Hyperacute Management of Posterior Circulation Strokes

September 14, 2021

Christine Hawkes, MD FRCPC

Objectives

1. Introduction using a case
2. Discuss treatment options for posterior circulation ischemic strokes
3. Incorporate Canadian Stroke Best Practices

Outline

1. Thrombolysis
2. Other medical therapies
3. Endovascular treatment

Disclosures

- None!

Case

53M

PMHx: remote stroke, HTN, CAD, OSA

Last seen normal (LSN) 2000h day before

0430h wife finds him UNCONSCIOUS on the floor, weaker on the left side

Question #1

What is the most likely diagnosis?

A. Anterior circulation ischemic stroke

B. Posterior circulation ischemic stroke

C. Intracerebral hemorrhage

D. Toxic/metabolic/infectious encephalopathy

E. Not enough information

Question #1

What is the most likely diagnosis?

A. Anterior circulation ischemic stroke

B. Posterior circulation ischemic stroke

C. Intracerebral hemorrhage

D. Toxic/metabolic/infectious encephalopathy

E. Not enough information

“Unconscious” Patient

Clinical Medicine 2018

Table 1. Differential

Neurological		ogical brain dysfunction	Psychiatric
Ischaemic stroke		ding nonconvulsive us	Psychiatric coma
Intracerebral haemorrhag		ition	Malingering
Subarachnoid haemorrha			
Subdural haematoma			
Brain tumour			
Cerebral lymphoma	Addisonian crisis	Hypothermia	
Multiple brain metastases	Hypothyroidism	Neuroleptic malignant syndrome	
Central nervous system infection	Uraemia	Serotonin syndrome	
Cerebral abscess	Hypercapnia		
Cerebral oedema	Septic encephalopathy		
Hydrocephalus	Hepatic encephalopathy		
Anoxic brain injury (eg post cardiac arrest)			
Posterior reversible encephalopathy syndrome (PRES)			
Trauma			

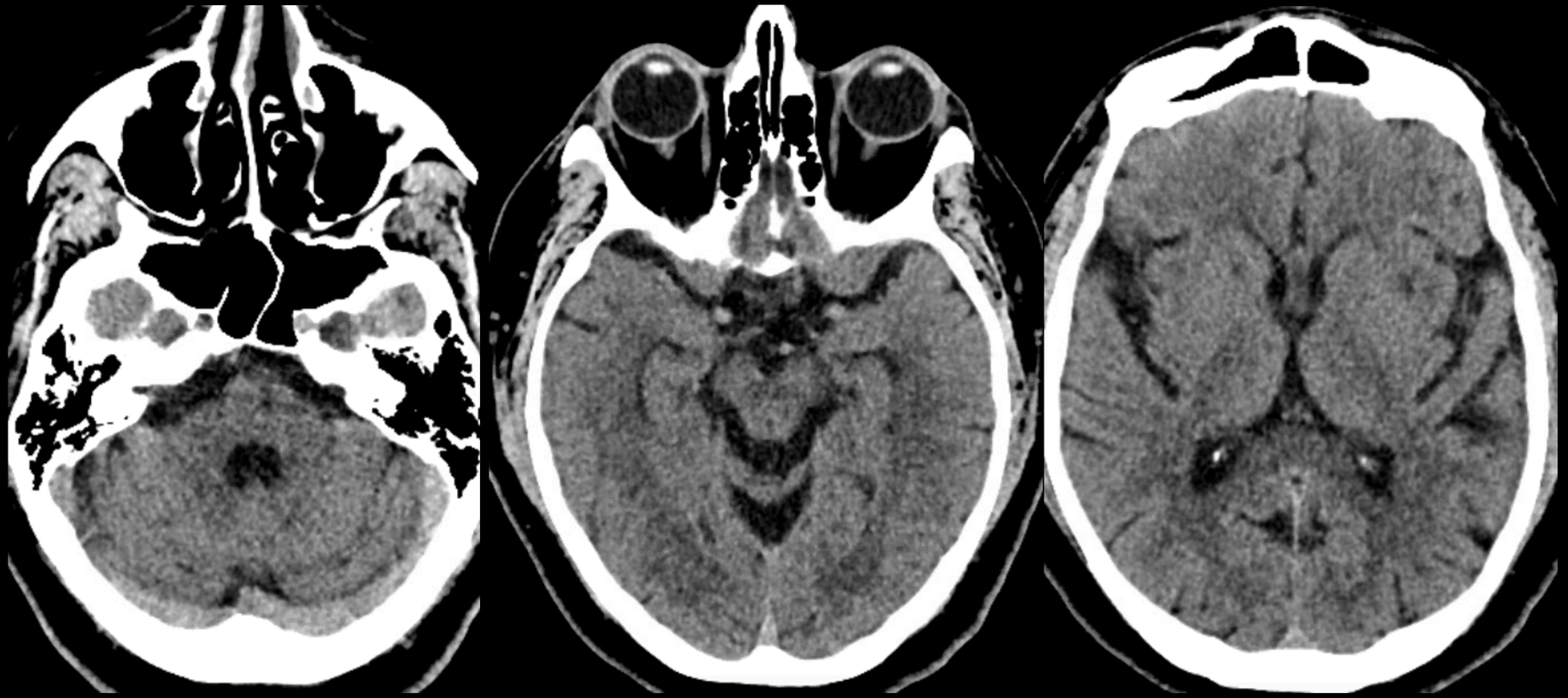
Basilar occlusion accounts for:
1% of AIS, 5% LVO

