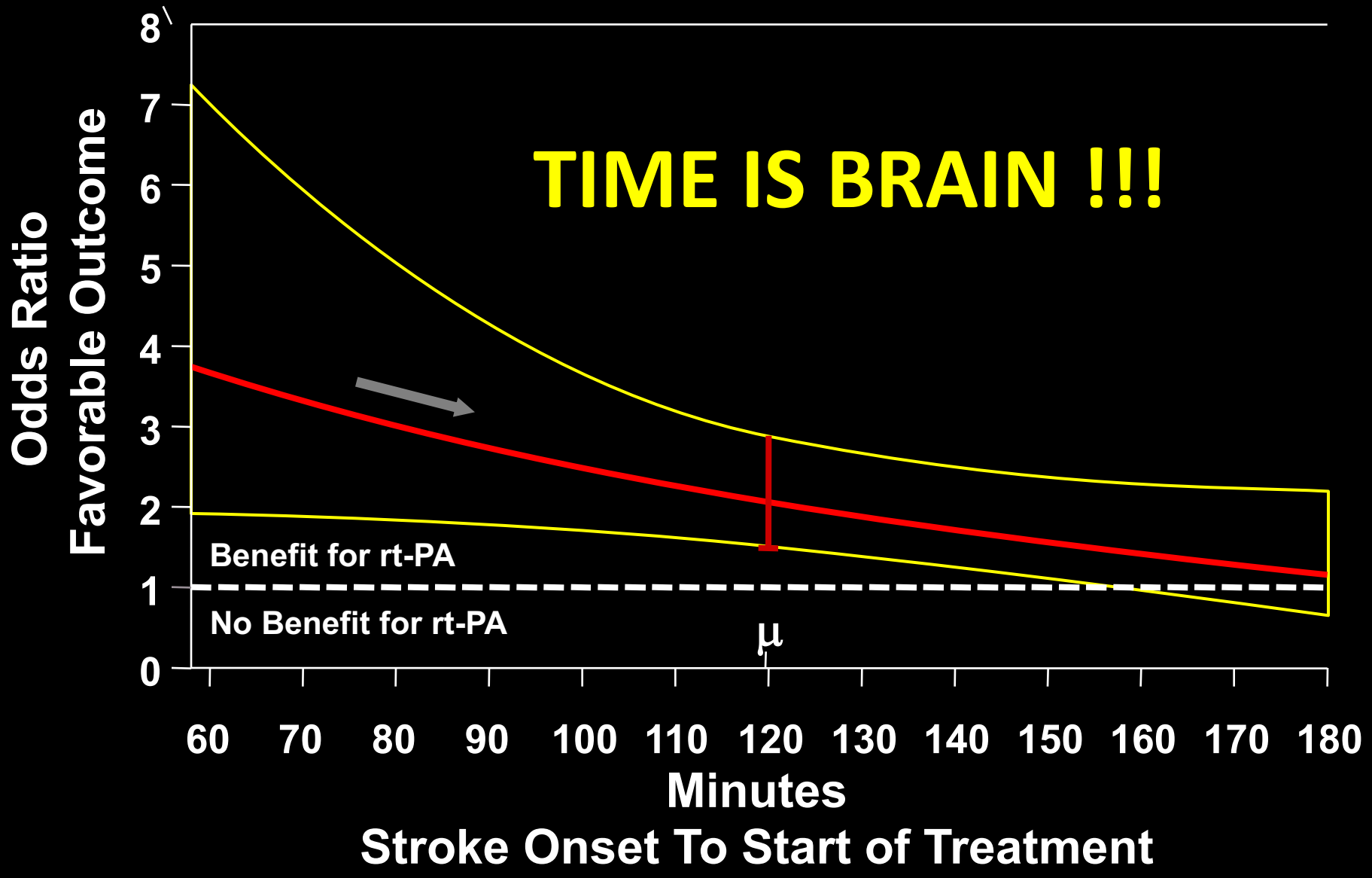
Comprehensive Stroke Centre

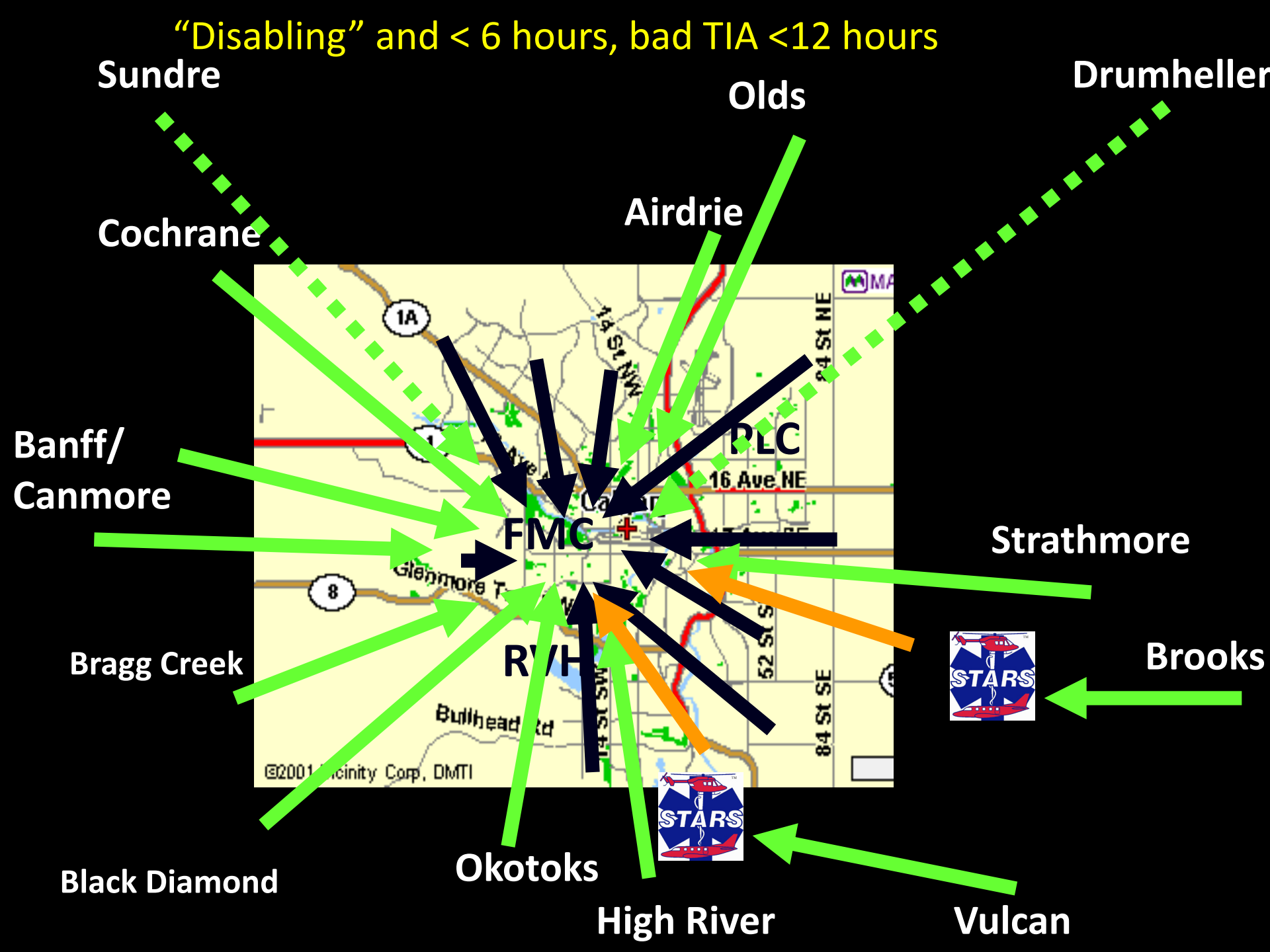


Alberta Provincial Stroke Strategy

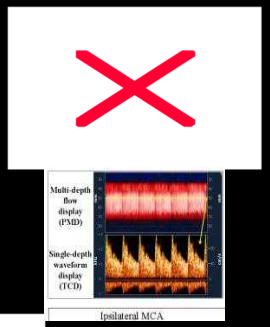


NINDS TPA Stroke Study:
Time to Treatment and Odds Ratio of Favorable Outcome

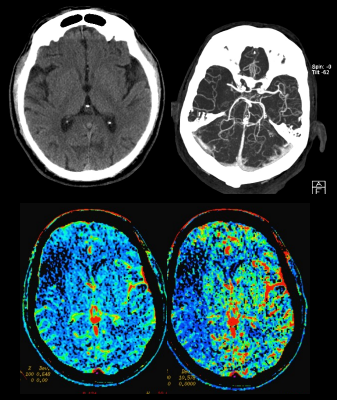



"Disabling" and < 6 hours, bad TIA <12 hours
Sundre
Olds
Drumheller
Cochrane
Airdrie
Banff/
Canmore
PLC
FMC
RVH
Strathmore
Bragg Creek
Brooks
Black Diamond
Okotoks
High River
Vulcan
1A
8
16 Ave NE
84 St SE
STARS
STARS

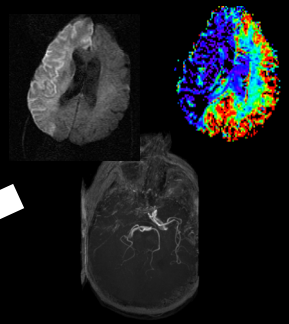
TCD

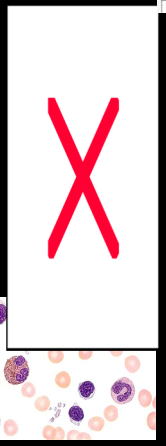


CT



MRI





Time

Neurovascular imaging choices depend on stroke population

Hyperacute (<3 hour) disabling stroke

SPEED

Acute (3-24 hour) disabling stroke

SELECTION

Nondisabling stroke and TIA

VULNERBILITY

Subacute stroke work-up

ETIOLOGY

Hyperacute Disabling Stroke

Less than 3 hours from onset, disabling deficits.

