

# Endovascular Thrombectomy (EVT) – Latest Evidence

Dr. James McEachern  
Interventional Neuroradiologist  
Radiology Consultants of Winnipeg

# Faculty Disclosure

- Faculty: James McEachern
- Relationship with Commercial Interests:
  - Not Applicable

# Mitigating Potential Bias

- Not Applicable

# Outline - EVT

- What is a thrombectomy?
- Case examples
- Practical Approach to EVT Decision Making
  - Patient Selection  $\leftrightarrow$  Evidence

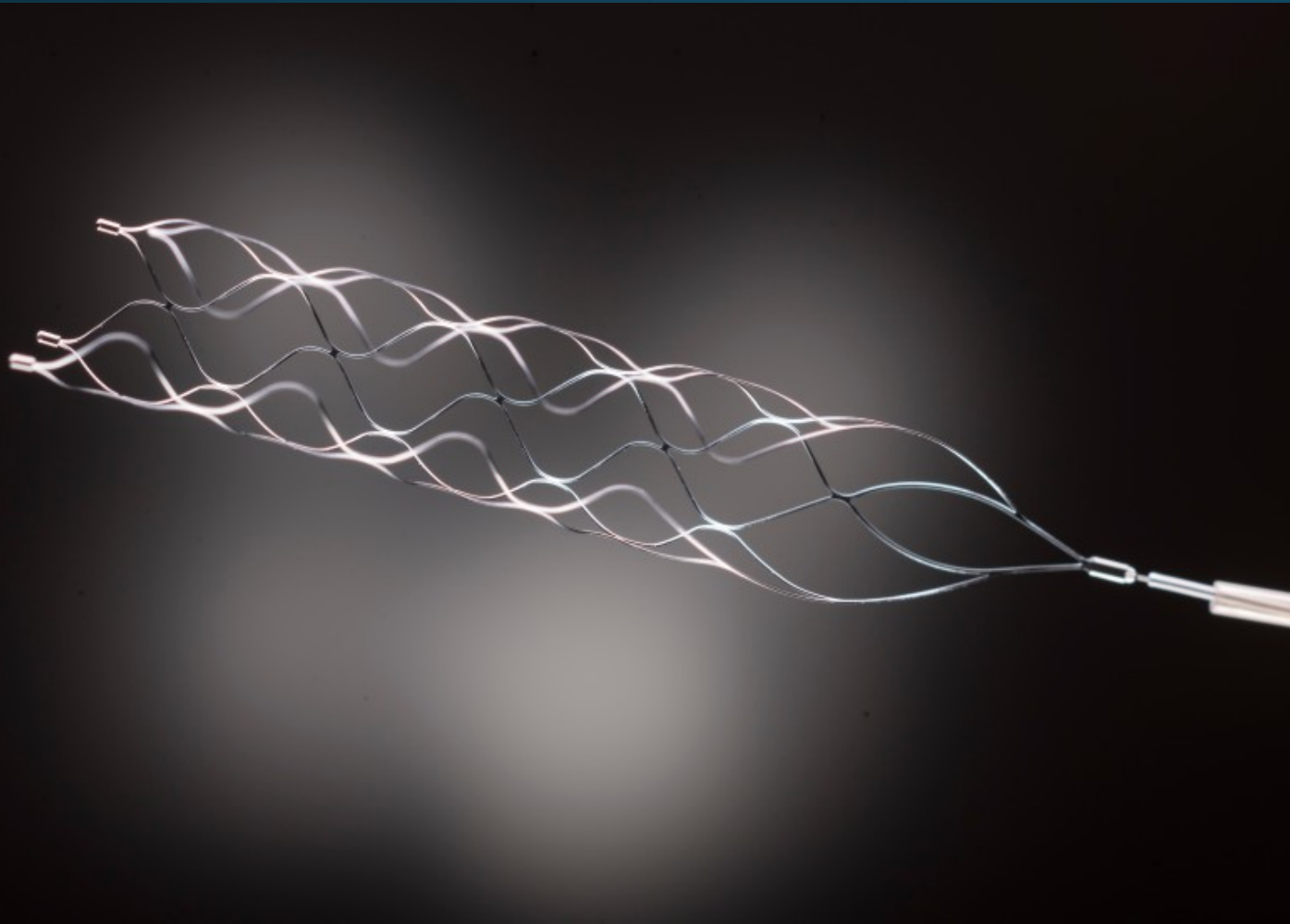
# Mechanical Thrombectomy

- Removal of a large vessel occlusion through an angiographic approach
- Arterial access obtained, usually from the common femoral artery
- Series of catheters constructed, sequentially smaller
  - Larger catheters positioned within the neck
  - Smaller catheters advanced intracranially to remove the clot
- Stent retriever and Aspiration systems