Case

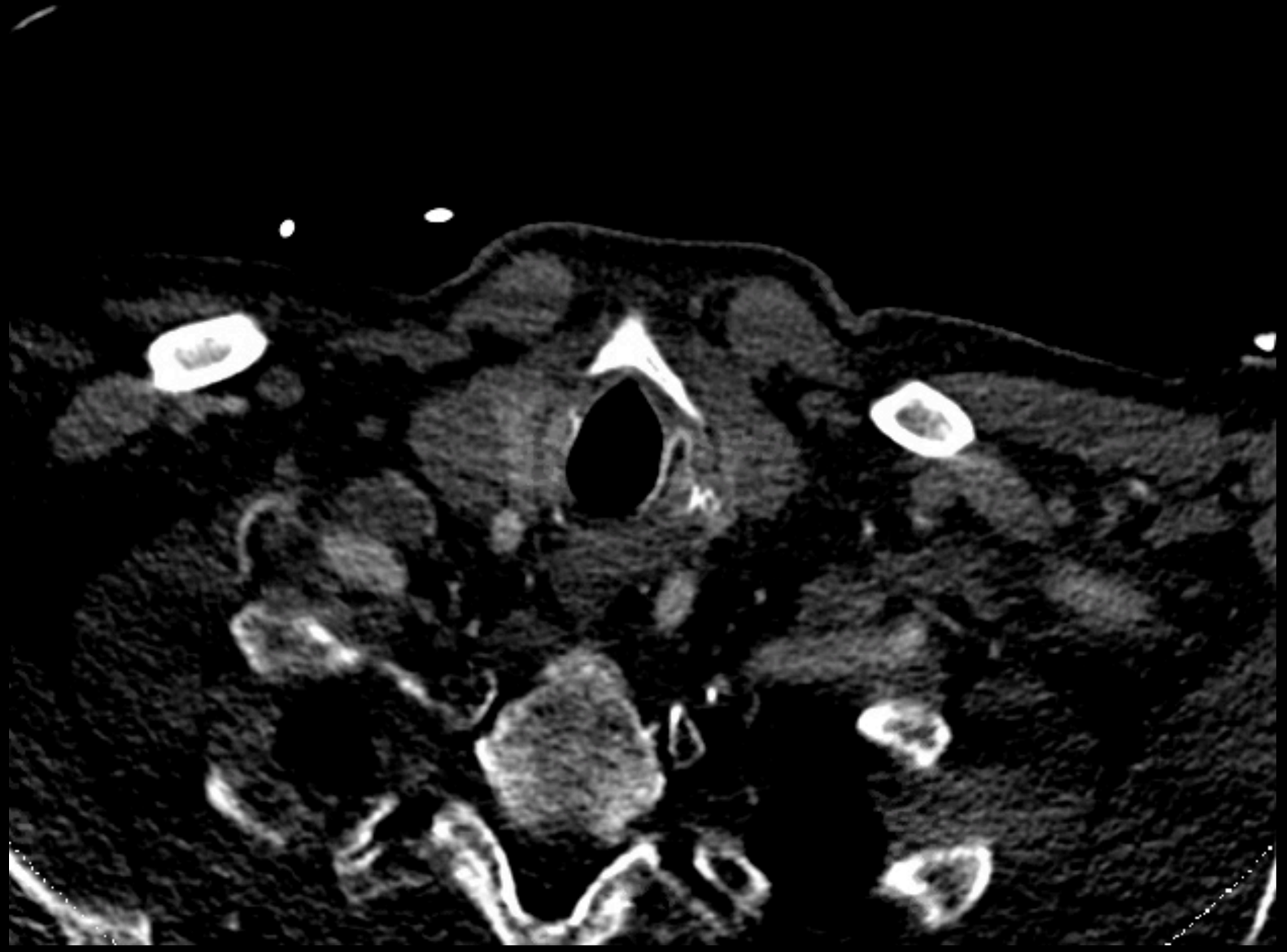
Evaluated in the ED

NIHSS = 23 before intubation

Obtunded, not speaking/obeying, R facial droop, L > R weakness



Case



Question #2

What is the diagnosis?

A. Anterior circulation ischemic stroke

B. Posterior circulation ischemic stroke

C. Intracerebral hemorrhage

D. Toxic/metabolic/infectious encephalopathy

E. Not enough information

Question #2

What is the diagnosis?

A. Anterior circulation ischemic stroke

B. Posterior circulation ischemic stroke

C. Intracerebral hemorrhage

D. Toxic/metabolic/infectious encephalopathy

E. Not enough information

Question #3

What is the treatment?

A. Thrombolysis (TPA or TNK)

B. Endovascular treatment (thrombectomy)

C. Both A + B

D. None

E. Consult with a stroke expert + interventionalist

Question #3

What is the treatment?

A. Thrombolysis (TPA or TNK)

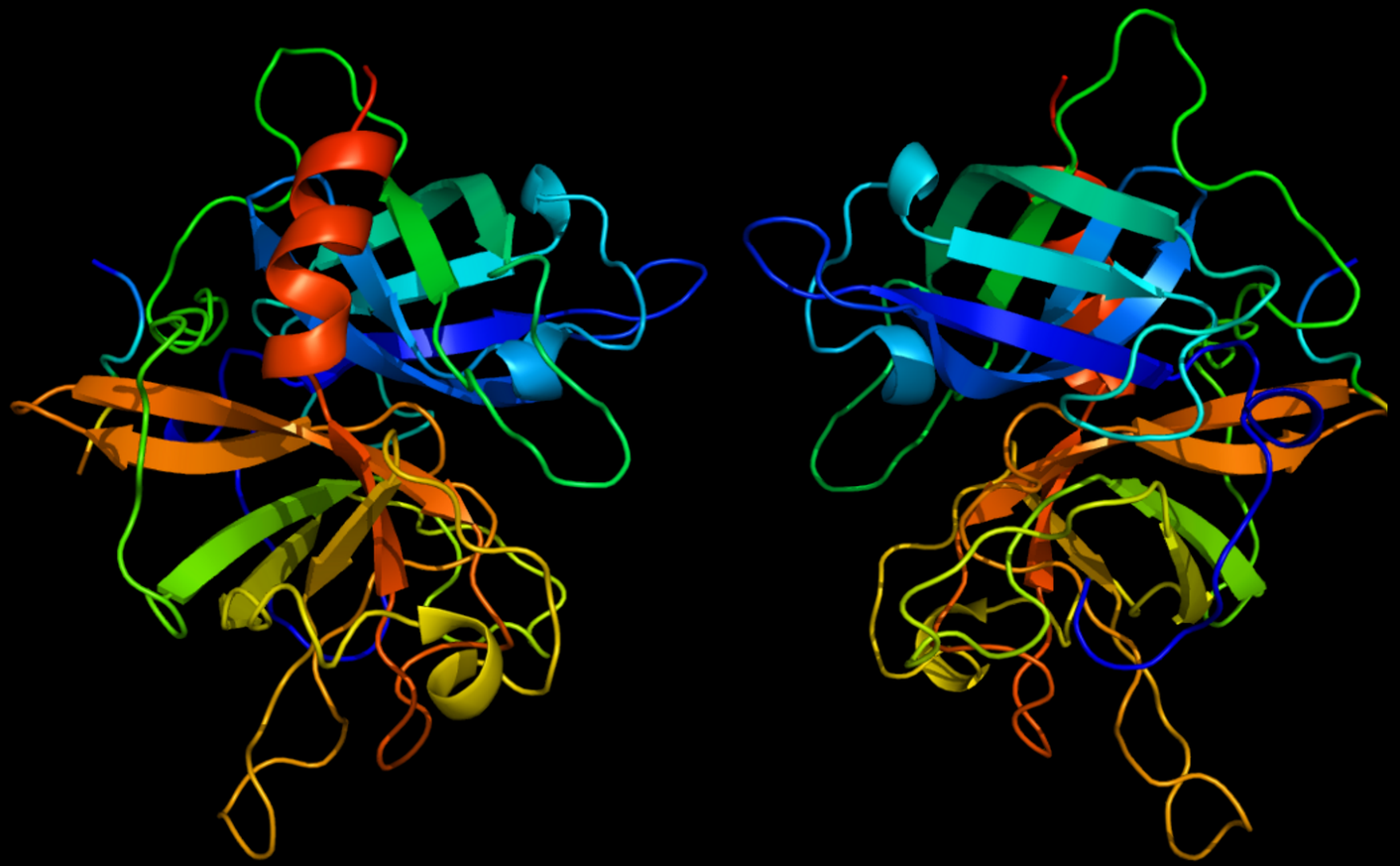
B. Endovascular treatment (thrombectomy)

C. Both A + B

D. None

E. Consult with a stroke expert + interventionalist

1. Thrombolysis



Canadian Stroke Best Practices 2018

Inclusions for Thrombolysis

- Diagnosis of ischemic stroke
- Causing disabling deficits
- Time from last known well (LKW) less than 4.5 hours*

Exclusions

Absolute Exclusion Criteria

- ❑ Any source of active hemorrhage or any condition that could increase the risk of major hemorrhage after alteplase administration.
- ❑ Any hemorrhage on brain imaging.