20% of all stroke

THINK SPEED

1500 strokes/year → > 3 hours 900 strokes

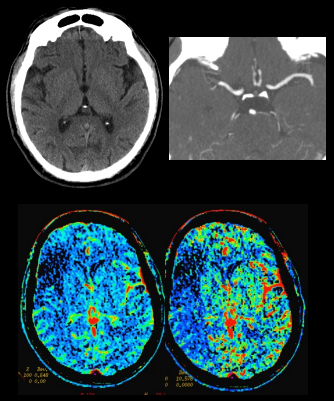
↓

< 3 hours 600 strokes → < 3 hours 300 mild strokes

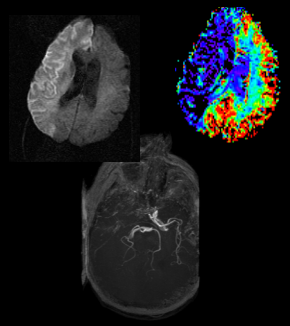
↓

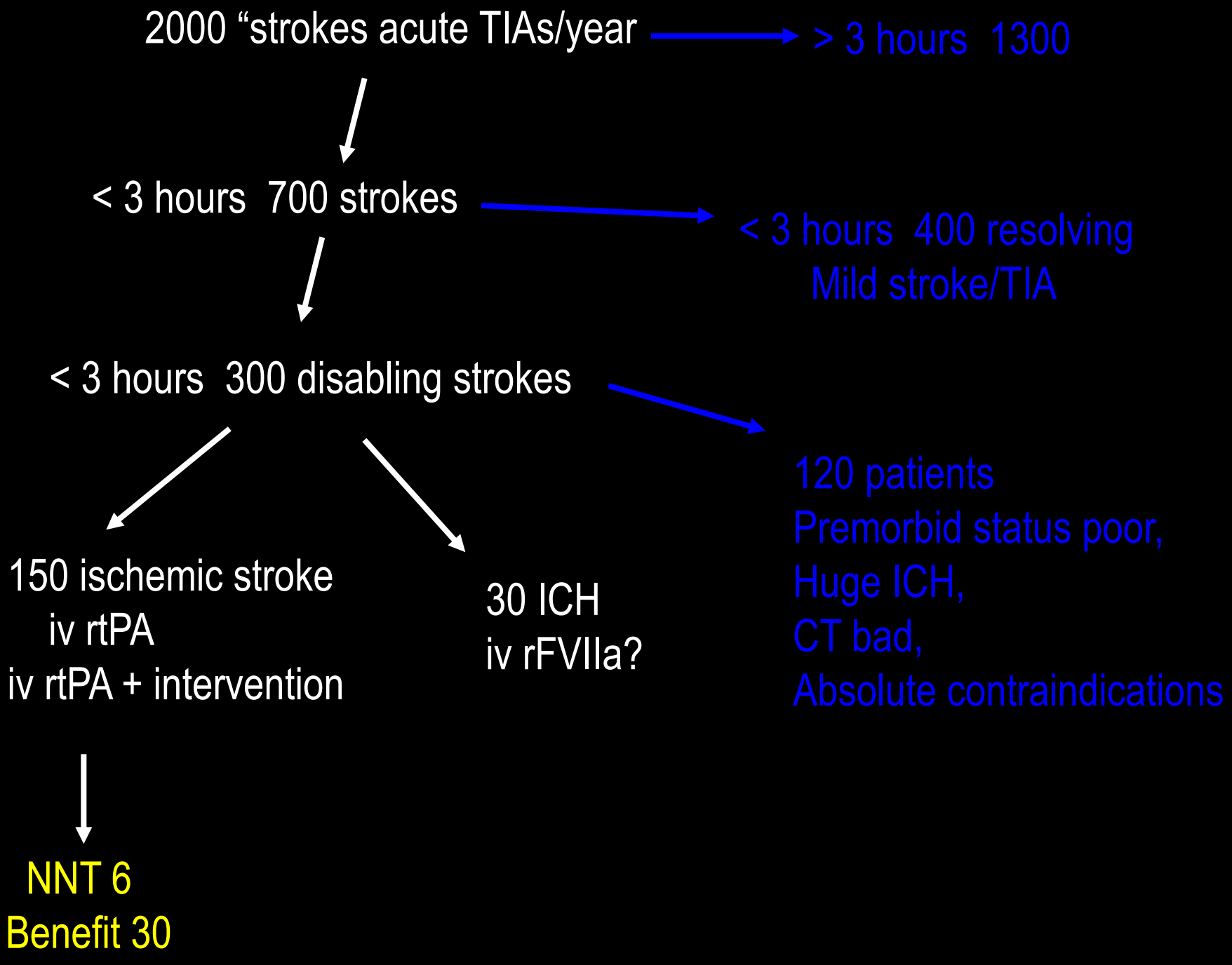
< 3 hours 300 disabling strokes

CT



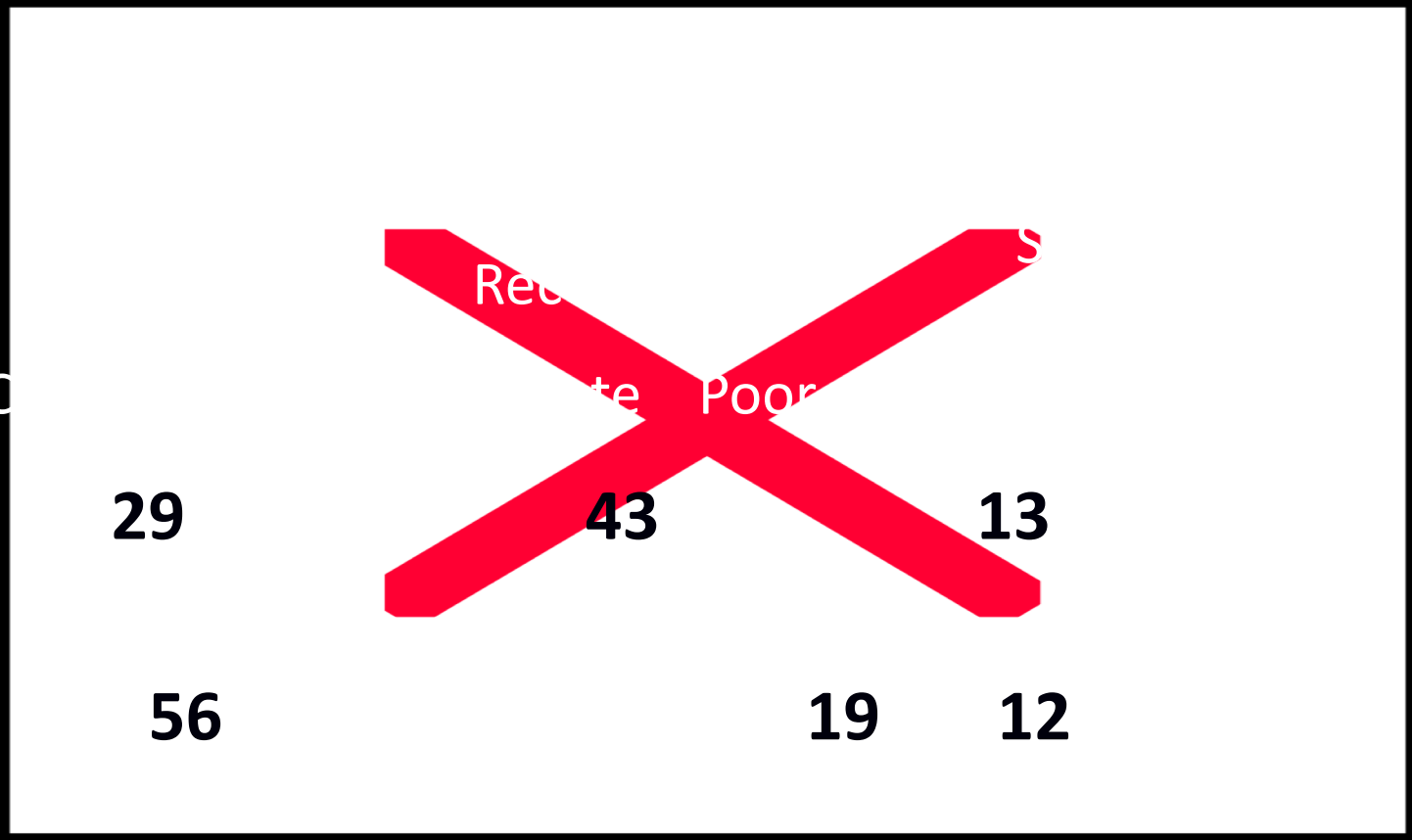
MRI



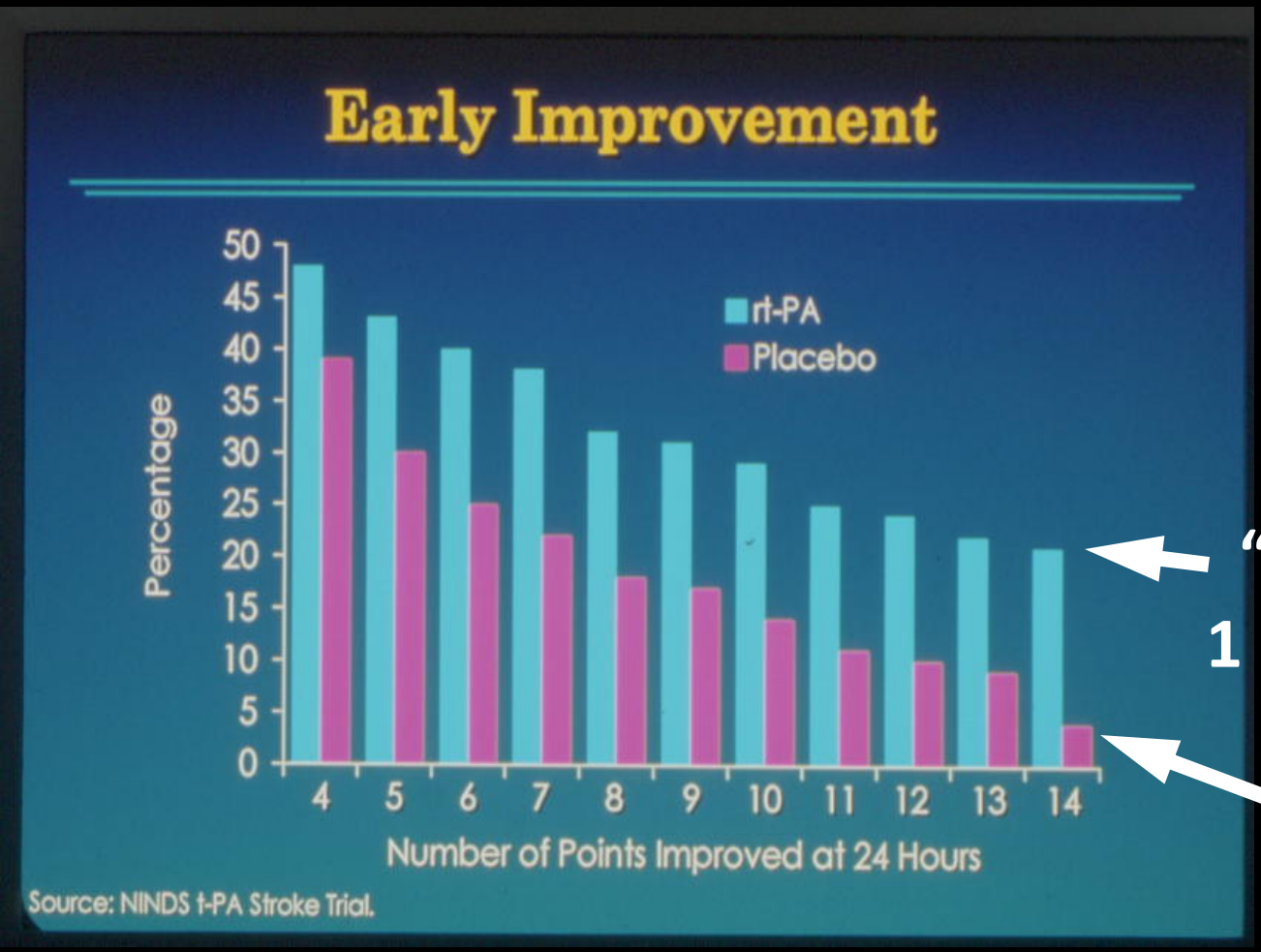

2000 “strokes acute TIAs/year
> 3 hours 1300
< 3 hours 700 strokes
< 3 hours 400 resolving
Mild stroke/TIA
< 3 hours 300 disabling strokes
120 patients