# Treatment Strategies

- Current:
  - Stent-retrievers
  - Aspiration

# Stent Retriever Systems



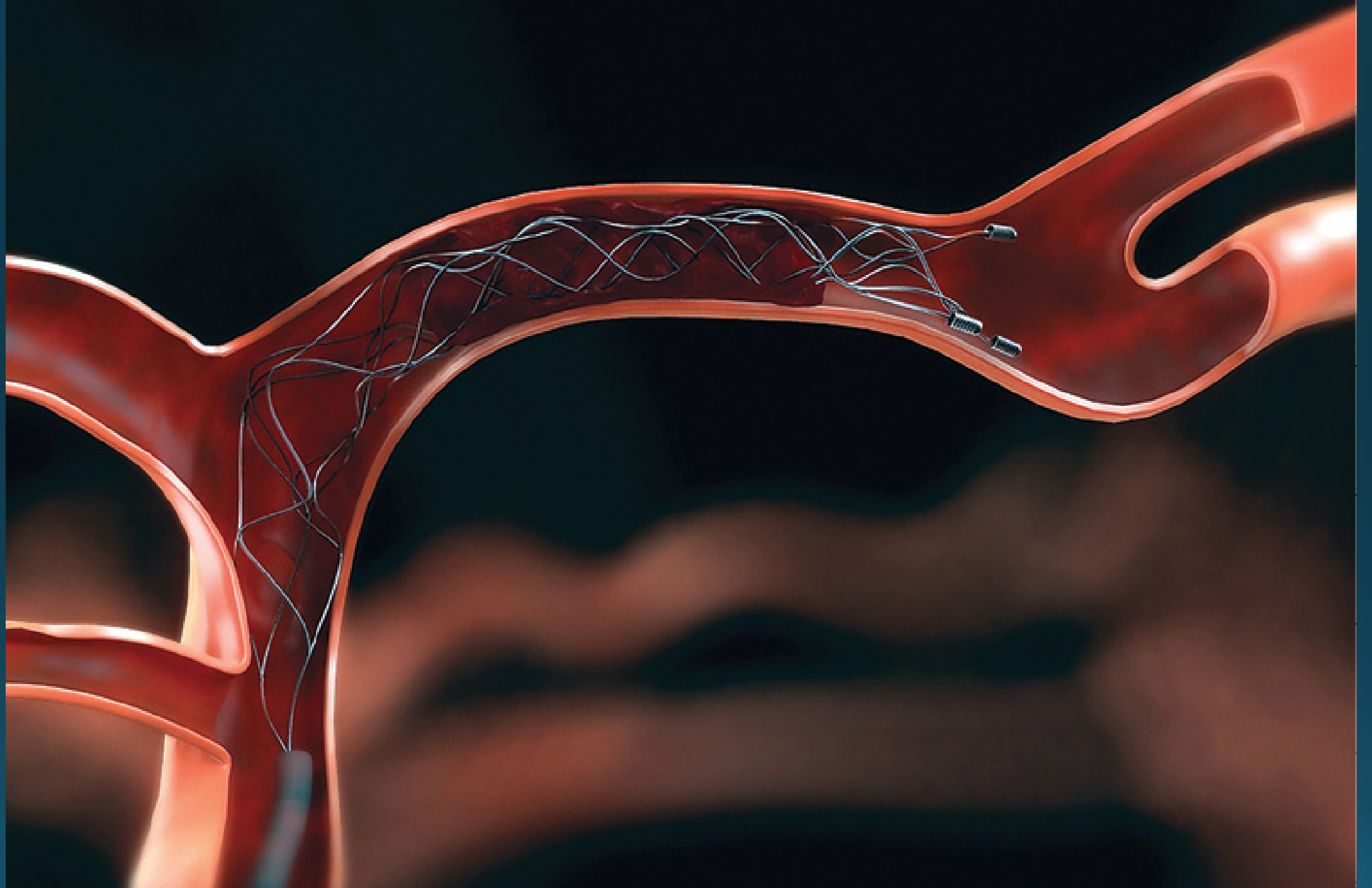


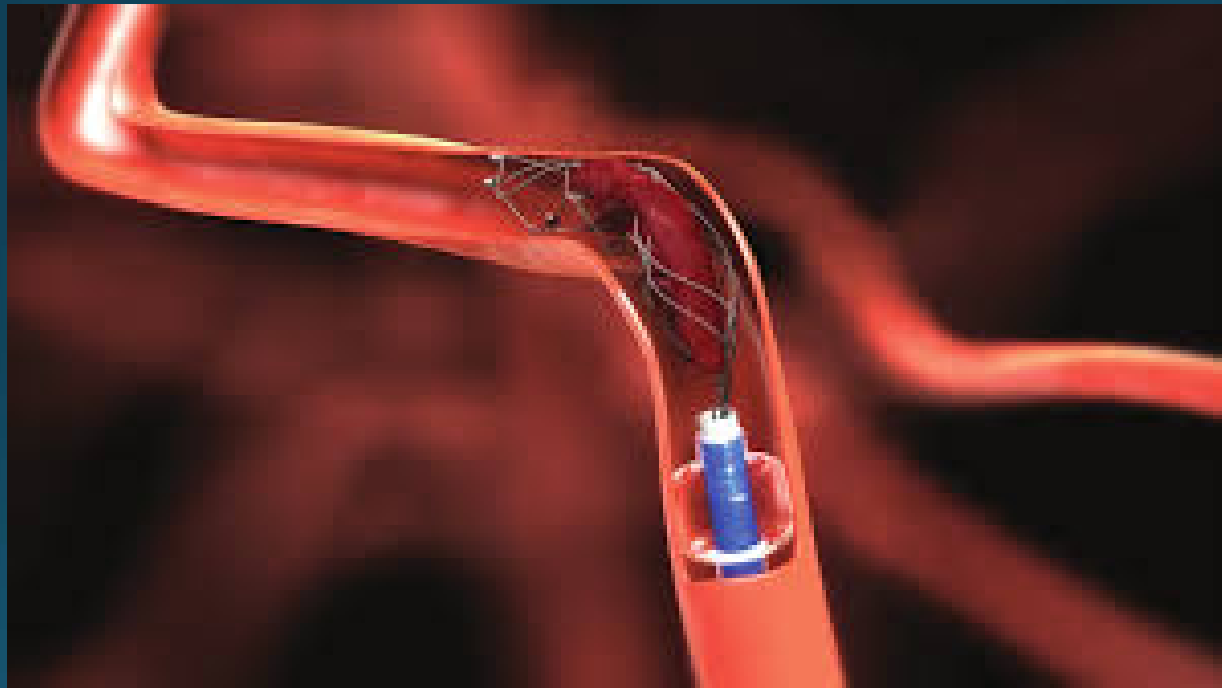
### **STENTRIEVER (early 2012)**

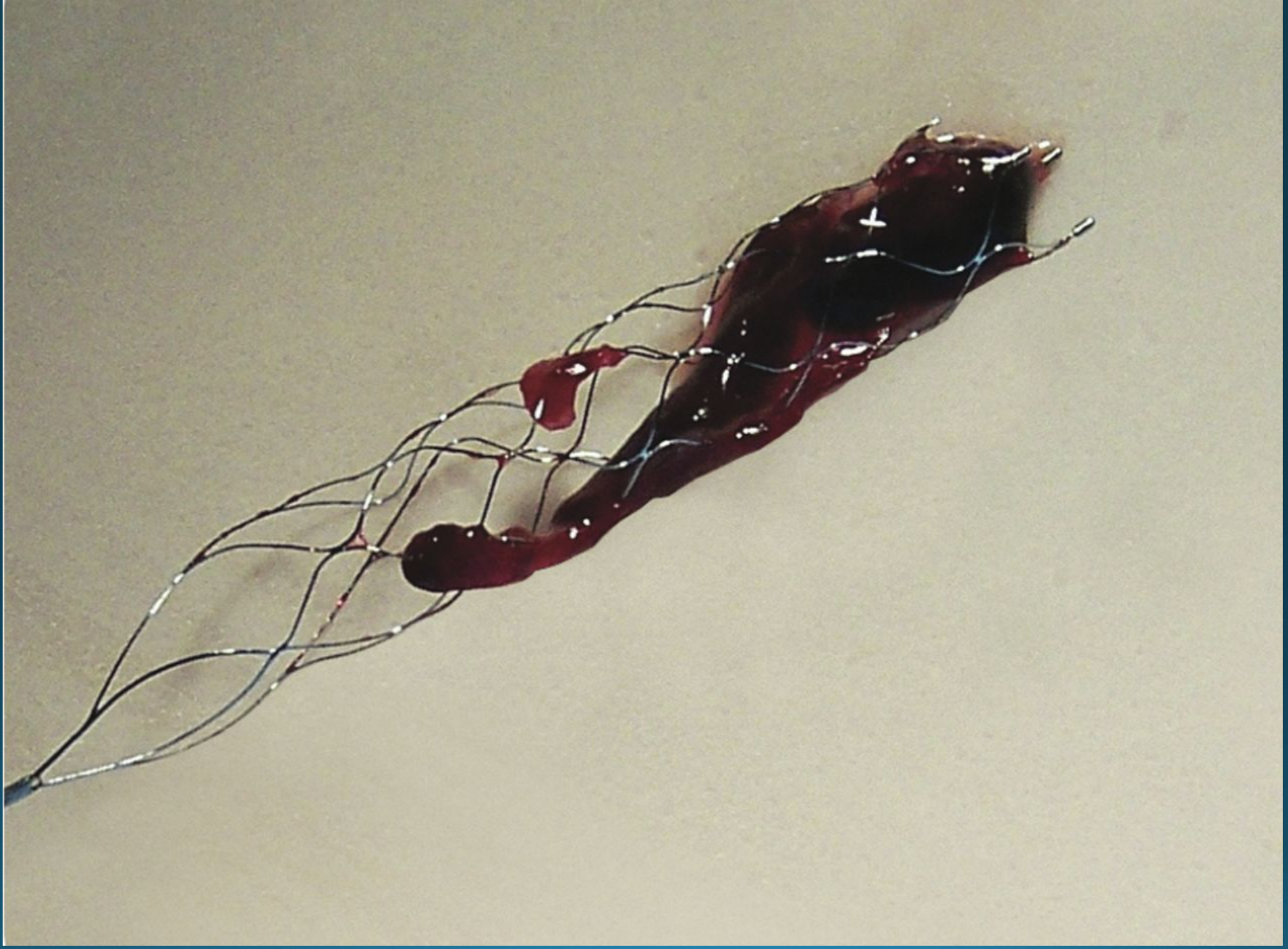
#### **3RD GENERATION**

Engage the thrombus with stent retrieve deployment, which also temporarily restores flow across the occlusion. Proximal balloon inflation allows device retrieval into the guide while minimizing the risk of emboli.