Relative Exclusion Criteria (requiring clinical judgement based upon the specific situation)

Historical

- ❑ History of intracranial hemorrhage.
- ❑ Stroke or serious head or spinal trauma in the preceding three months.
- ❑ Major surgery, such as cardiac, thoracic, abdominal, or orthopedic in the preceding 14 days. Risk varies according to the procedure.
- ❑ Arterial puncture at a non-compressible site in the previous seven days.

Clinical

- ❑ Symptoms suggestive of subarachnoid hemorrhage.
- ❑ Stroke symptoms due to another non-ischemic acute neurological condition such as seizure with post-ictal Todd's paralysis or focal neurological signs due to severe hypo- or hyperglycemia.
- ❑ Hypertension refractory to aggressive hyperacute antihypertensive treatment such that target blood pressure less than 180/105 cannot be achieved or maintained. Blood pressure should be treated rapidly and aggressively in order to minimize delays to thrombolysis.
- ❑ Patient currently prescribed and taking a direct non-vitamin K oral anticoagulant (DOAC). *Refer to Section 5.2 clinical considerations for additional information.*

CT or MRI Findings

- ❑ CT showing early signs of extensive infarction

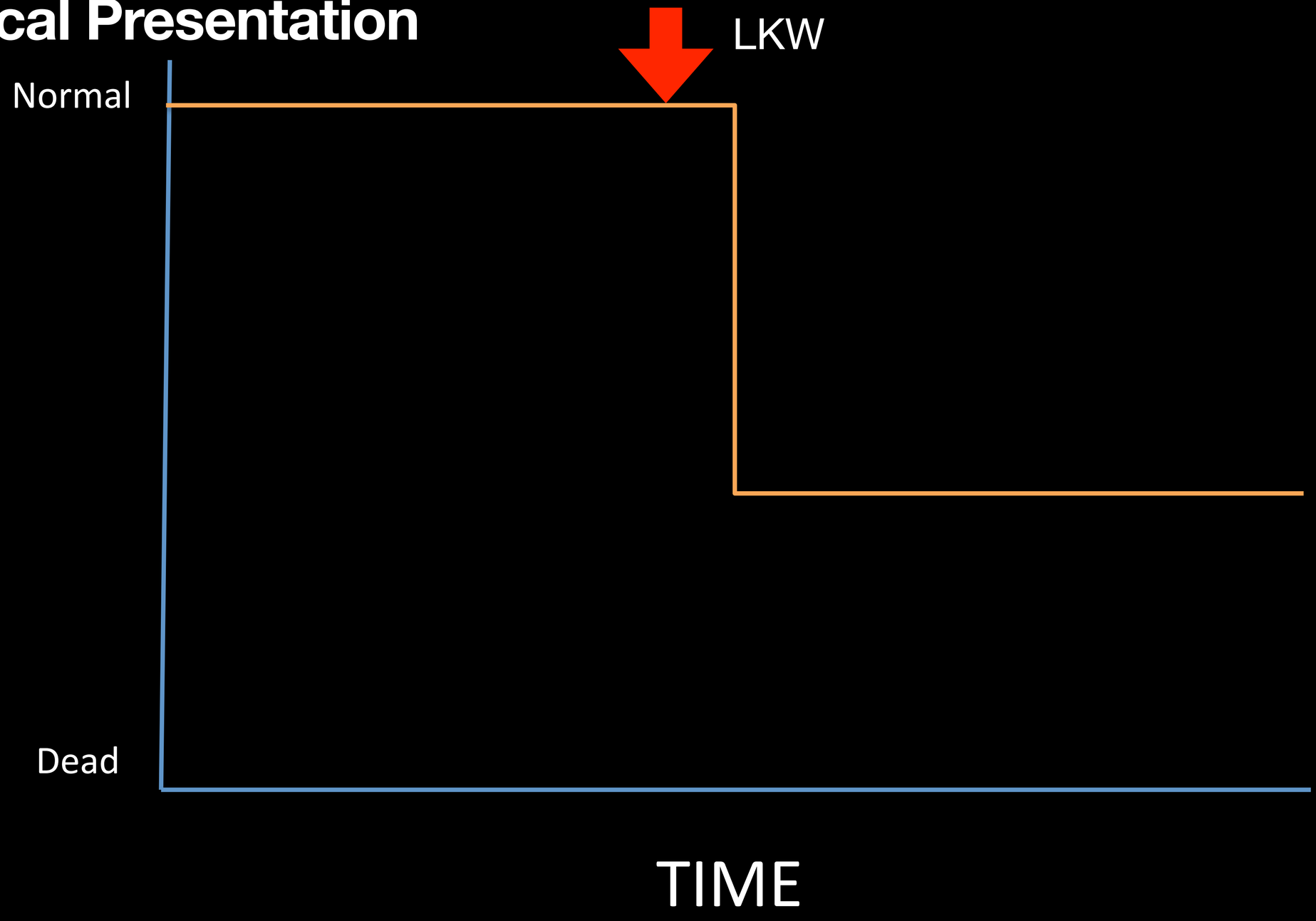
Laboratory

- ❑ Blood glucose concentration below 2.7 mmol/L or above 22.2 mmol/L.
- ❑ Elevated activated partial-thromboplastin time.
- ❑ International Normalized Ratio greater than 1.7.
- ❑ Platelet count below 100,000 per cubic millimetre.