Premorbid status poor,
Huge ICH,
CT bad,
Absolute contraindications
150 ischemic stroke
iv rtPA
iv rtPA + intervention
30 ICH
iv rFVIIa?
NNT 6
Benefit 30

< 3 Hours from onset
NINDS tPA Trial age ≤ 60

Parts A and B



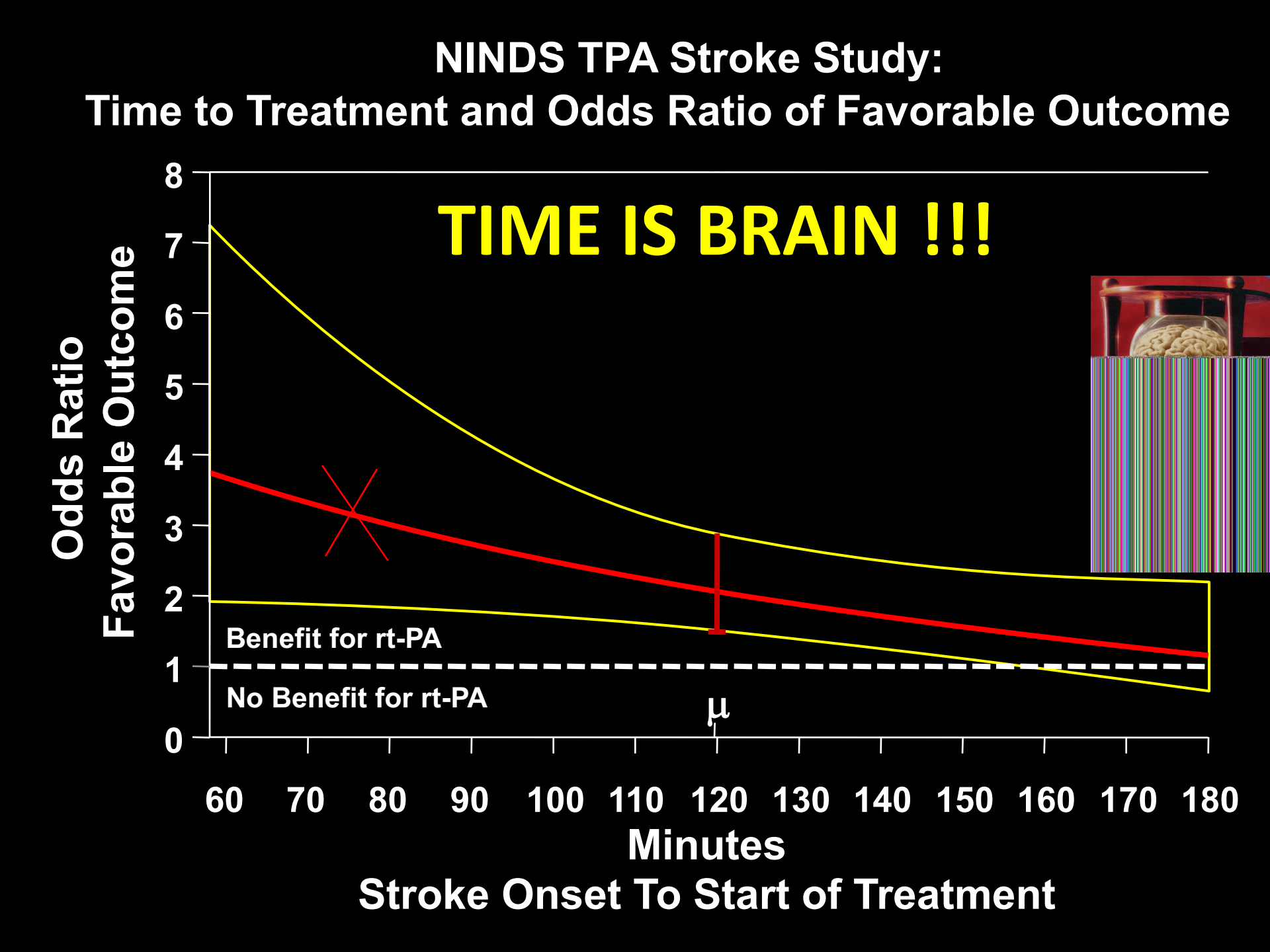
iv tPA “On the table responders”



“Lazarus effect”
1 in 4-5 tPA patients

versus 1 in 30
placebo patients

NINDS TPA Stroke Study:
Time to Treatment and Odds Ratio of Favorable Outcome



Hyperacute Disabling Stroke

Rapid accessibility is key for imaging choices.