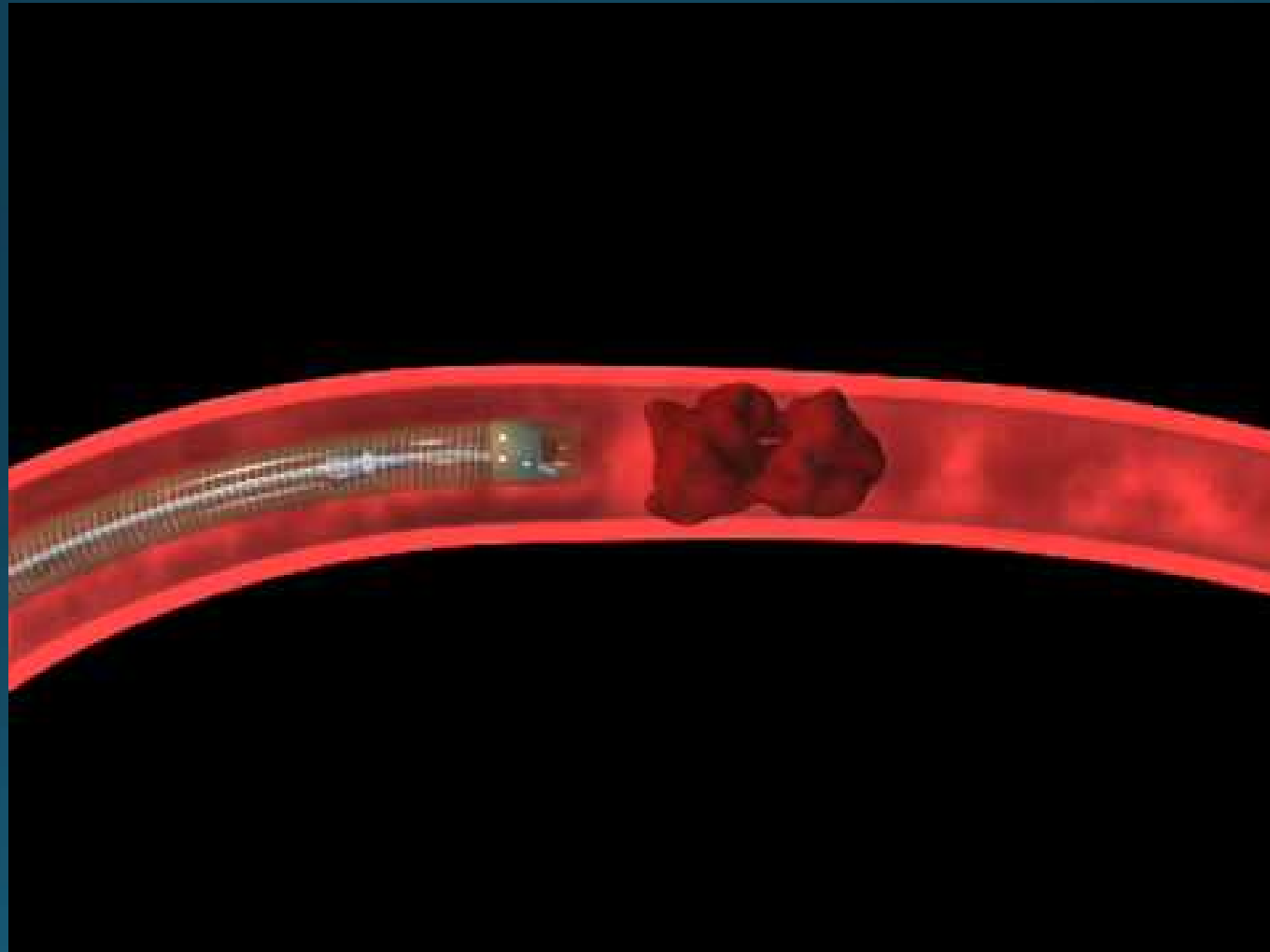


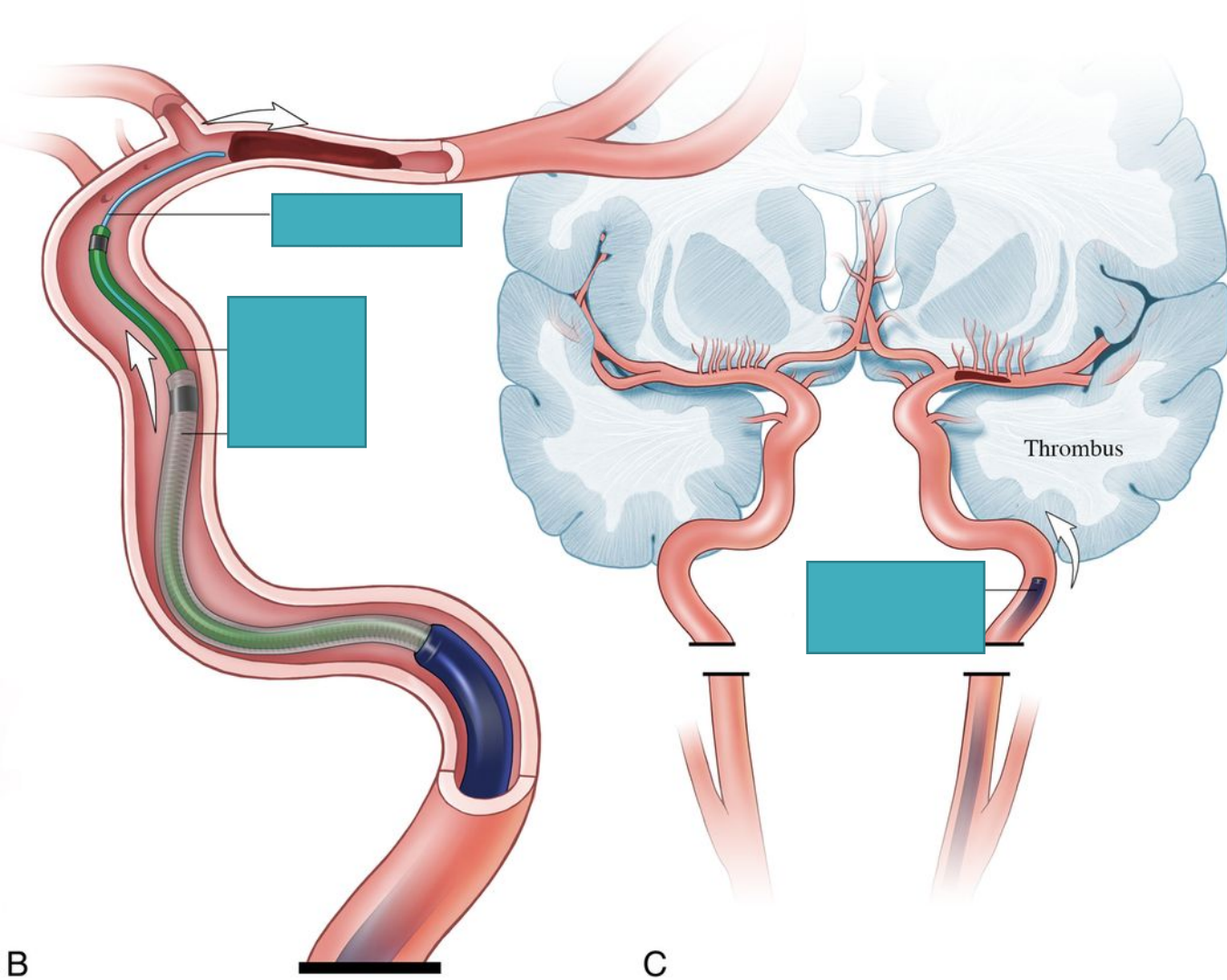




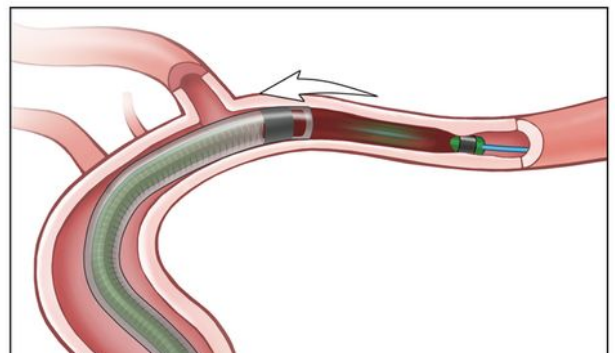


# Aspiration Systems

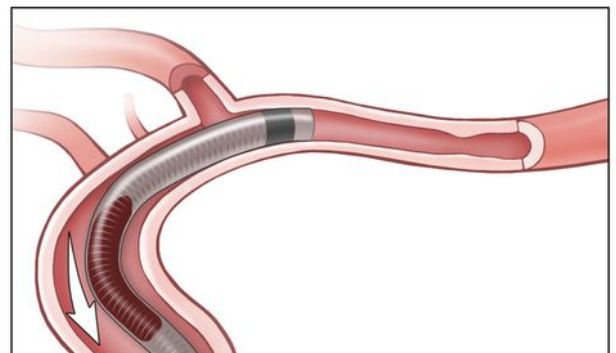


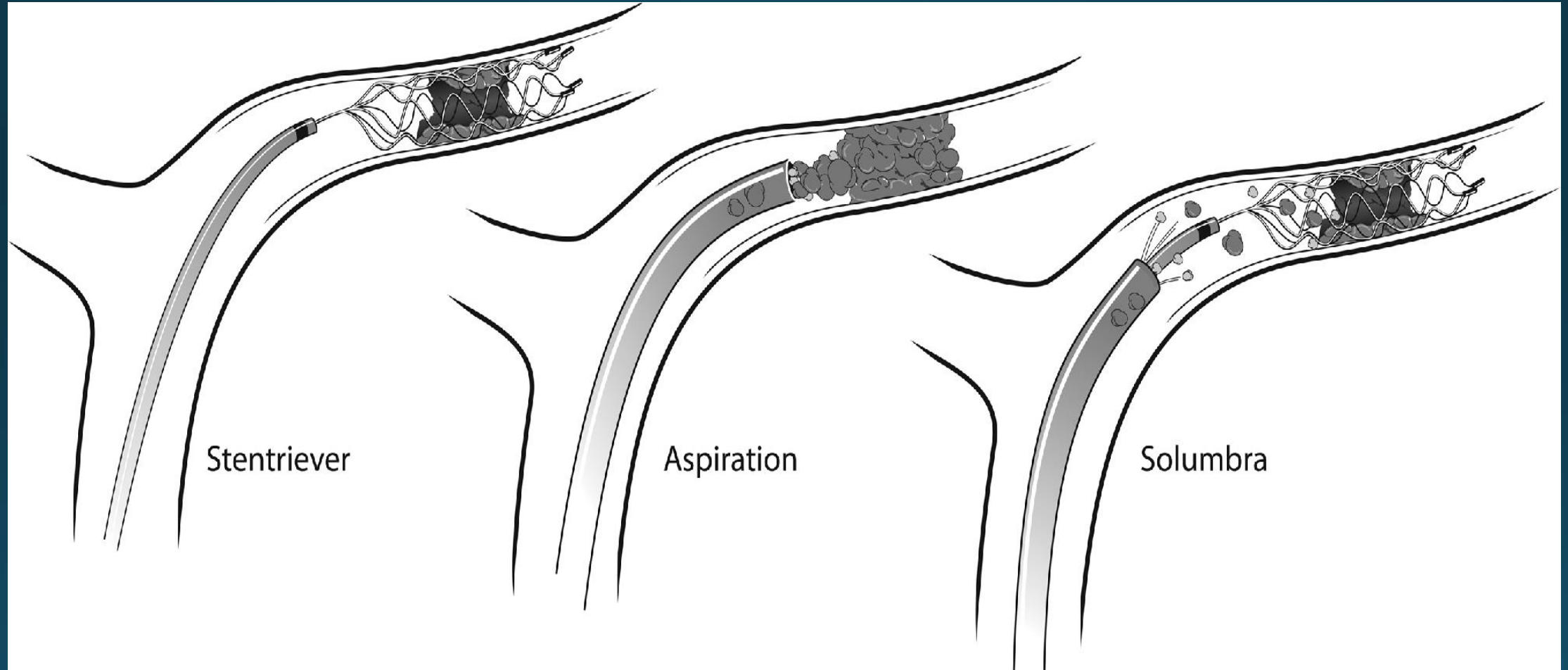


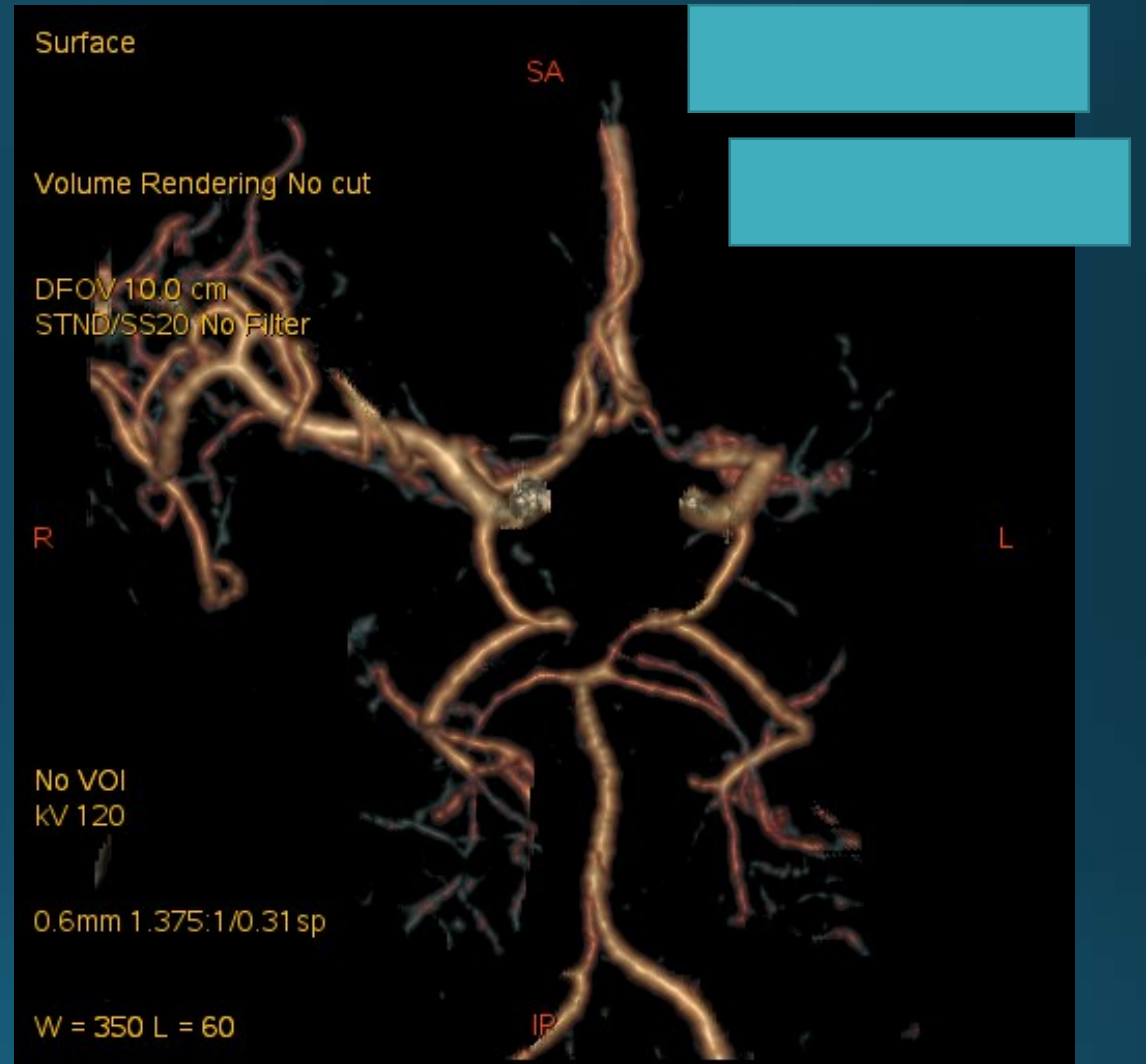
B



C







Case 1: 55y male with acute onset right sided weakness and aphasia ~4h ago. Initial imaging with CT and CTA; no acute hemorrhage or established infarct. Large vessel occlusion of the left M1 segment.