Posterior Circulation Symptoms

“Typical” Stroke Symptoms	Posterior Circulation Symptoms
Facial droop	Decreased level of alertness
Unilateral weakness	Crossed findings
Unilateral numbness	Dystaxia
Speech changes/Aphasia	Diplopia
Gaze preference	Vertigo/“Dizziness”
Neglect/Inattention	Dysphagia/Dysarthria
	Vision Loss

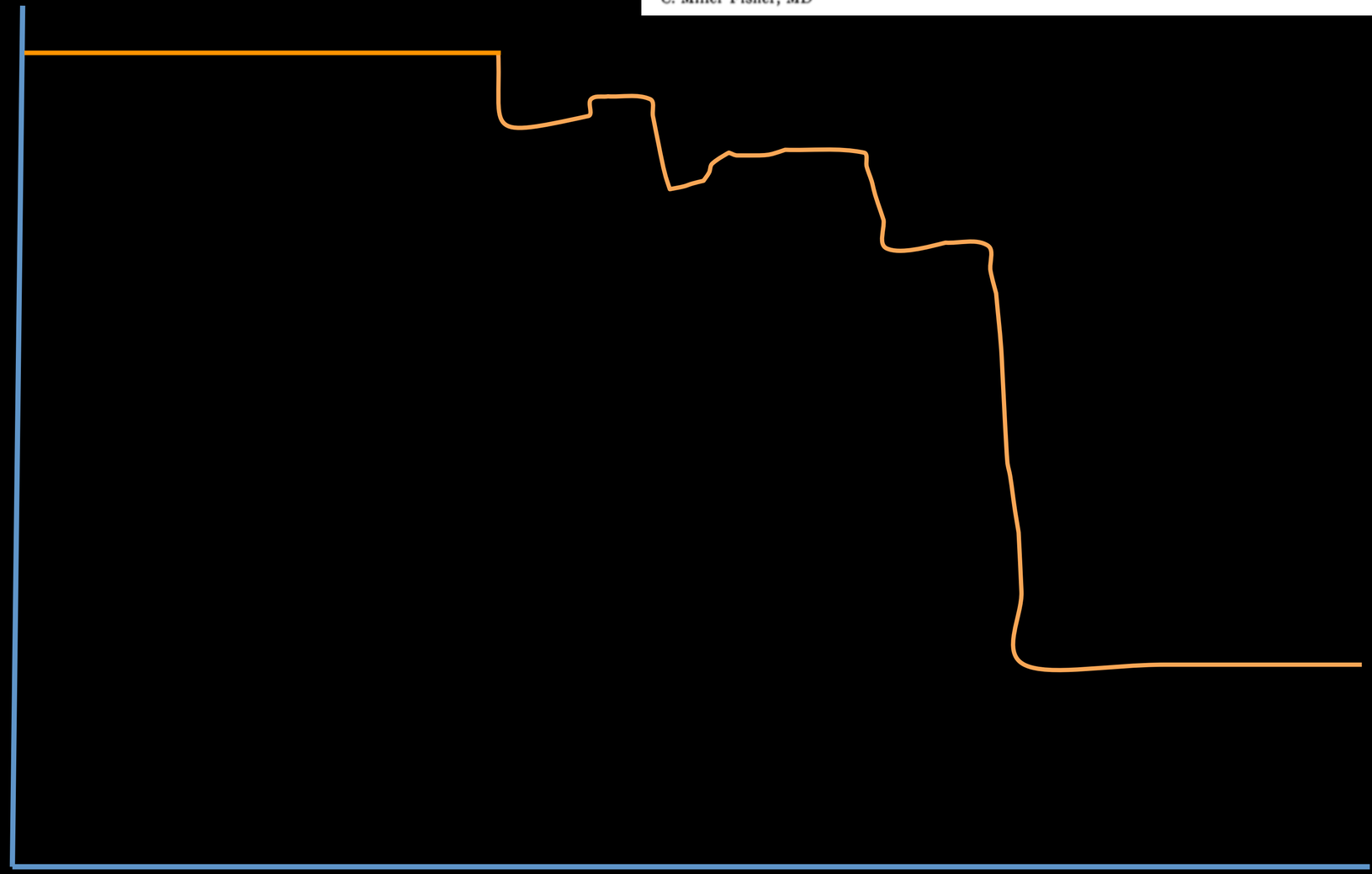
Clinical Presentation



Clinical Presentation

The 'Herald Hemiparesis' of Basilar Artery Occlusion

C. Miller Fisher, MD



Challenges of Thrombolysis

Posterior vs Anterior Circulation

- Delays in diagnosis = delays in thrombolysis
  - In the field
  - In the ED
  - By the neurologist
- NIHSS does not represent all the posterior circulation stroke symptoms

Example

Delays in Posterior Circulation Strokes

63F with HTN was at home with husband 0700h then developed “dizziness” after standing up

0730h - Dizziness resolved when EMS arrived

0745h - Brought to Juravinski hospital ED

0755h - Triaged as “TIA”

0815h - ED physician identified a visual field cut, mild left sided weakness

0845h - Arrived at Hamilton General, NIHSS 5

0900h - CT head/CTA stroke protocol

0910h - IV TPA

Safety of Thrombolysis

Posterior vs Anterior Circulation

- At least as safe, if not safer
- Benefit and safety seen in basilar occlusions with lower NIHSS (BASICS trial*)

Expanding the Use of Thrombolysis
>4.5 h Window

- RCTs looking at using “tissue window” to determine candidates for thrombolysis
  - MRI showing a mismatch
- Not available at all centres
- Requires stroke neurologist input

ARTICLE CLASS OF EVIDENCE

Tenecteplase vs Alteplase Before Endovascular Therapy in Basilar Artery Occlusion

Fana Alemseged, MD, Felix C. Ng, MBBS, Cameron Williams, MBBS, Volker Puetz, MD, Gregoire Boulouis, MD, Timothy John Kleinig, MBBS, Alessandro Rocco, MD, Teddy Y. Wu, PhD, Darshan Shah, MBBS, Francesco Arba, MD, Daniel Kaiser, MD, Francesca Di Giuliano, MD, Andrea Morotti, MD, Fabrizio Sallustio, MD, Helen M. Dewey, PhD, Peter Bailey, MBBS, Billy O'Brien, MBBS, Gagan Sharma, MCA, Steven Bush, MBBS, Richard Dowling, MBBS, Marina Diomedi, PhD, Leonid Churilov, PhD, Bernard Yan, DMedSci, Mark William Parsons, PhD, Stephen M. Davis, MD, Peter J. Mitchell, MMed, Nawaf Yassi, PhD, and Bruce C.V. Campbell, PhD, on behalf of the BATMAN study group and EXTEND IA TNK study group

Correspondence
Dr. Alemseged
fana.alemseged@mh.org.au

Neurology® 2021;96:e1272-e1277. doi:10.1212/WNL.0000000000011520

Abstract

Objective

To investigate the efficacy of tenecteplase (TNK), a genetically modified variant of alteplase with greater fibrin specificity and longer half-life than alteplase, prior to endovascular thrombectomy (EVT) in patients with basilar artery occlusion (BAO).

Methods

To determine whether TNK is associated with better reperfusion rates than alteplase prior to EVT in BAO, clinical and procedural data of consecutive patients with BAO from the Basilar Artery Treatment and Management (BATMAN) registry and the Tenecteplase vs Alteplase before Endovascular Therapy for Ischemic Stroke (EXTEND-IA TNK) trial were retrospectively analyzed. Reperfusion >50% or absence of retrievable thrombus at the time of the initial angiogram was evaluated.