Brain Saving
Technologies

MRI contraindications

electronically, magnetically, and mechanically activated implants

ferromagnetic or electronically operated active devices like automatic cardioverter defibrillators

cardiac pacemakers

metallic splinters in the eye

ferromagnetic haemostatic clips in the central nervous system

cochlear implants or stapedial implants

other pacemakers, e.g. for the carotid sinus

insulin pumps and nerve stimulators

lead wires or similar wires (MRI Safety risk)

prosthetic heart valves (in high fields, if dehiscence is suspected)

haemostatic clips (body)

MRI Environment – Serious Business

MDR-351516: A patient with an implanted cardiac pacemaker died during an MR exam. (12/2/92)

MDR-175218: A patient with an implanted cardiac pacemaker died during or shortly after an MR exam.
The coroner determined that the death was due to the interruption of the pacemaker by the MR system. (9/18/89)

MDR-349790: A patient with an implanted intracranial aneurysm clip died as a result of an attempt to scan her.
The clip reportedly shifted when exposed to the magnetic field. The staff apparently had obtained information indicating that the material in this clip could be scanned safely. (11/11/92)

MDR-100222: Dislodgement of an iron filing in a patient's eye during MR imaging resulted in vision loss in that eye. (1/8/85)

MDR-454660: A patient complained of double vision after an MR exam. The MR exam as well as an x-ray revealed the presence of metal near the patient's eye. The patient was sedated at the time of the exam and was not able to inform anyone of this condition. (12/15/93)

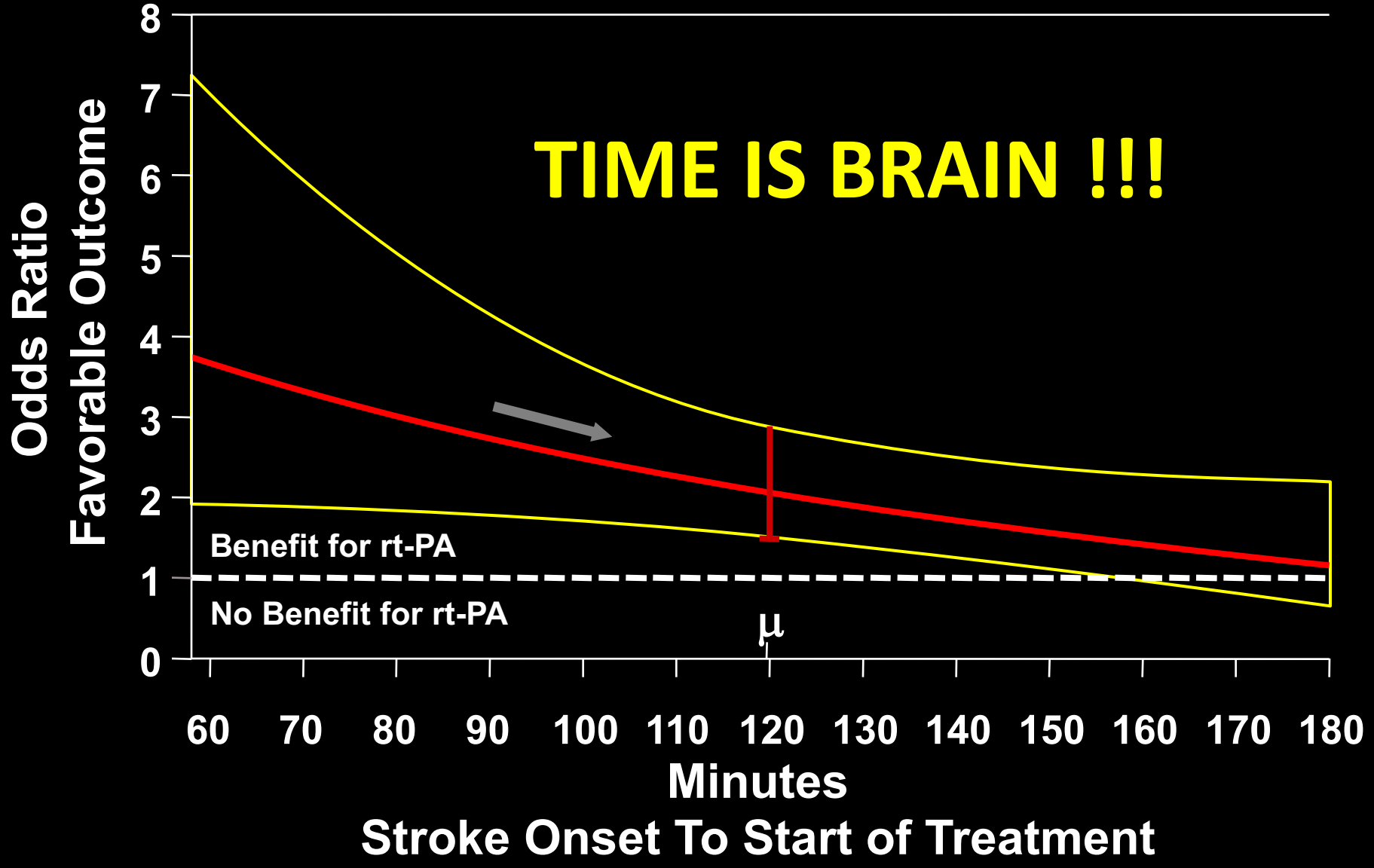
MDR-547886: An IV pole was attracted to the magnet and struck a patient, cutting his arm. The patient required stapling of the cut. (8/30/94)

MDR-405200: A pair of scissors was pulled out of a nurses hand as she entered the magnet room.
The scissors hit a patient causing a cut on the patient's head. (8/2/93)

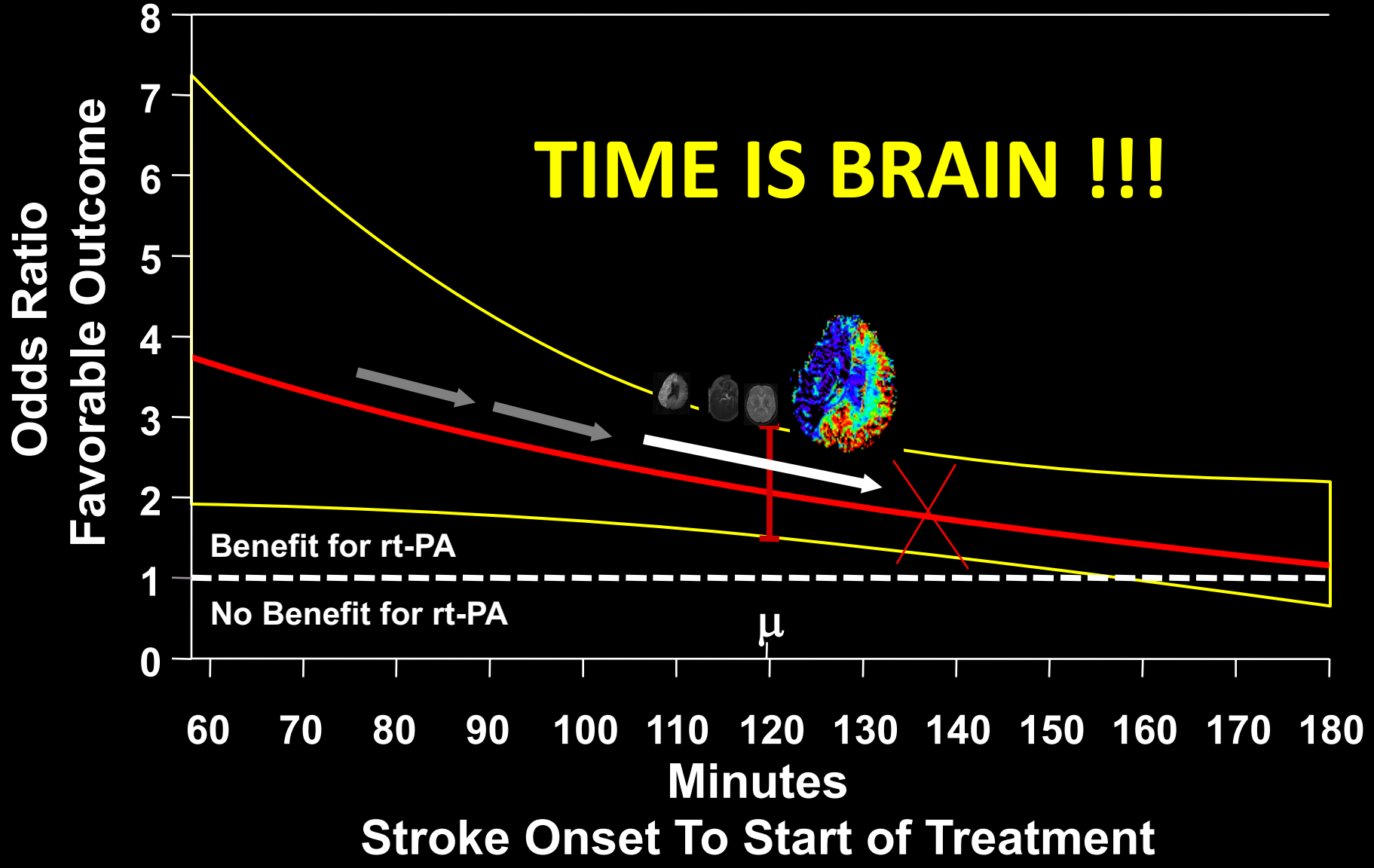
MDR-234698: A patient was struck by an oxygen bottle while being placed in the magnet bore.
The patient received injuries requiring sutures. (6/2/91)