05/11/2017 11:46:09

SE:1

IM:100



PRE 1  
Station:AXIS05292

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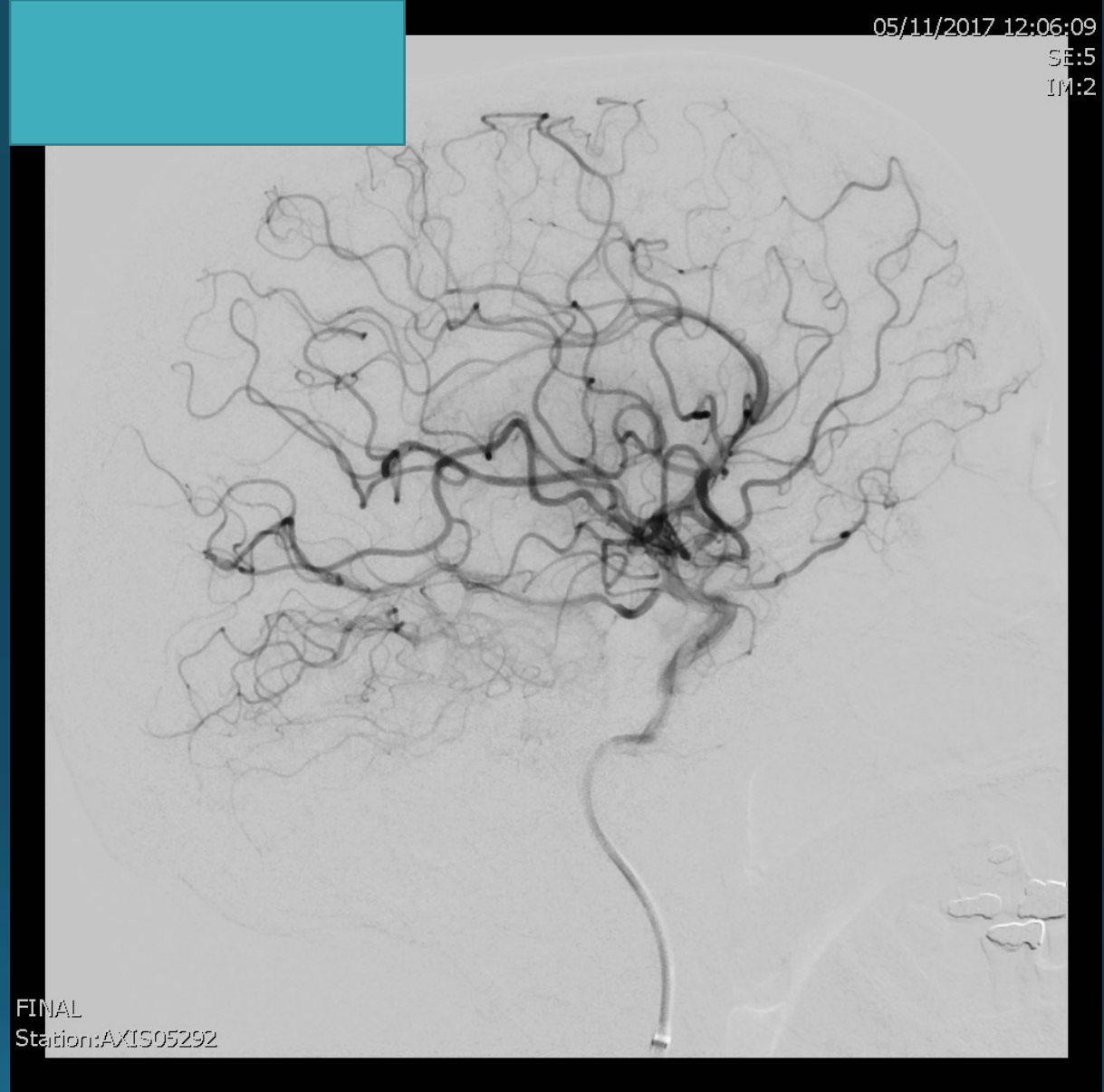
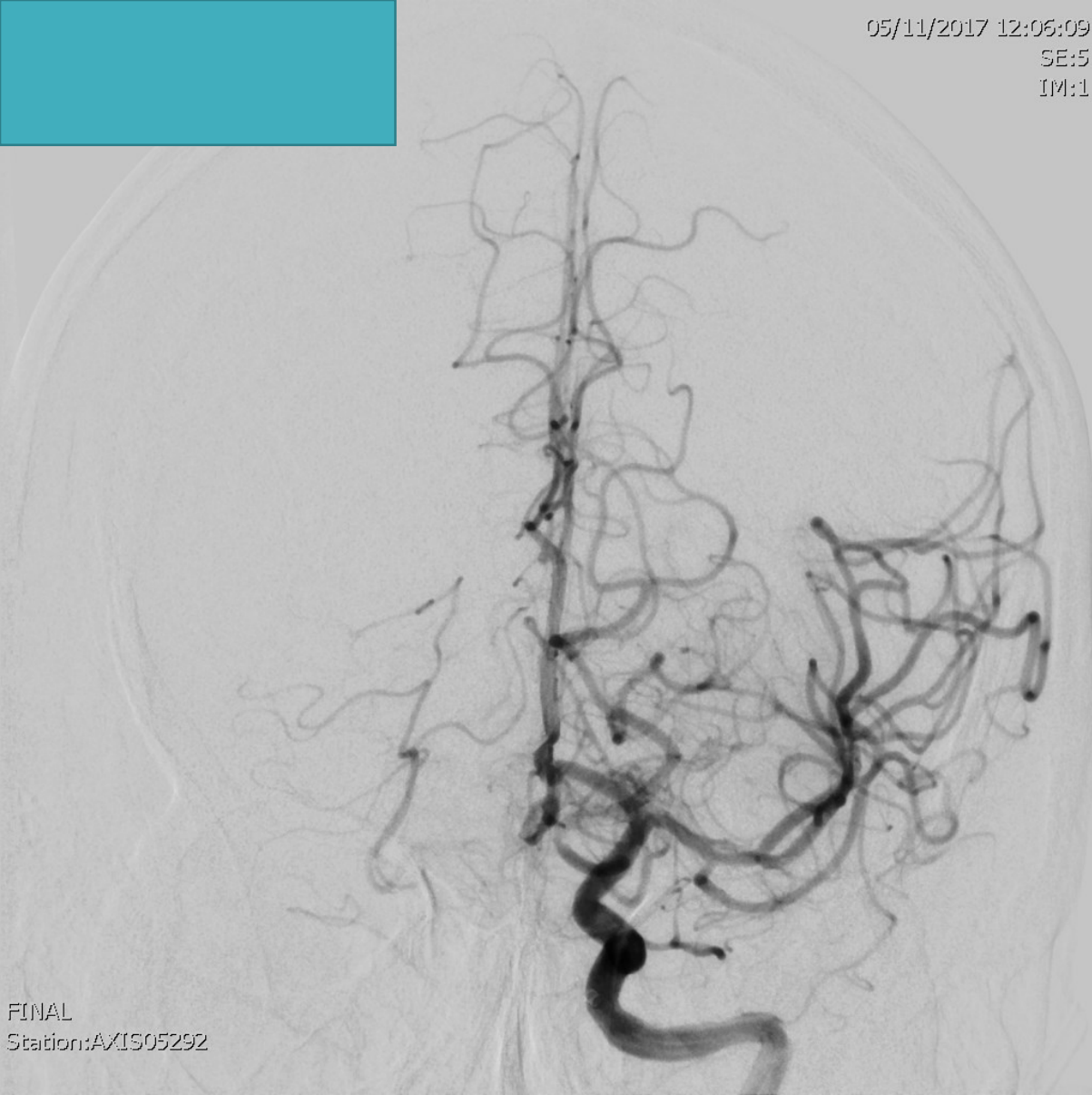
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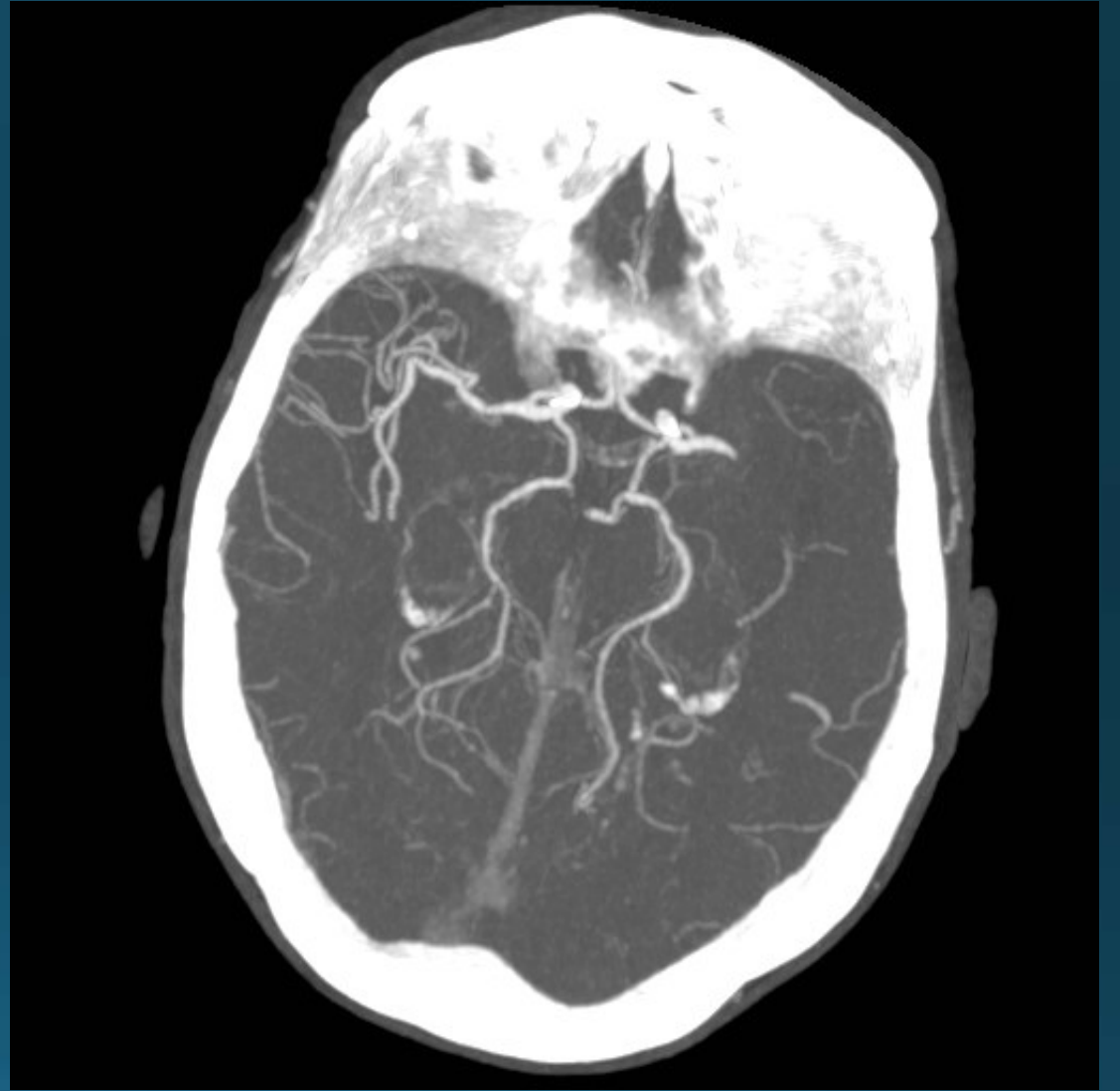
PRE 1  
Station:AXIS05292





Status post single pass with an aspiration system, complete restoration of flow and no complicating features





Case 2: 99y lady with acute onset right sided weakness and aphasia. Last known normal 1.5h, lives independently with a baseline modified Rankin score of 1. NIHSS of 20. History of a remote right MCA infarct.