Results

We included 110 patients with BAO treated with IV thrombolysis prior to EVT (mean age 69 [SD 14] years; median NIH Stroke Scale score 16 [interquartile range (IQR) 7–32]). Nineteen patients were thrombolysed with TNK (0.25 mg/kg or 0.40 mg/kg) and 91 with alteplase (0.9 mg/kg). Reperfusion >50% occurred in 26% (n = 5/19) of patients thrombolysed with TNK vs 7% (n = 6/91) thrombolysed with alteplase (risk ratio 4.0, 95% confidence interval 1.3–12; $p = 0.02$), despite shorter thrombolysis to arterial puncture time in the TNK-treated patients (48 [IQR 40–71] minutes) vs alteplase-treated patients (110 [IQR 51–185] minutes; $p = 0.004$). No difference in symptomatic intracranial hemorrhage was observed (0/19 [0%] TNK, 1/91 [1%] alteplase; $p = 0.9$).

Conclusions

TNK may be associated with an increased rate of reperfusion in comparison with alteplase before EVT in BAO. Randomized controlled trials to compare TNK with alteplase in patients with BAO are warranted.

Clinicaltrials.gov Identifiers

NCT02388061 and NCT03340493.

Classification of Evidence

This study provides Class III evidence that TNK leads to higher reperfusion rates in comparison with alteplase prior to EVT in patients with BAO.

RELATED ARTICLE

Editorial
Tenecteplase Prior to Mechanical Thrombectomy: Ready for Prime Time?
Page 413

MORE ONLINE

→ **Class of Evidence**
Criteria for rating therapeutic and diagnostic studies
NPub.org/coe

Podcast
Dr. Andrew Southerland talks with Dr. Fana Alemseged about tenecteplase versus alteplase before endovascular therapy in basilar artery occlusion.
NPub.org/0ahpo6

- Higher rates of reperfusion using TNK (26%) vs TPA (7%)
- Thrombolysis to puncture time shorter with TNK (48 min vs 110 min)
- No difference in ICH

2. Other Medical Therapies

Antiplatelet Agents

Examples: ASA, clopidogrel, or both (DAPT)

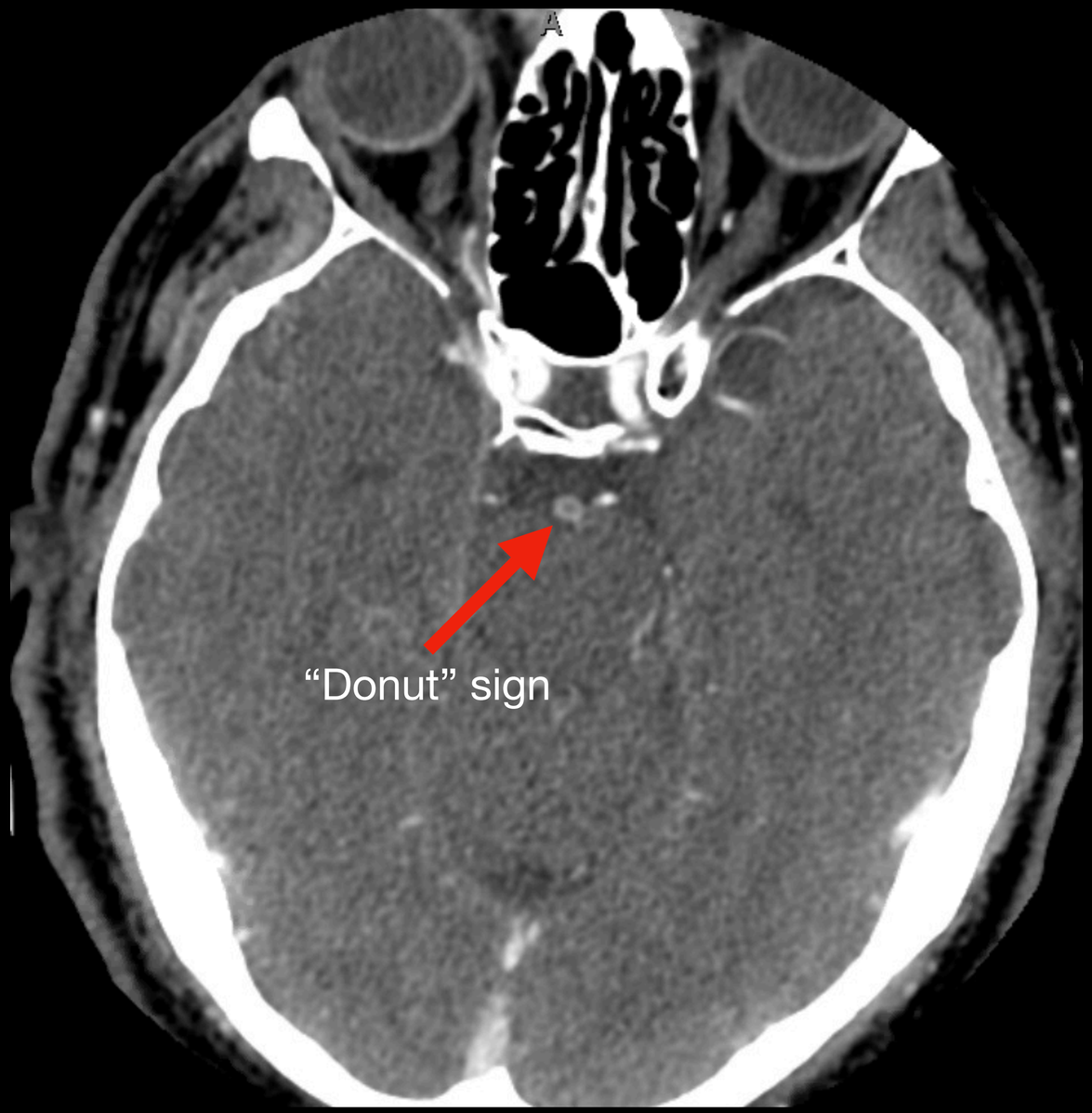
- Mainstay of subacute posterior circulation stroke treatment
- Used when patients are not candidates for thrombolysis or thrombectomy (and not starting anticoagulation*)
  - Outside the “window”
  - Minor or resolved symptoms
  - Established infarct

Etiology specific therapies

1. Intracranial atherosclerotic disease (ICAD)
   - Standard - DAPT, high dose statin, lifestyle modification
   - Ongoing research - anticoagulation (CATIS)
2. Cardioembolic
   - Anticoagulation
3. Dissection
   - Antiplatelet agents (ASA)

IV Heparin

- Clinical decision
  - Low NIHSS/minimal deficits
  - Not a thrombolysis candidate
- Close clinical monitoring
- Re-evaluate for endovascular treatment if clinical worsening