PRP-19168: Two steel tines (parts of a fork lift) weighing 80 pounds each were accelerated by the magnet striking a technician and knocking him over 15 feet resulting in serious injury. (6/5/86)

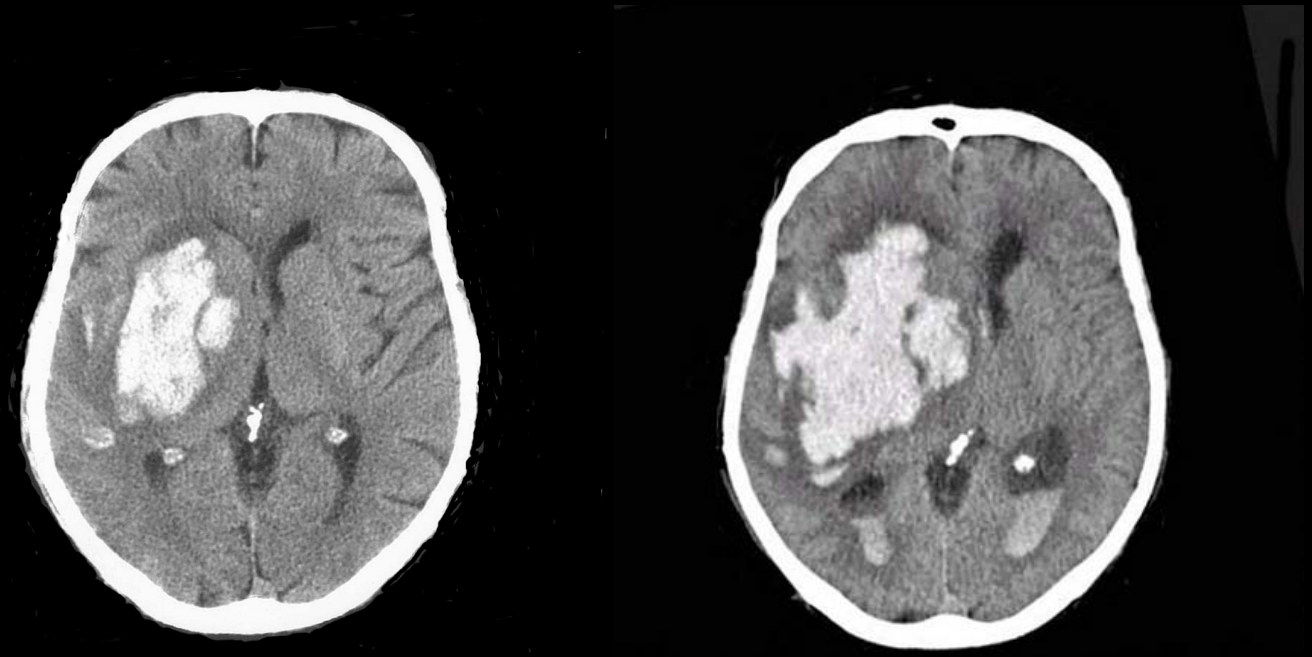
NINDS TPA Stroke Study:
Time to Treatment and Odds Ratio of Favorable Outcome



NINDS TPA Stroke Study:
Time to Treatment and Odds Ratio of Favorable Outcome



“Early Hematoma Growth”