LT COMMON CAROTID  
Station:AXIS05292

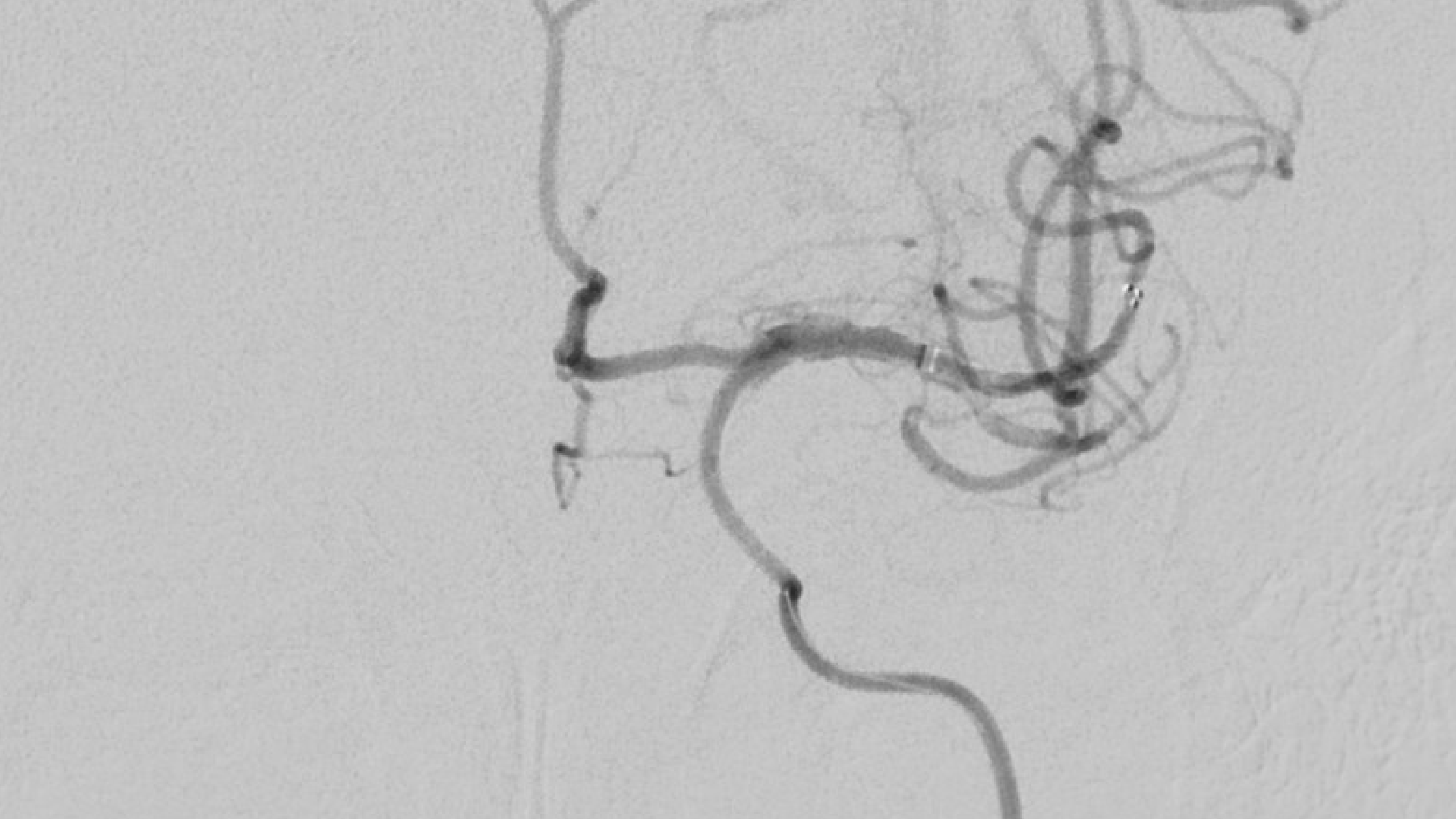
Case 2: 99y lady with acute onset right sided weakness and aphasia. Last known normal 1.5h, lives independently with a baseline modified Rankin score of 1. NIHSS of 20. History of a remote right MCA infarct.


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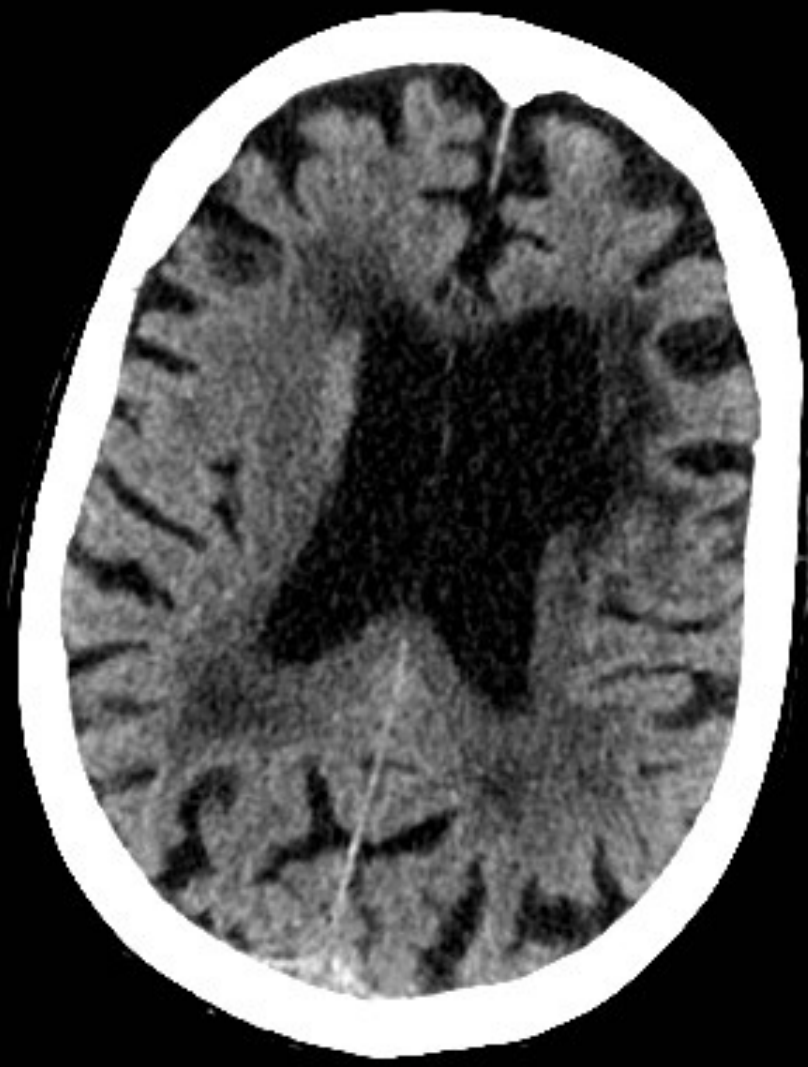
IM:1

CATH POSITION  
Station:AXIS05292





POST THROMBECTOMY  
Station:AXIS05292





# Evidence - Initial

- Early experience with EVT
  - Anecdotal positive outcomes
  - Limited experience
- No large trials to prove it could work

# Evidence

- 2015 Trials established that mechanical thrombectomy
  - Improves clinical outcomes
    - Significant increase in patients living independently
    - Trend towards decreased mortality
  - Is safe
    - Low complication rates
    - Overall better outcomes
    - Similar rates of intracranial hemorrhage
  - Is cost effective
    - High up front cost
    - Less time in hospital
    - Less time in advanced care/assisted living facilities

# Practical Approach

Summarizing the Latest Evidence

# A Practical Approach to EVT

- Is this patient a candidate for EVT?
  - Clinical
    1. Symptoms?
    2. Age?
    3. Pre Morbid functional status?
    4. Last known normal?
  - Imaging
    - Is there brain to salvage?
    - Is there a large vessel occlusion?

# Symptoms?

- NIHSS
- NIHSS >6
  
- Significant enough to justify the risk of EVT
  - Not that high
- Asymptomatic LVO?
  - Close observation?
  - Can't make them better?
  - Discuss with patient?

# Age and Pre morbid Function?

- By itself, not a contraindication
- Pre morbid functioning is
  - mRs <2
  - Some disability
  - Cant do everything
  - But functionally independent



# A Practical Approach to EVT

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# LVO ?

- Large vessel occlusion?