3. Endovascular Treatment

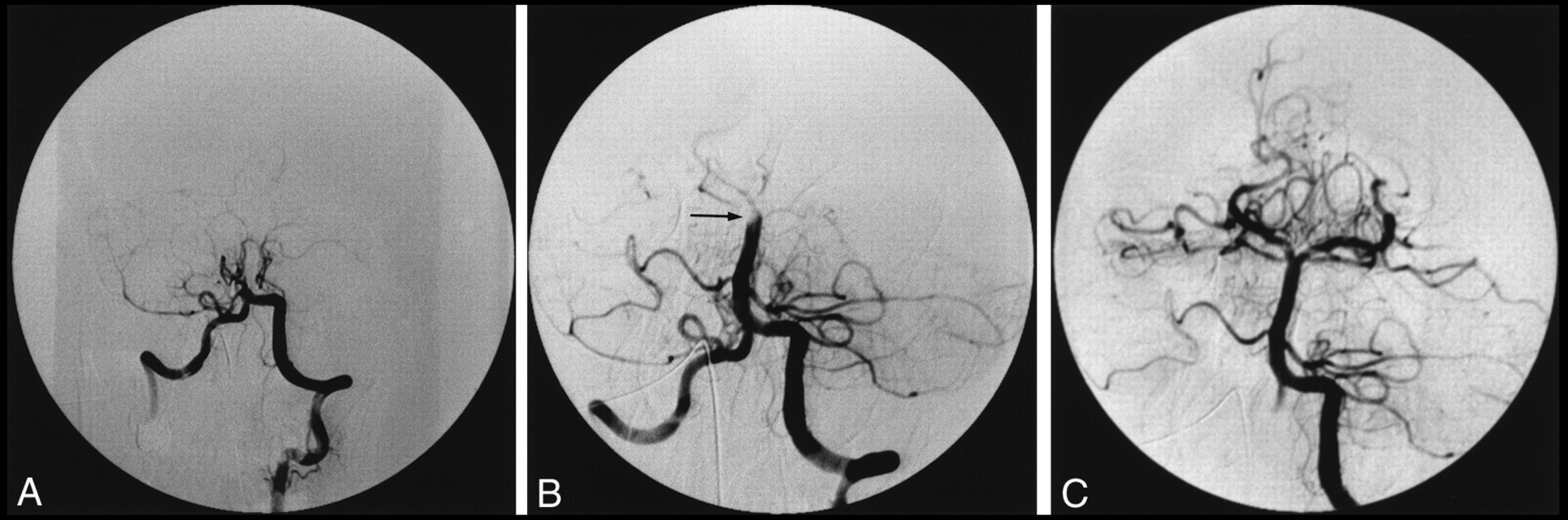
AKA EVT
AKA mechanical thrombectomy
AKA the “cath lab”