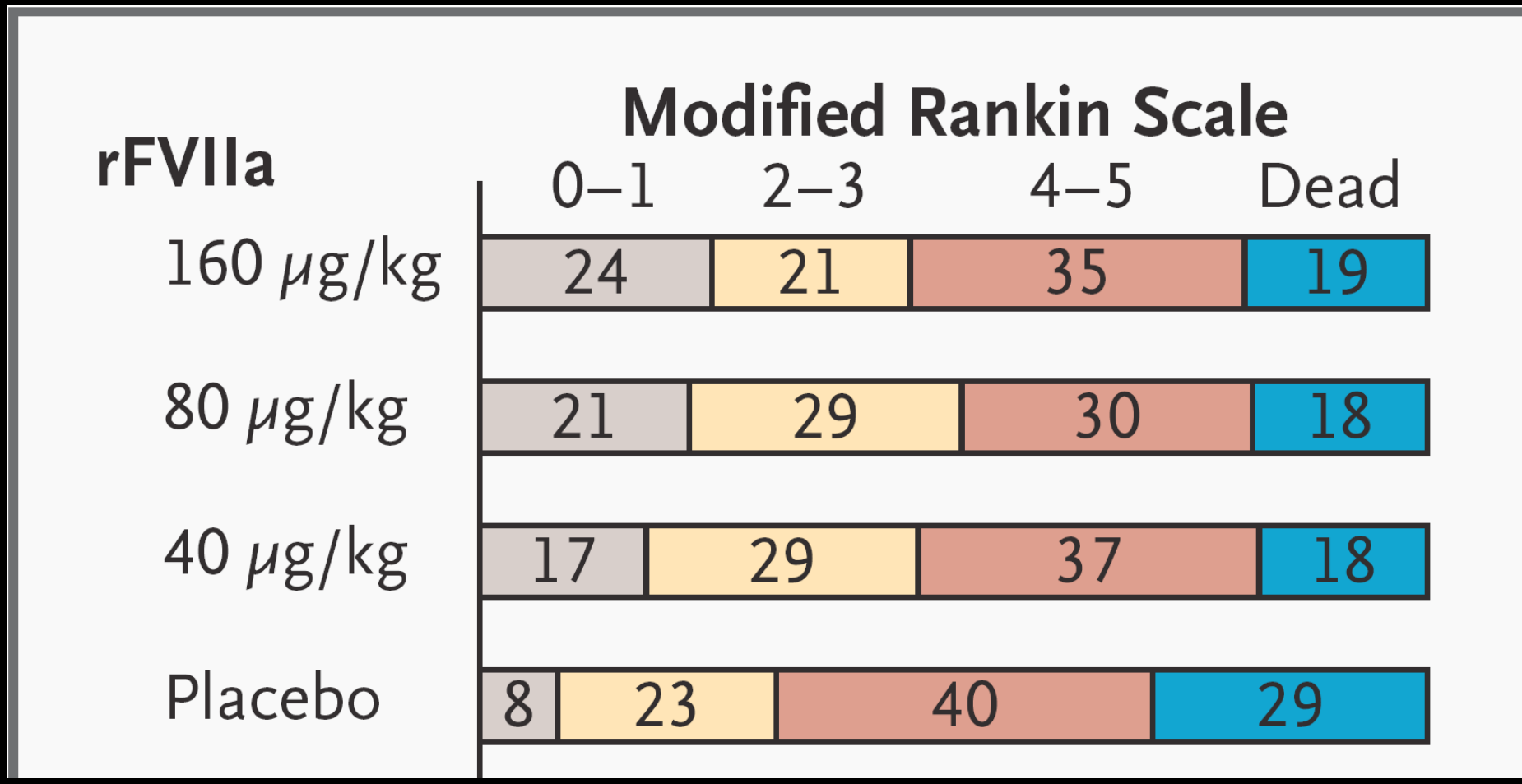


2.5 hours after symptom onset

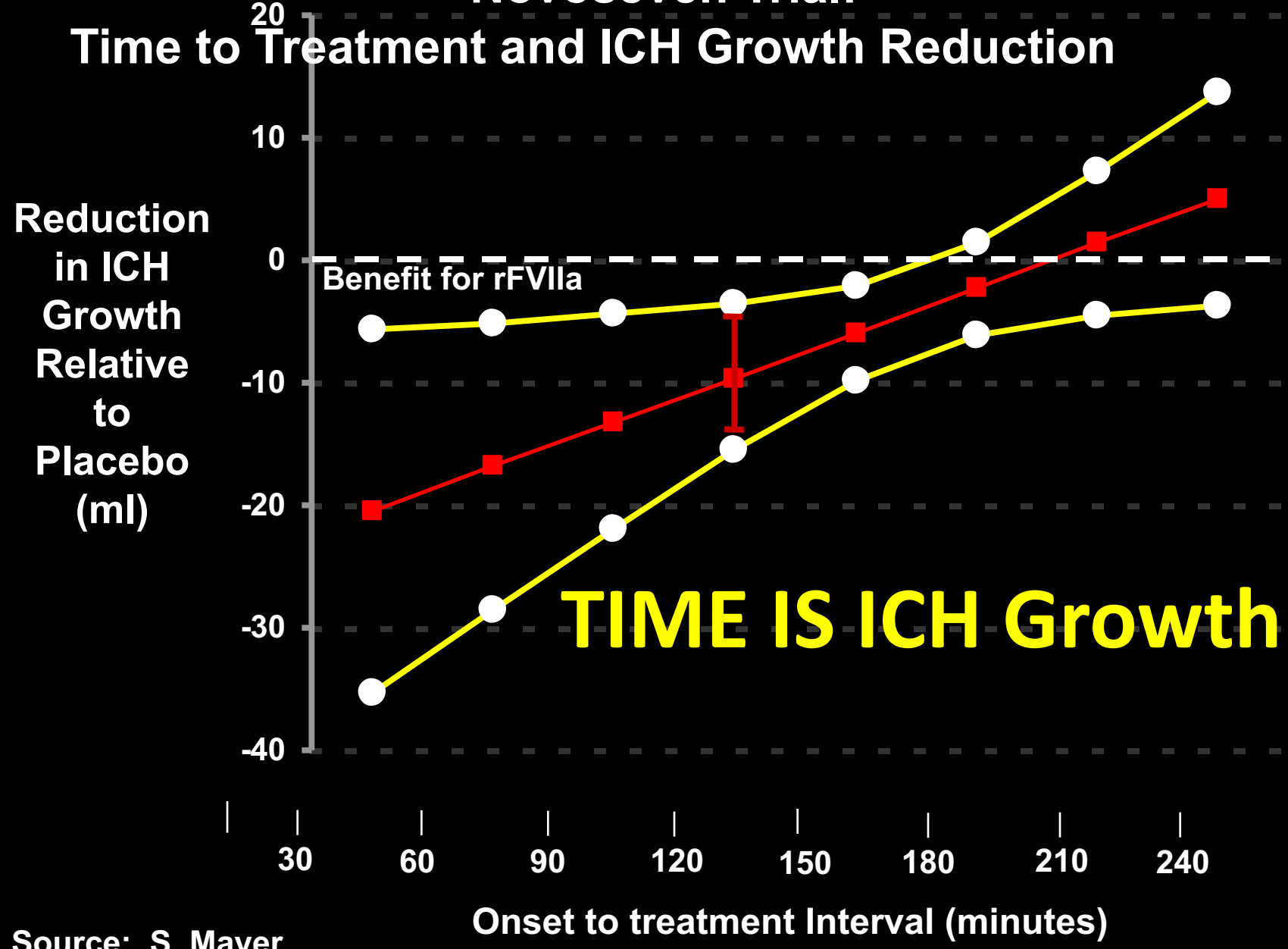
6.5 hours after onset, with enlargement of the hematoma due to ongoing bleeding

Novoseven Trial

NEJM 2005;352:777-785

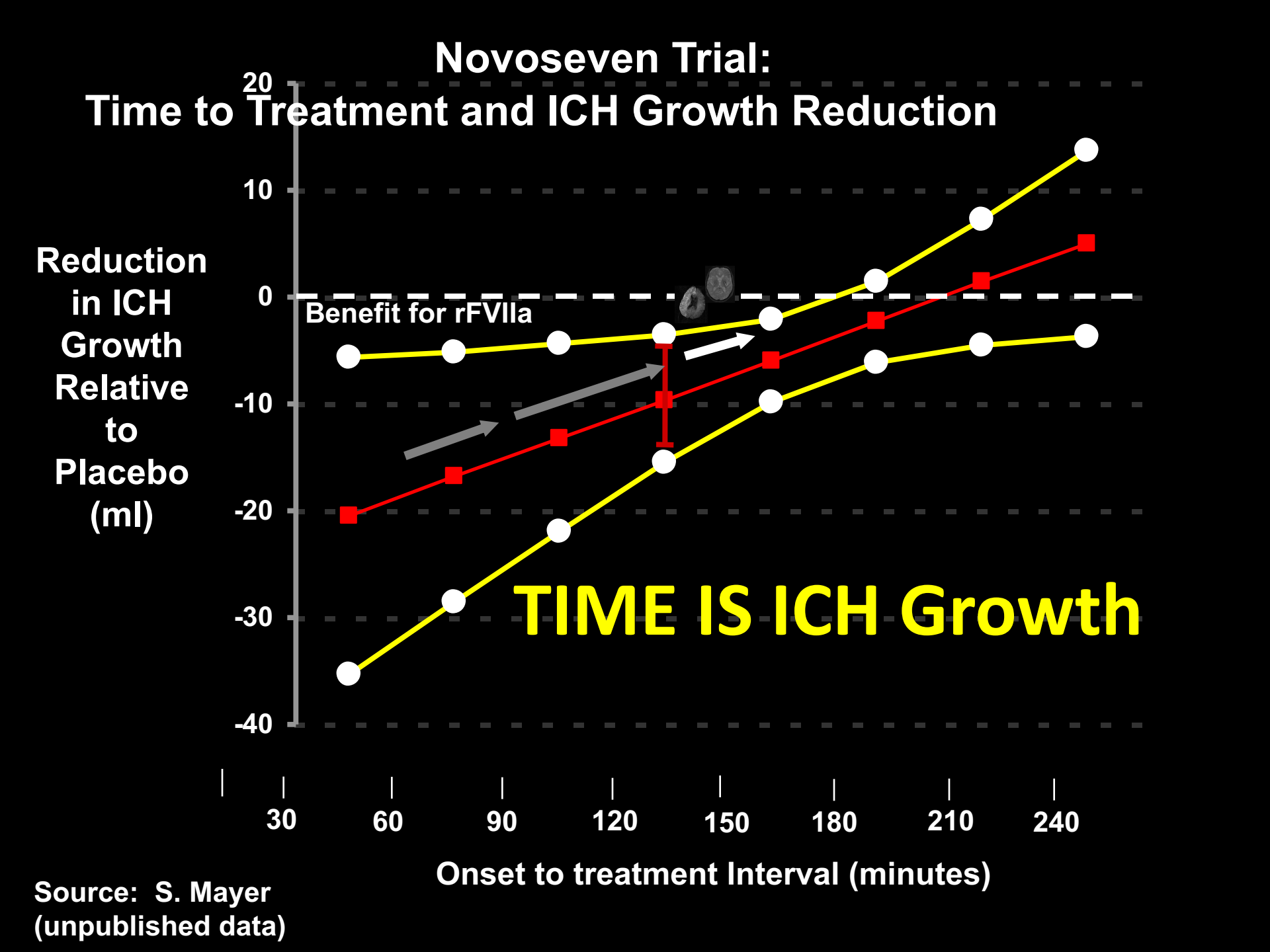


Novoseven Trial:
Time to Treatment and ICH Growth Reduction



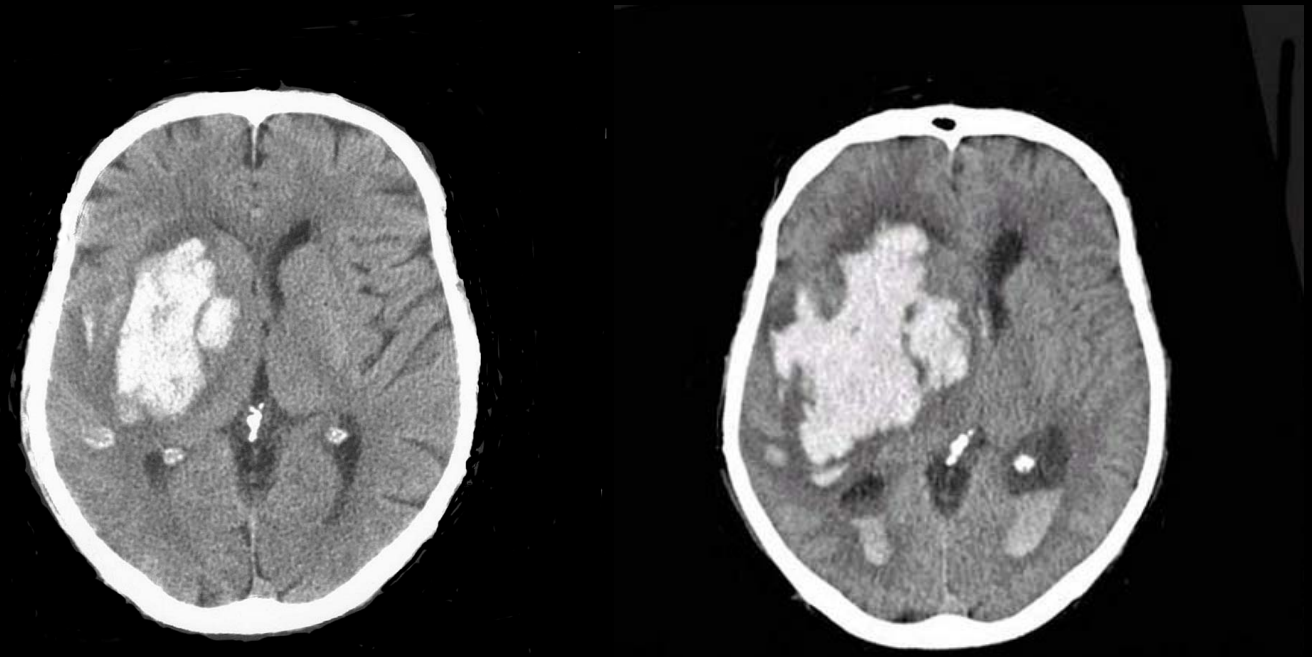
Source: S. Mayer (unpublished data)

Novoseven Trial:
Time to Treatment and ICH Growth Reduction



Source: S. Mayer (unpublished data)

“Early Hematoma Growth”