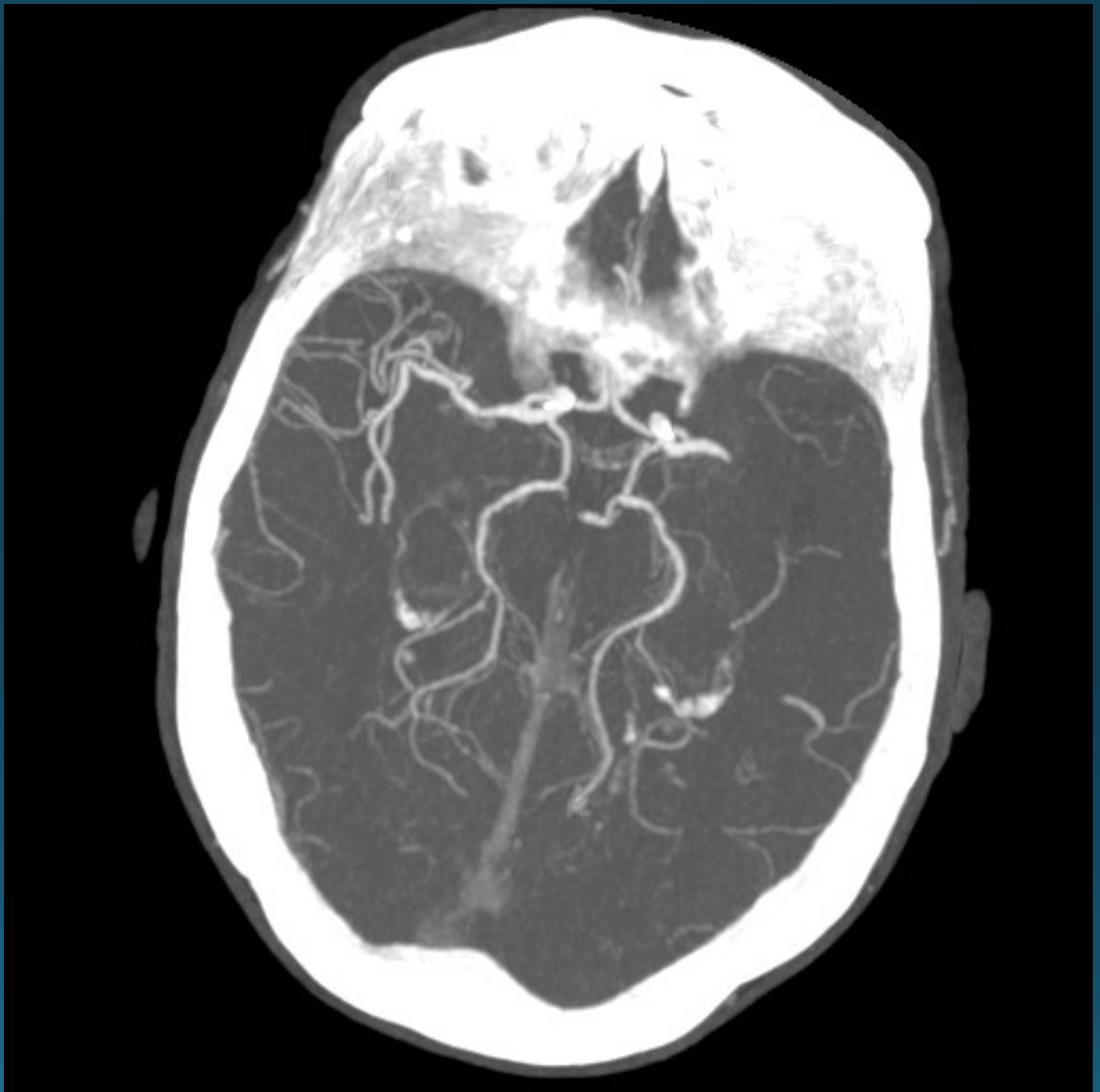
# Los Angeles Motor Scale (LAMS)

Score  $\geq 4$   
Sensitivity 81%  
Specificity 89%

<b>Facial Droop</b>		
Absent		<b>0</b>
Present		<b>1</b>
<b>Arm Drift</b>		
Absent		<b>0</b>
Drifts Down		<b>1</b>
Falls Rapidly		<b>2</b>
<b>Grip Strength</b>		
Normal		<b>0</b>
Weak		<b>1</b>
No Grip		<b>2</b>
<b>Total</b>		<b>/5</b>

# LVO?

- CTA

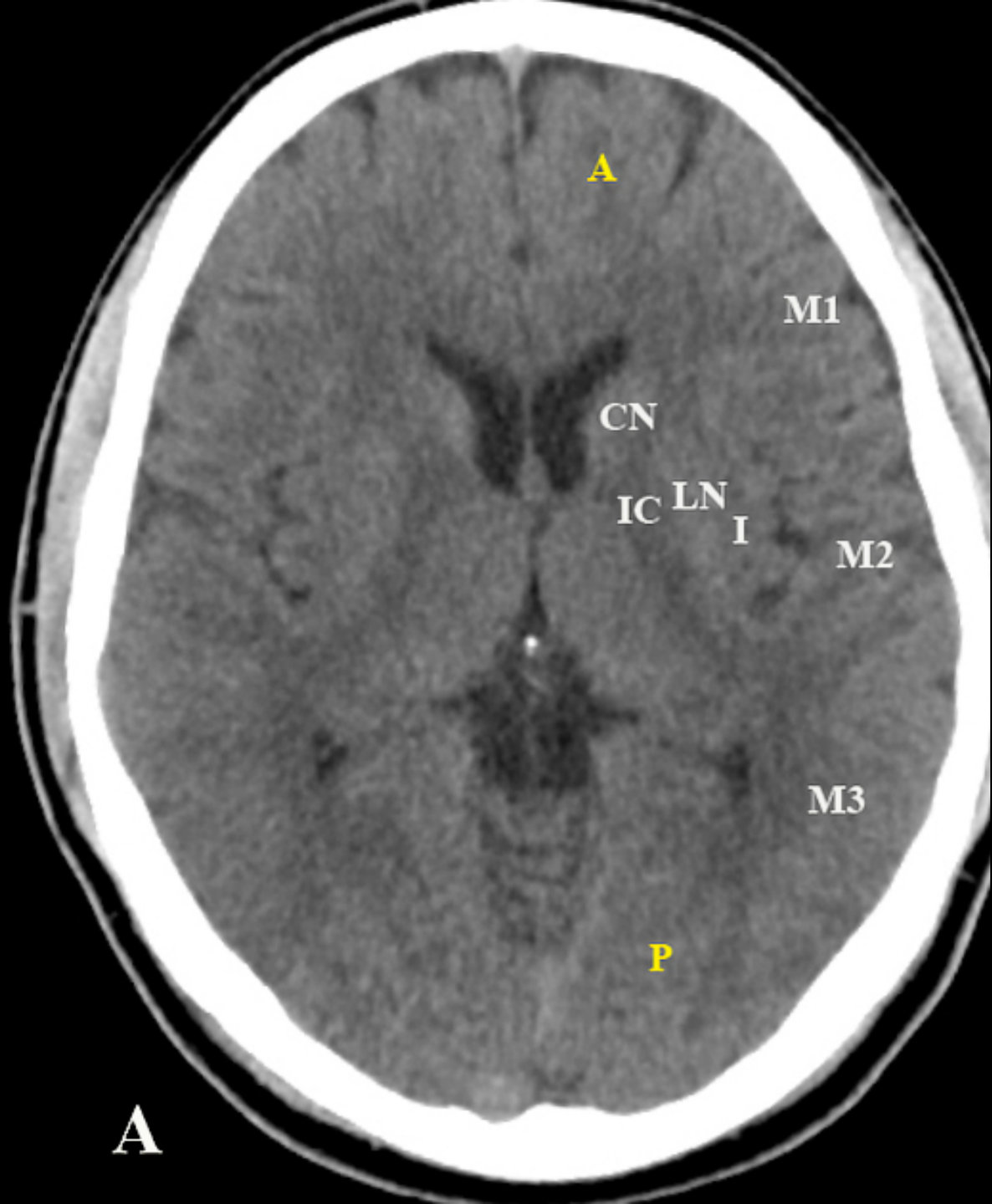


# A Practical Approach to EVT

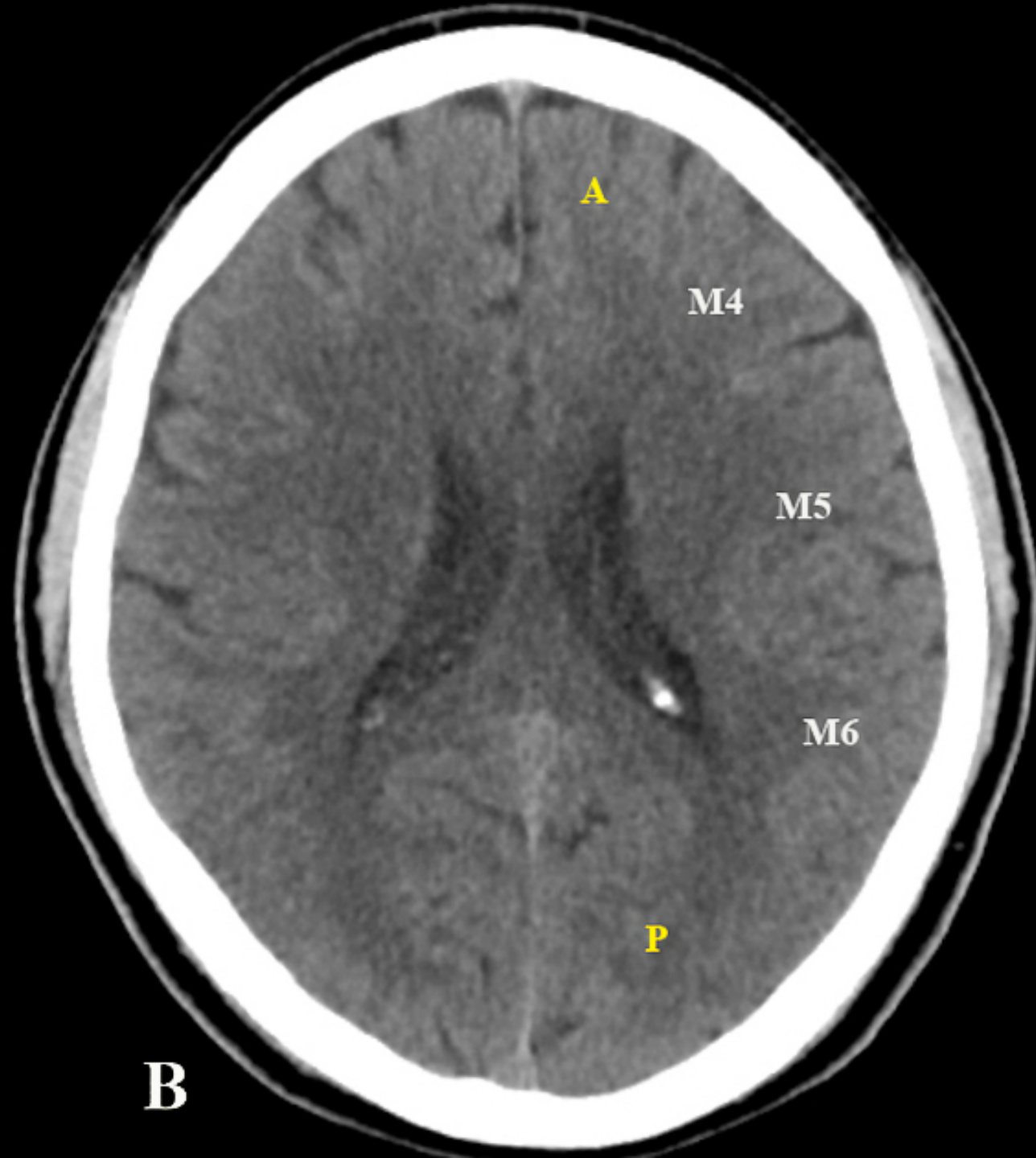
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# Is there brain to salvage?