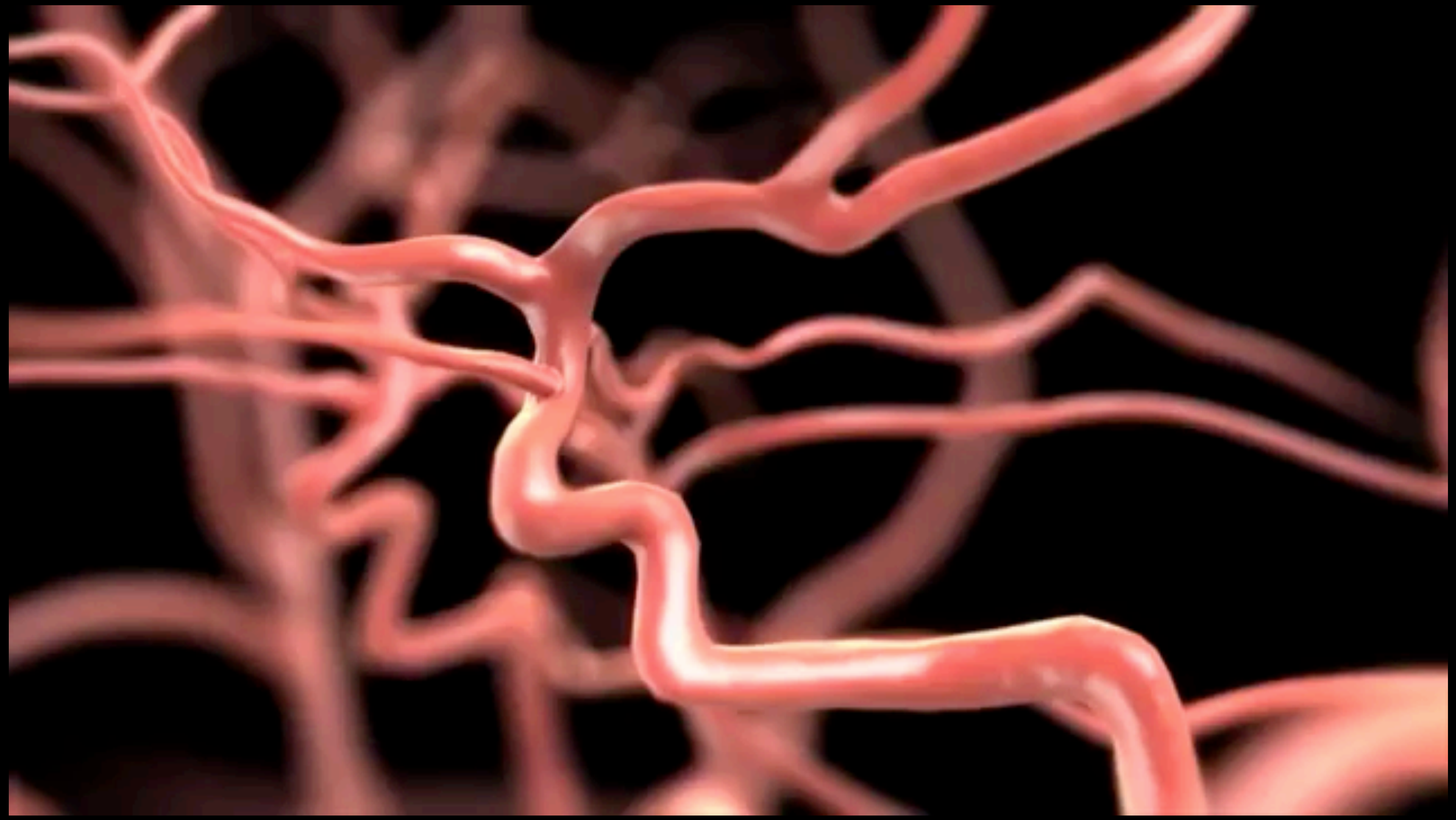
Techniques

Often first tried in the posterior circulation

1982: 1st description of IA thrombolysis in the posterior circulation

2002: Thromboaspiration described in the posterior circulation





Canadian Stroke Best Practices 2018

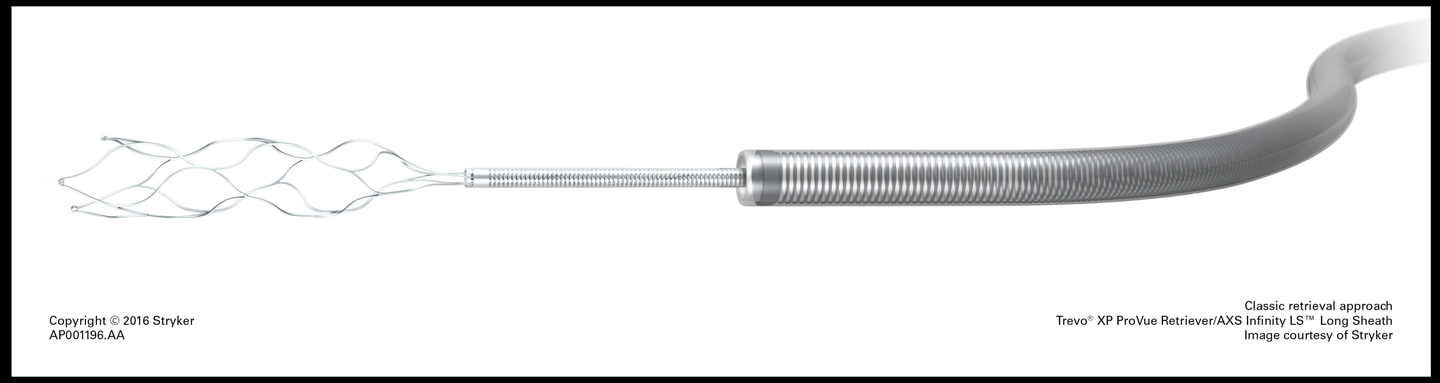
Basilar Artery Occlusions

For patients with basilar artery occlusions, the decision to treat with endovascular thrombectomy should be based on the potential benefits and risks of the therapy, made by a physician with stroke expertise in consultation with the neuro-interventionist, and the patient and/or decision-makers.

What is the evidence for EVT?

Posterior circulation strokes were not included in:

- MR CLEAN
- ESCAPE
- REVASCAT
- EXTEND IA
- SWIFT PRIME
- DAWN
- DEFUSE 3

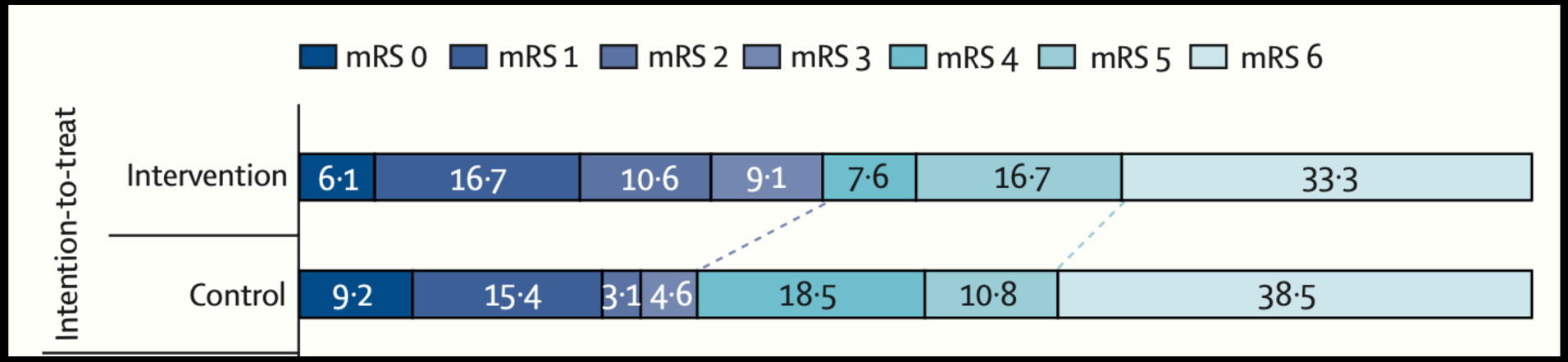


Classic retrieval approach
Trevo® XP ProVue Retriever/AXS Infinity LS™ Long Sheath
Image courtesy of Stryker

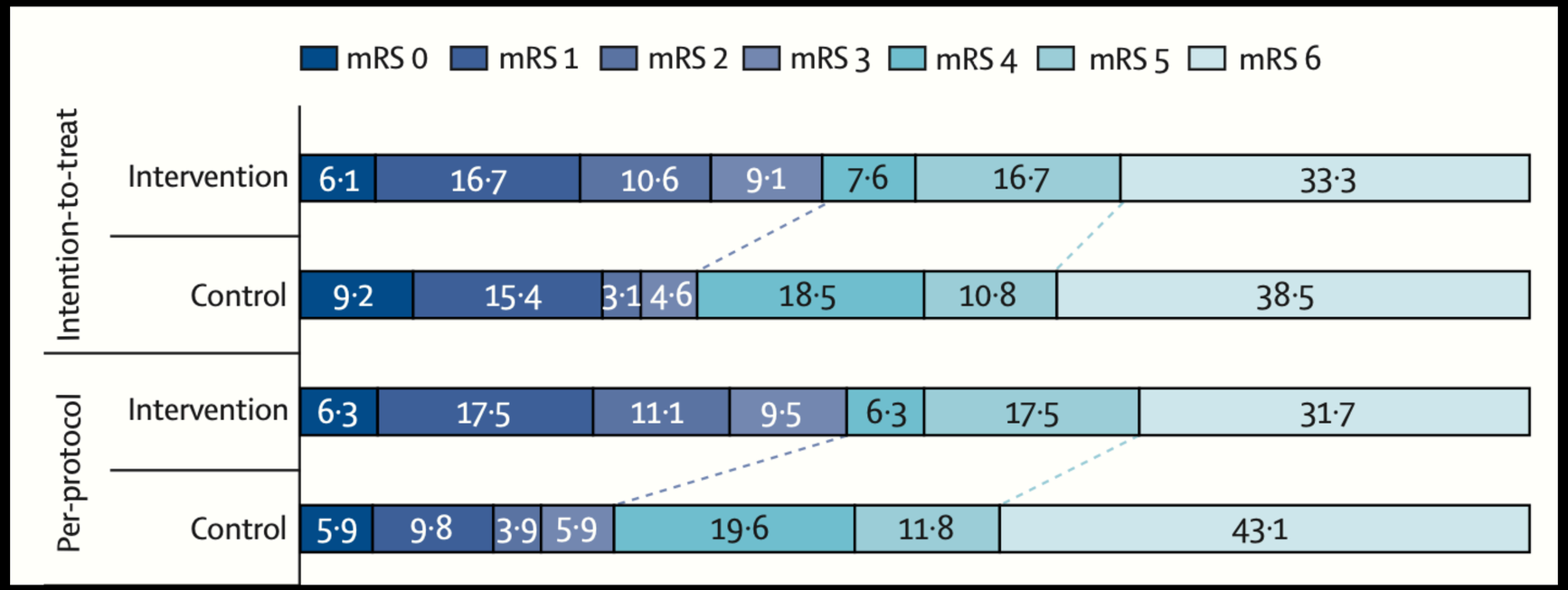
BEST, Lancet Neurology 2019

EVT vs medical treatment for basilar occlusions
Open label RCT
Stopped early

No significant difference in proportion of patients with “good outcome”