2.5 hours after symptom onset

6.5 hours after onset, with enlargement of the hematoma due to ongoing bleeding

FAST Trial

Phase 3, pivotal trial
Over 600 patients, 20+ countries
80 mcg/kg; 20 mcg/kg; placebo

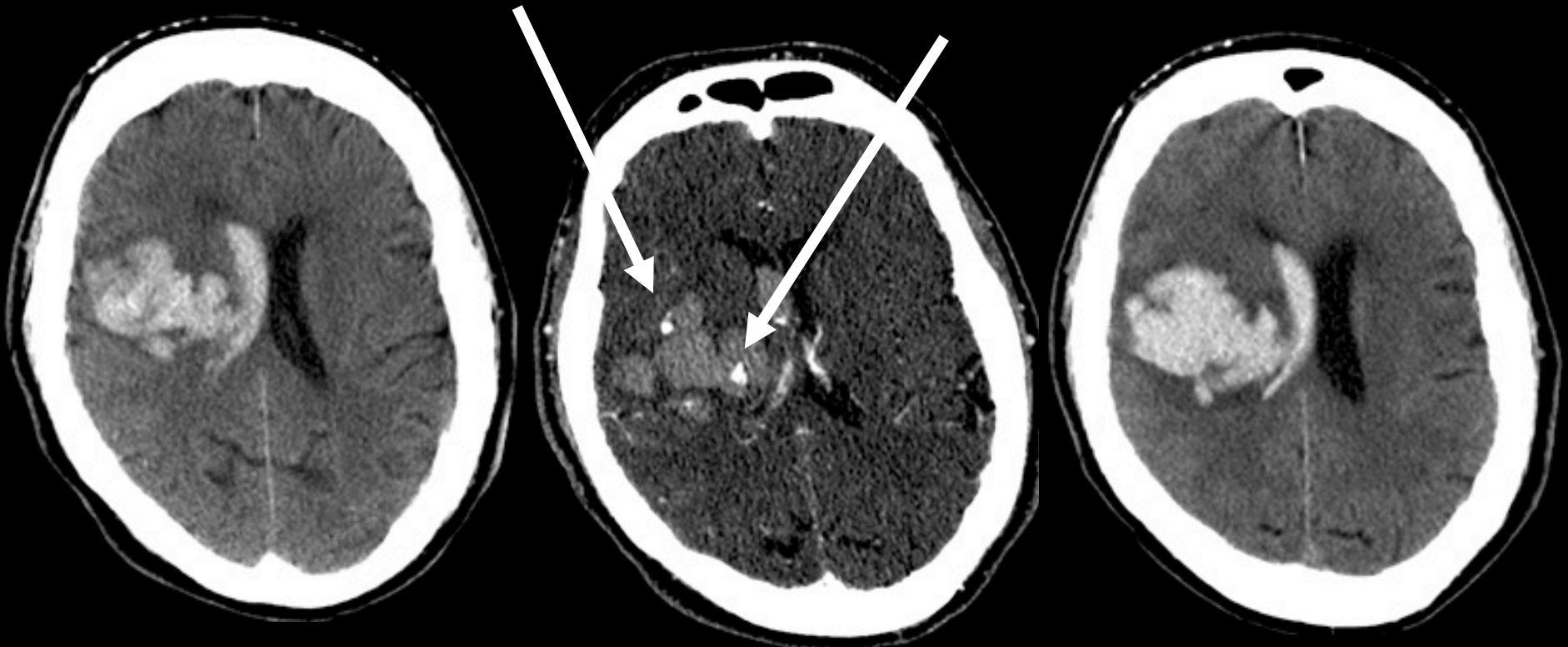
Overall neutral result however rFVIIa 80 mcg/kg highly statistically significantly prevented ICH growth

Better outcomes at day 15 with NIHSS but didn't meet endpoints at 90 days
Safe with only numerical trend in MI with rFVIIa.
No increase in ischemic stroke or DVT

CT Angiography "Spot Sign" Predicts Hematoma Expansion in Acute Intracerebral Hemorrhage

Ryan Wada, MD; Richard I. Aviv, MBChB; Allan J. Fox, MD; Demetrios J. Sahlas, MD; David J. Gladstone, MD; George Tomlinson, PhD; Sean P. Symons, MD

Spot Sign Example



69 yo male with L hemiparesis, presented within 3 hours; treated with FVIIa.

Baseline volume 47 cc

24 hour volume 65 cc

CT Angiography "Spot Sign" Predicts Hematoma Expansion in Acute Intracerebral Hemorrhage

Ryan Wada, MD; Richard I. Aviv, MBChB; Allan J. Fox, MD; Demetrios J. Sahlas, MD;
David J. Gladstone, MD; George Tomlinson, PhD; Sean P. Symons, MD

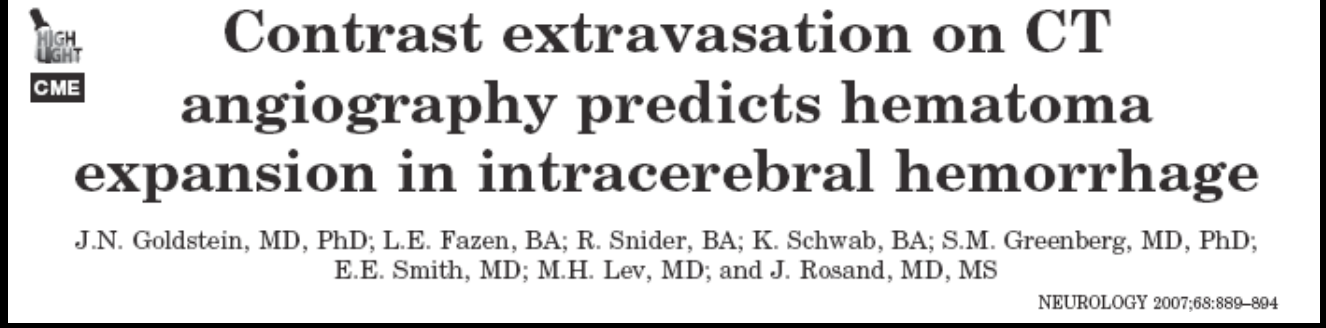
(*Stroke*. 2007;38:1257-1262.

	Any "spot" n=13	No "spot" n=26
Onset to CTA	< 3 hours?	
Baseline ICH volume	24.9 ml	
Significant ICH expansion	77%	4%
Absolute ICH volume change	+14.3 ml	-1.7 ml
Hospital stay	19 days	9 days
Mortality	23%	15%
High INR	4 reported	

ICH expansion : >30% or 6 ml growth

"spot sign", contrast extravasation and anticoagulation predicted ICH expansion

Multiple "spot signs" associated with greater ICH growth than single "spot sign".



	Contrast extravasation	No contrast extravasation
	n=58	n=46
Onset to CTA	8.9h	10.7h
Baseline ICH volume	34 ml	12 ml
Significant ICH expansion	22%	2%
Absolute ICH volume change	+12 ml	
Hospital stay		
Mortality	33%	15%

ICH expansion: 33% increase from baseline

contrast extravasation predicted ICH expansion

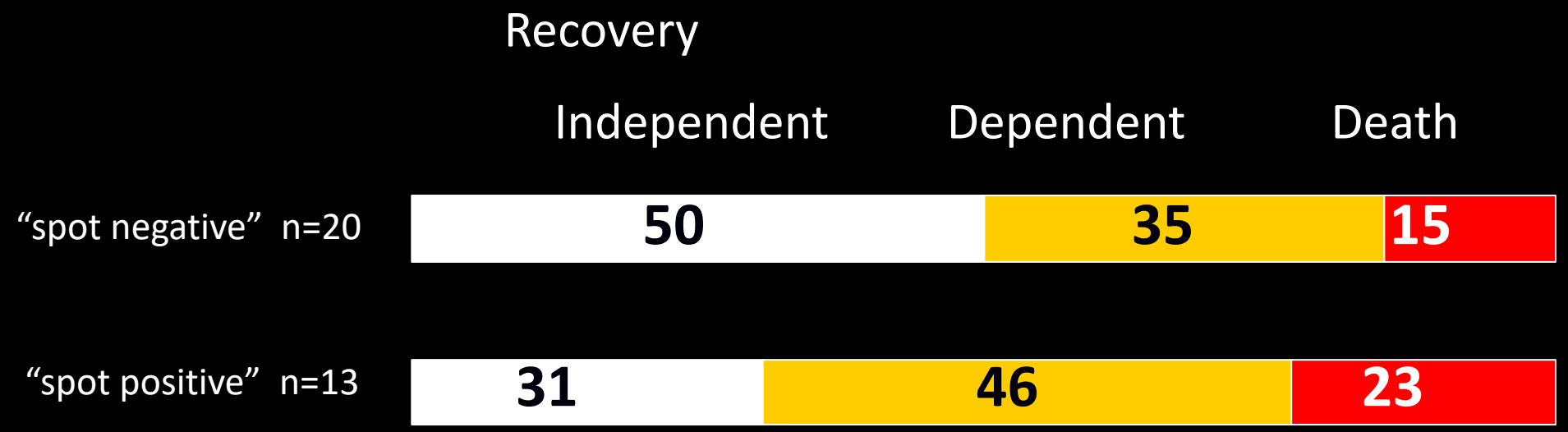
PREDICT study

	Any “spot” n=8	No “spot” n=6
Onset to CT (minutes)	183.1	172.8
Baseline ICH volume	27.6 ml	9.8 ml
Significant ICH expansion	75%	0%
Any ICH expansion (>2cc)	88%	16%
Absolute ICH volume change	+24.6 ml	+0.2 ml
Hospital stay		
Mortality		