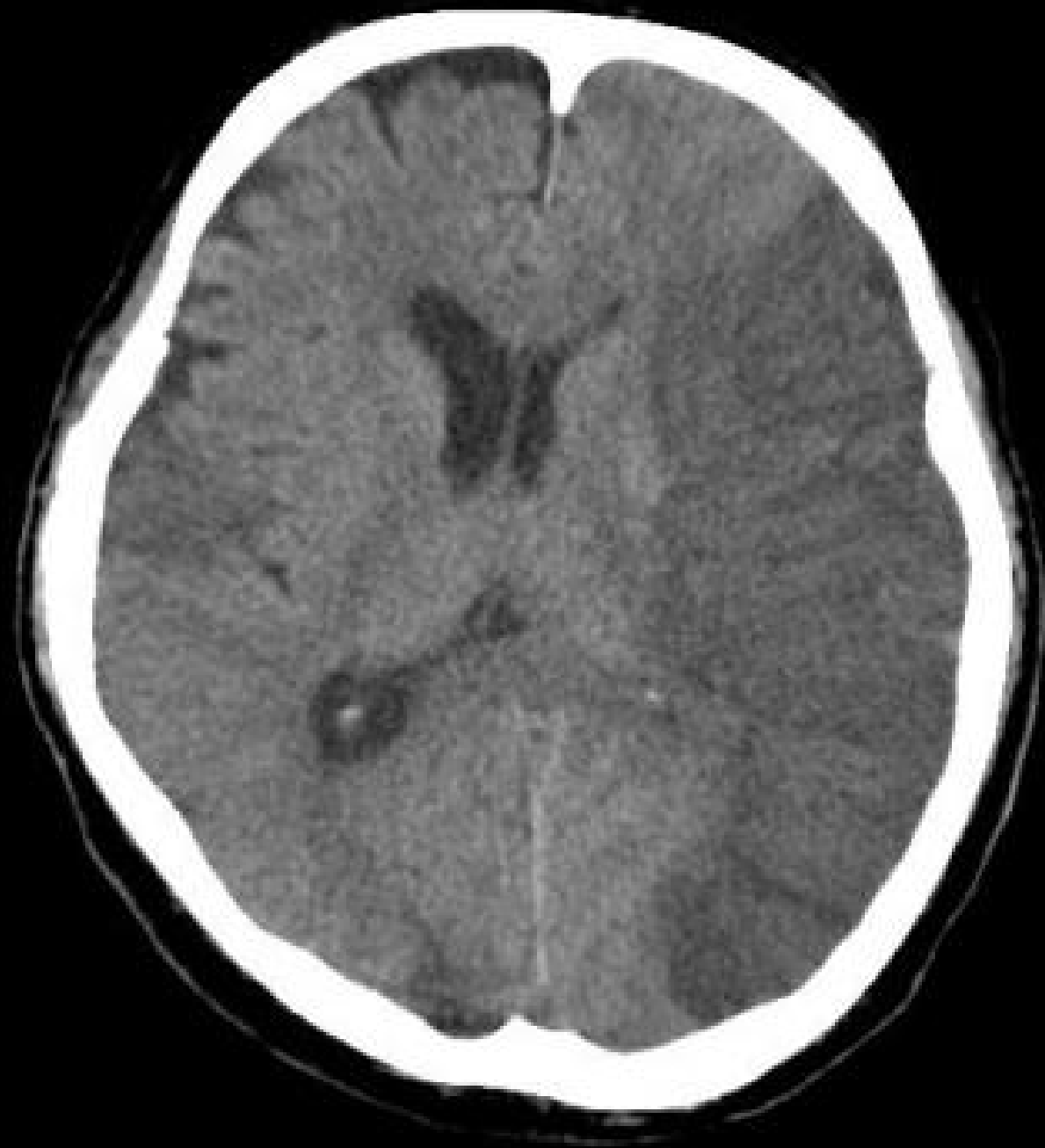
- ASPECTS
- Perfusion
  - MR or CT
  - Automated quantification software



**A**

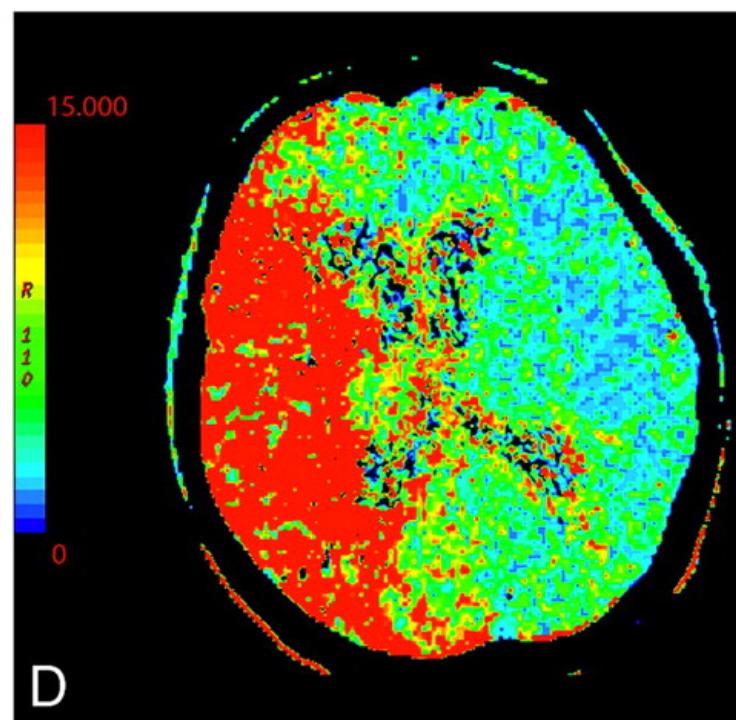
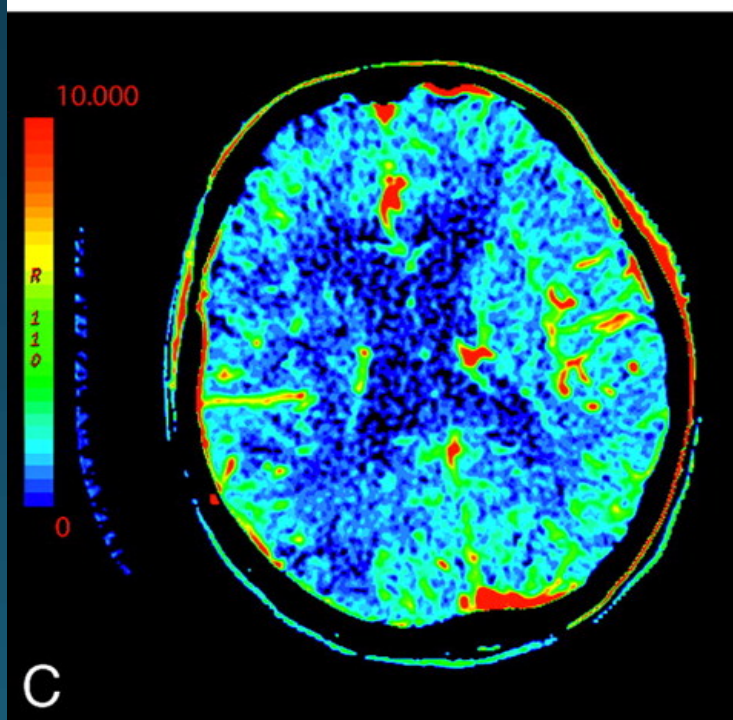
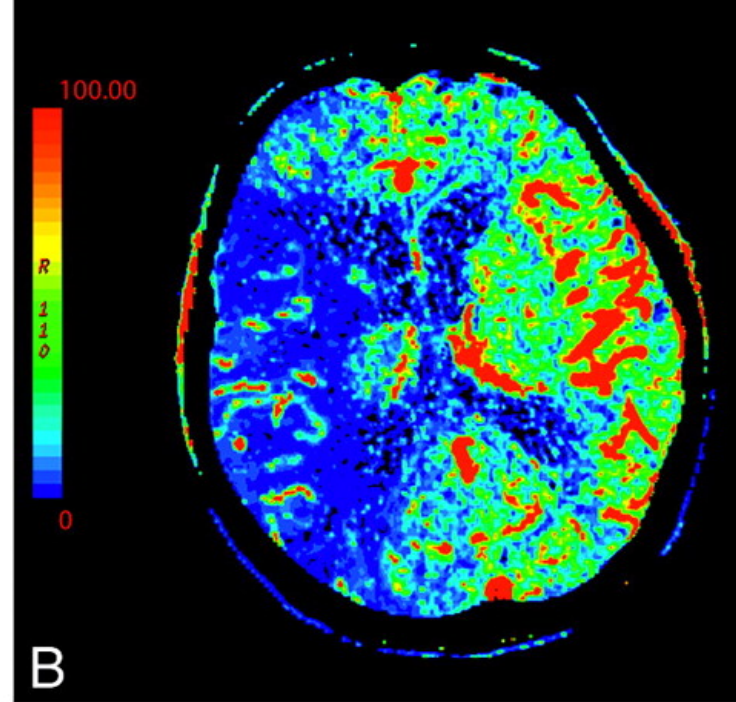
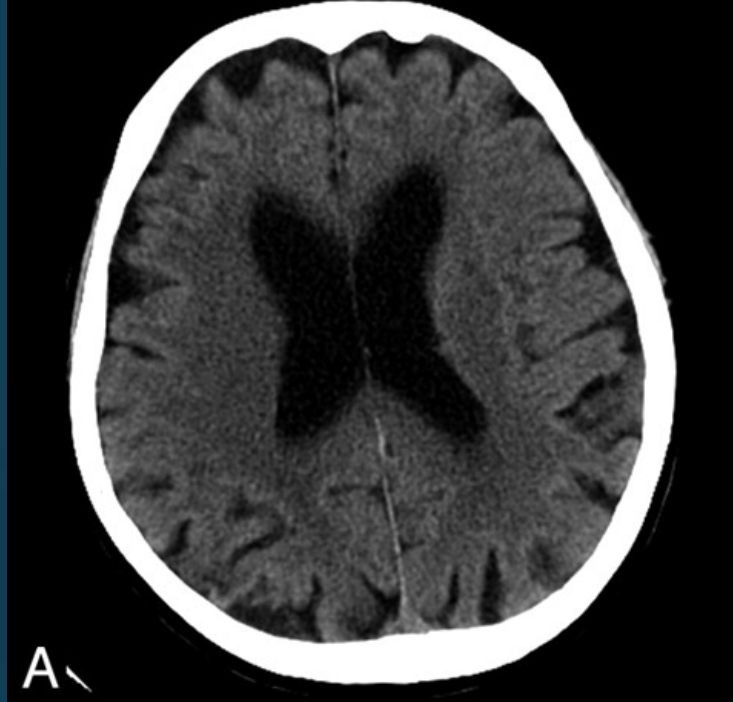


**B**



# Salvageable Brain

- Perfusion Imaging
  - Dead Brain (core infarct)
  - At risk brain (penumbra)
  - Normal brain







DWI lesion  
22 ml

Hypoperfusion  
(Tmax>6s)  
92 ml

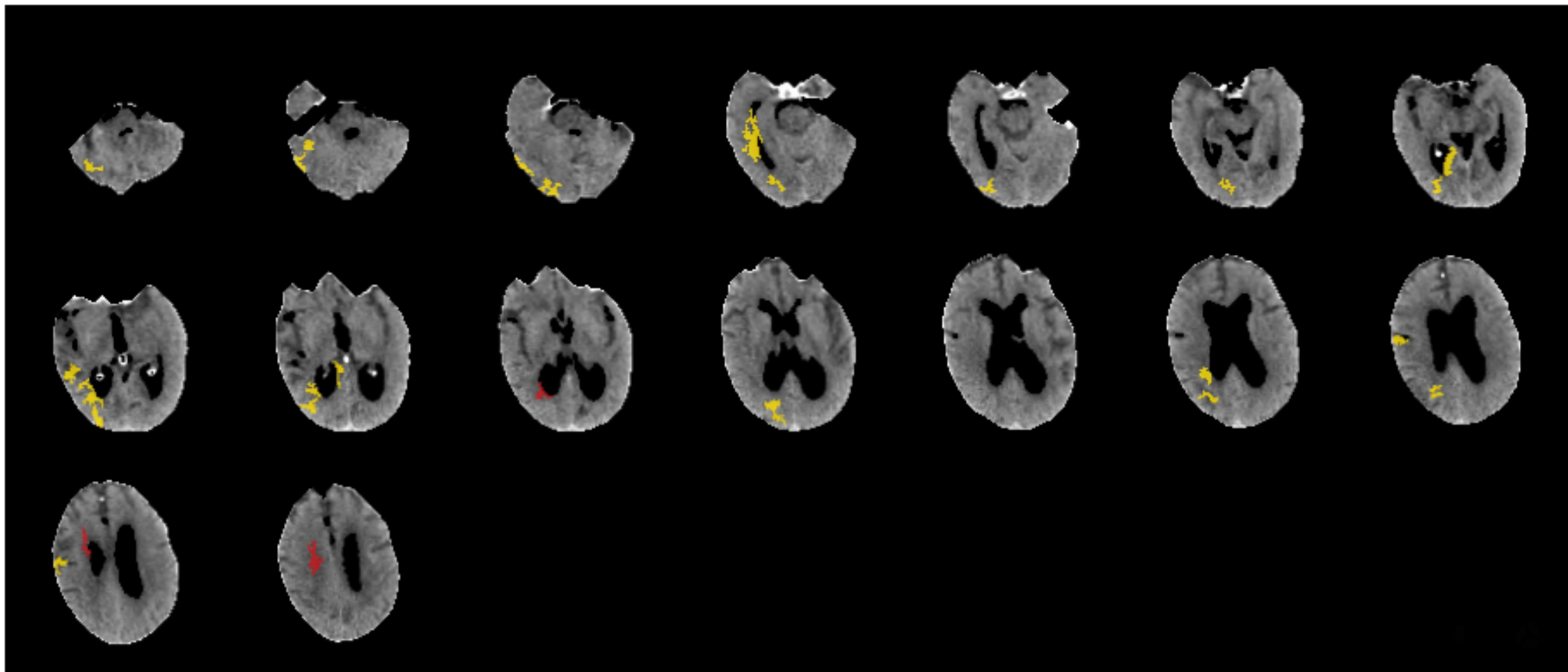
Mismatch Volume: 70 ml  
Mismatch Ratio: 4.2



Move to inbox

VOLUME 1	rrBF < 40 % aTMAX > 2 s	1.83 cc
VOLUME 2	aTMAX > 6 s	12.8 cc

Mismatch ratio	6.99
Relative mismatch	85.7 %



Mismatch ratio:  $VOLUME\ 2 / VOLUME\ 1$ ; Relative mismatch:  $(VOLUME\ 2 - VOLUME\ 1) / VOLUME\ 2 * 100$

# A Practical Approach to EVT

- Is this patient a candidate for EVT?
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# Last Known Normal?

- Last known normal?
- <6h, 6-24h or >24

# <6h

- Evidence is based largely on 6 landmark trials published in 2015
  - Varied design, patient selection, etc.
  - Commonalities:
    - All included some form of advanced imaging (minimum CTA)
    - Utilized advanced devices
    - Emphasized time and efficiency
- Realistic to achieve access within 6h?

3.7.2. 0 to 6 Hours From Onset	COR	LOE
<p><b>1. Patients should receive mechanical thrombectomy with a stent retriever if they meet all the following criteria: (1) prestroke mRS score of 0 to 1; (2) causative occlusion of the internal carotid artery or MCA segment 1 (M1); (3) age <math>\geq 18</math> years; (4) NIHSS score of <math>\geq 6</math>; (5) ASPECTS of <math>\geq 6</math>; and (6) treatment can be initiated (groin puncture) within 6 hours of symptom onset.</b></p>	I	A

- Clinical

- Last known normal - <6h
- Symptoms: NIHSS score >6
- Pre morbid function – 0 or 1
- Age - >18
- Groin puncture within 6h of symptom onset

<p><b>2. When evaluating patients with AIS within 6 hours of last known normal with LVO and an Alberta Stroke Program Early Computed Tomography Score (ASPECTS) of <math>\geq 6</math>, selection for mechanical thrombectomy based on CT and CTA or MRI and MRA is recommended in preference to performance of additional imaging such as perfusion studies.</b></p>	I	B-NR	
<p>Of the 6 RCTs that independently demonstrated clinical benefit of mechanical thrombectomy with stent retrievers</p>			3

- Imaging Criteria in patients <6h
  - Is there a large vessel occlusion (LVO)?
    - CTA
  - Is there brain to salvage?
    - ASPECTS – Non contrast head CT

# <6h

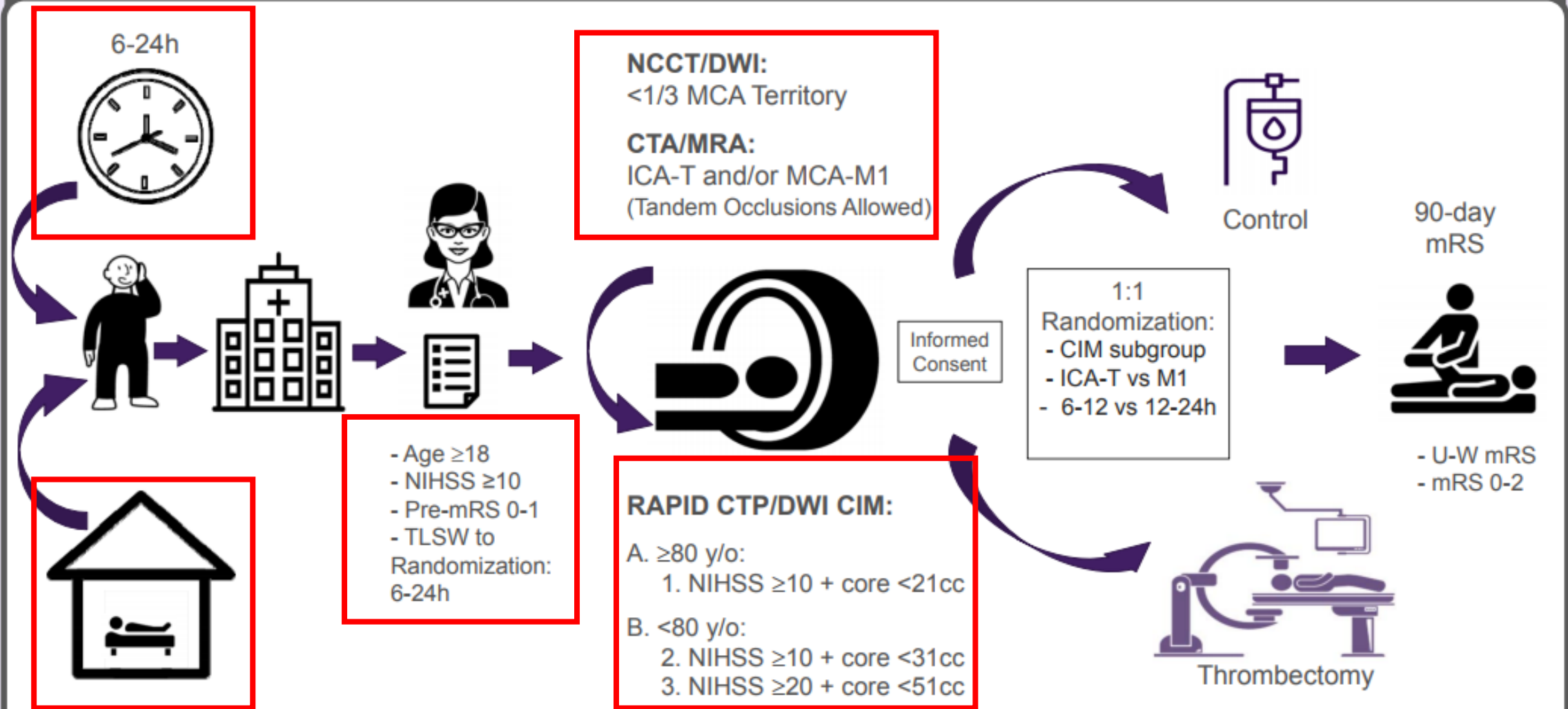
- 2 of the initial trials that showed a positive treatment effect did NOT include perfusion imaging
- ASPECTS in this setting is good enough to establish salvageable brain
- Other studies showed an even more positive effect if you highly select based on perfusion



# 6-24h

- We know that patients under 6h do not need perfusion imaging to establish salvageable brain
- ASPECTS is good enough
- But not validated over 6h
- What if we applied the highly selective criteria used in some trials to select patients 6-24
- Wake up strokes

# Study Methods: Workflow



Jovin et al, International Journal of Stroke, 2017

# >24

- Currently not evidenced based
- Physiologic perspective – No reason to not
- Practical
  - Less salvageable brain every hour
  - More patients would meet criteria every hour
  - More scans
  - More transfers
  - More resources
  - Maybe a handful of EVT

# Summary

- Is this patient a candidate for EVT?

- Clinical

1. Symptoms?
  1. Significant neurological symptoms?
  2. LAMS?
  3. NIHSS >6
2. Premorbid Function/age
  1. mRs <2 i.e. functionally independent
3. Last known normal
  1. <6
  2. 6-24h
  3. >24h

- Imaging

- LVO → CTA
- Salvageable brain?
  - <6h ASPECTS
  - >6h Perfusion + Software

# Common Issues

- tPA and EVT?
  - Totally fine
- EVT and Warfarin/NOACs
  - Totally fine\*
  - Might want to know INR prior to puncture
- Occluded ICA on CTA
  - MCA occluded?
  - ICA pseudo occlusion
- High grade stenosis of ICA and EVT
  - Totally fine