ICH expansion : >30% or 6 ml growth

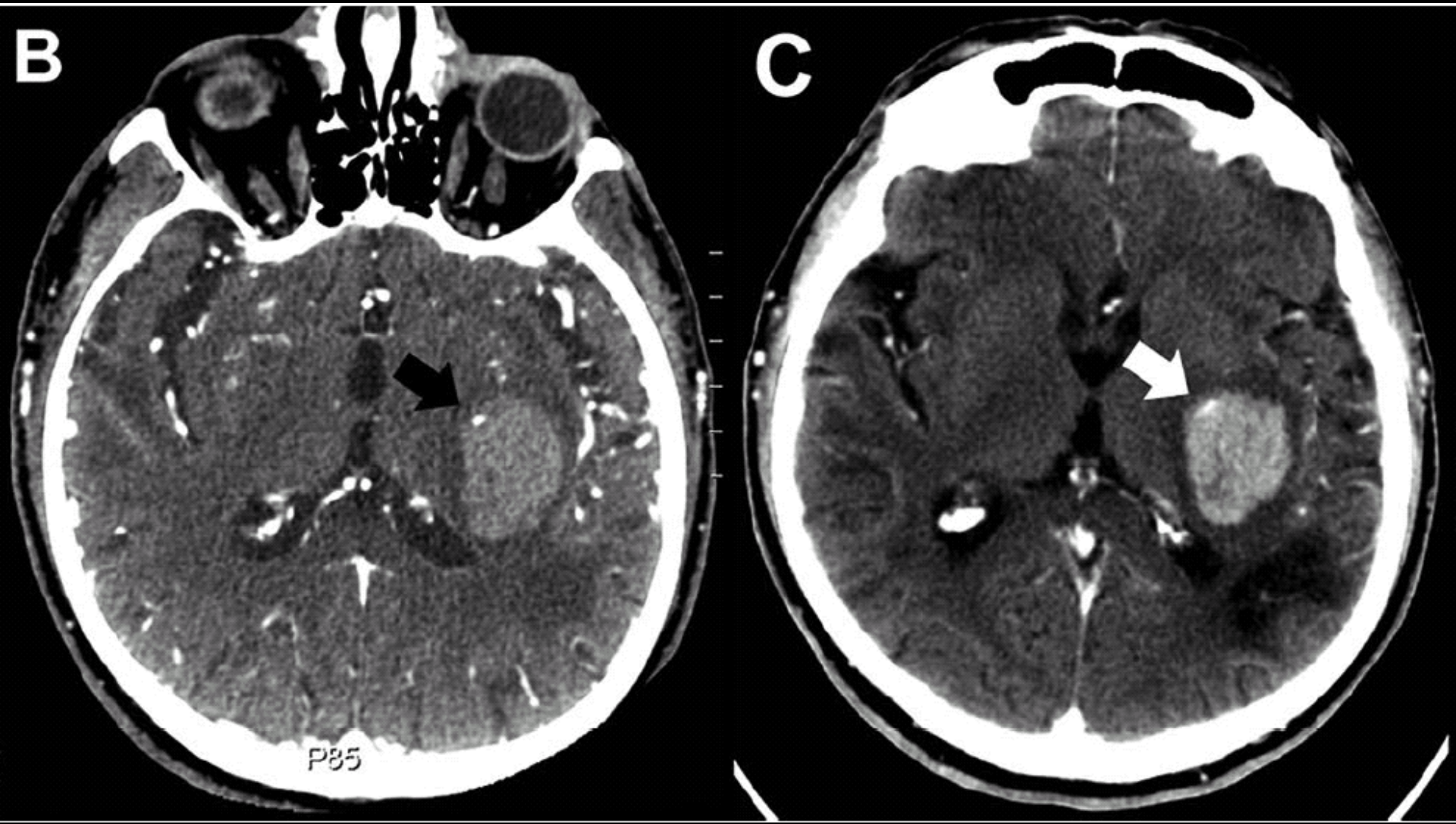
Spot Sign and Outcome

n=31 basilar occlusions



Spot Sign

Contrast Extravasation



Contrast extravasation in 6 patients, all of which developed hematoma expansion. 4/6 high INR

Table 2. MRI vs CT Panel Results (n=200)

	CT+	CT–	*P* Value
Acute hemorrhage			
MRI+	25	4	>.99
MRI–	4	167	
Chronic hemorrhage			
MRI+	0	52	<.001
MRI–	0	148	

Abbreviations: CT, computed tomography; MRI, magnetic resonance imaging.

Magnetic resonance brain imaging in patients with acute stroke: feasibility and patient related difficulties

P J Hand, J M Wardlaw, A M Rowat, J A Haisma, R I Lindley, M S Dennis

J Neurol Neurosurg Psychiatry 2005;**76**:1525–1527. doi: 10.1136/jnnp.2005.062539

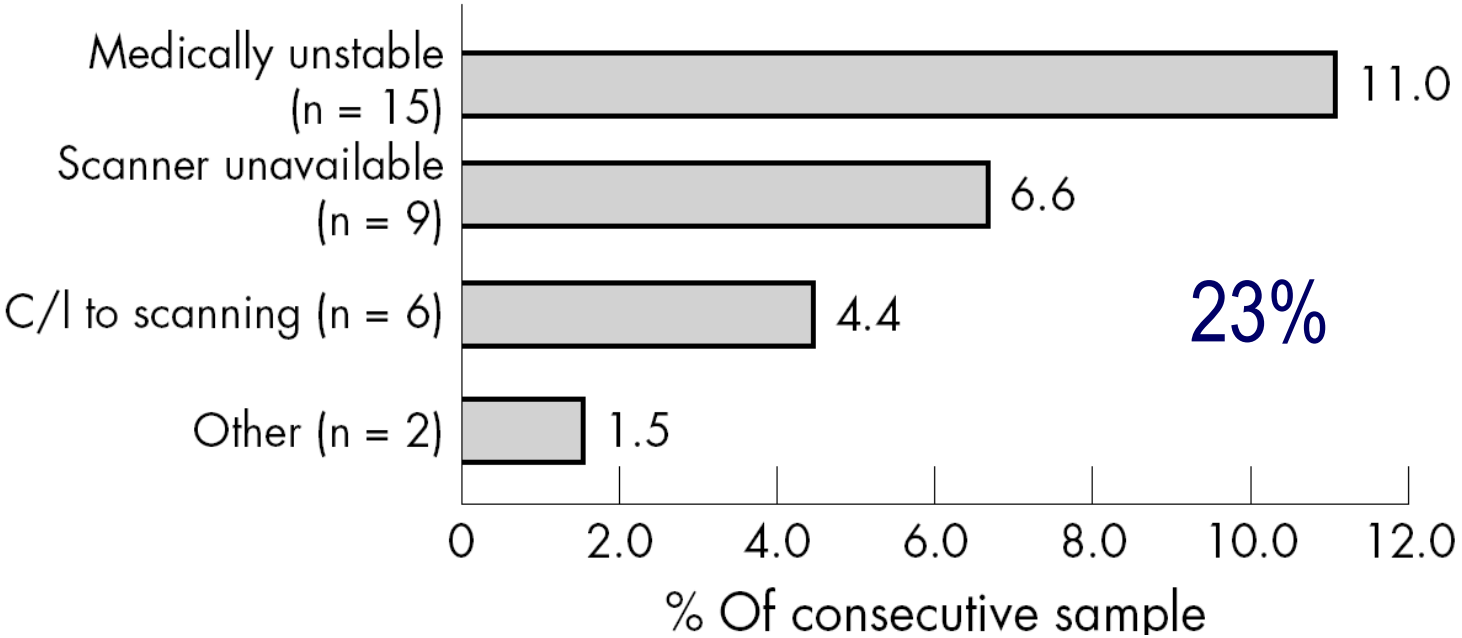


Figure 1 Reasons for failure to carry out a magnetic resonance imaging scan on eligible patients. C/I, contraindications.

Practical limitations of acute stroke MRI due to patient-related problems

Oliver C. Singer, MD; Matthias Sitzer, MD; Richard du Mesnil de Rochemont, MD; and Tobias Neumann-Haefelin, MD

Table *Characteristics of patients not receiving MRI due to patient-related problems*

	n		ICH	
MRI performed	113		20	
MRI not performed due to				
MRI contraindications	14		1	
Medical instability	11	20%	8	31%
Agitation	3		0	
Total	141		29	

NEUROLOGY 2004;62:1848–1849

Eleven of the 61 patients monitored became hypoxic during MRI (lowest recorded saturation during scanning, 74%). All patients had similar oxygen saturation on admis-

Do we need the light bulb effect for speedy interpretation of extent of parenchymal injury?