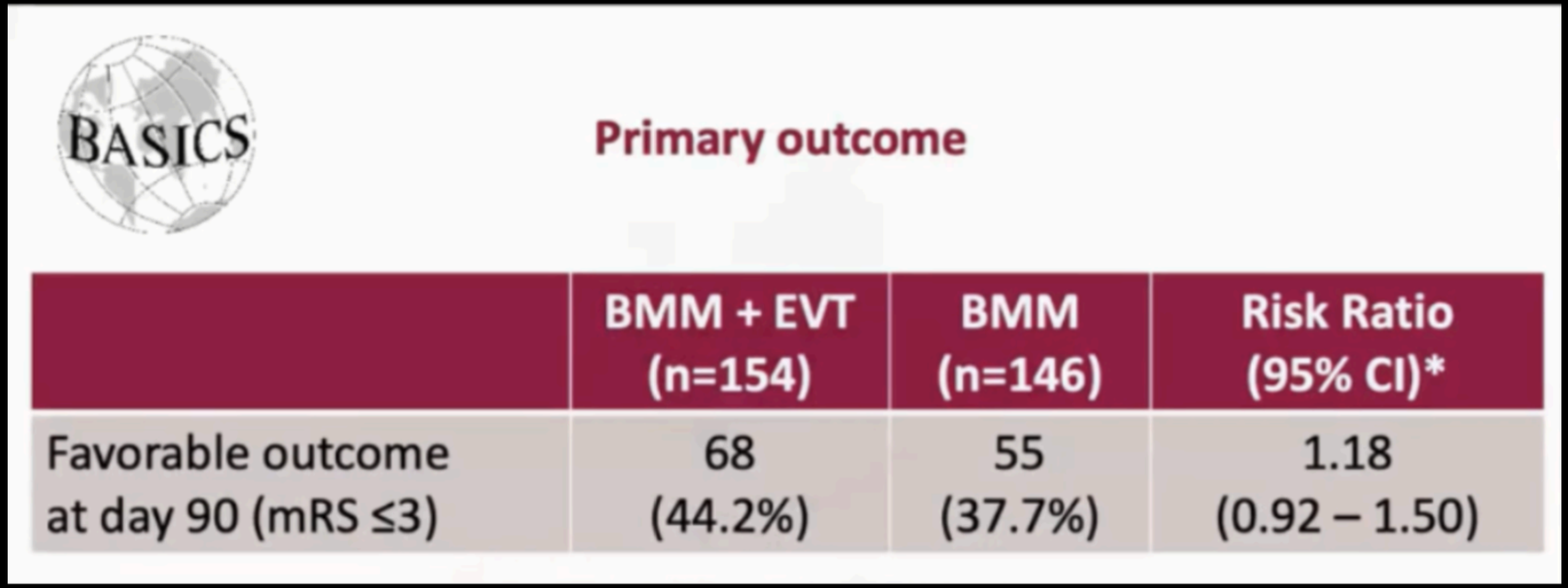


BEST, Lancet Neurology 2019



Per protocol
mRS 0-3:
44% EVT
25.5% Control

BASICS
NEJM, 2021



No significant difference in the primary outcome
Better than expected outcomes in medical Tx group (BMM)

Subgroup with benefit of EVT: patients with NIHSS 10+

Issues with BAO EVT RCTs

1. Poor recruitment
2. Loss of equipoise
3. Significant cross over

Ongoing Trials

ClinicalTrials.gov

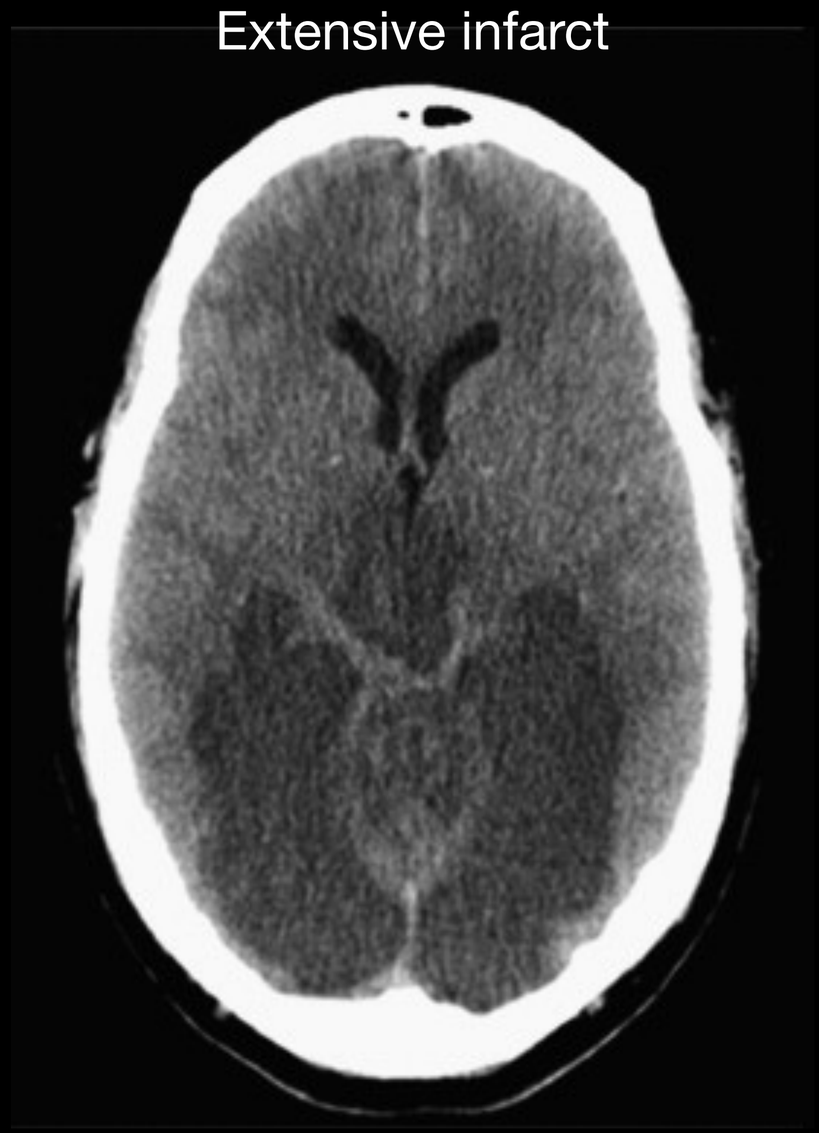
Randomized Assessment of Rapid Endovascular Treatment in Basilar Artery Occlusion Stroke (RARETBAS)

Basilar Artery Occlusion Chinese Endovascular Trial (BAOCHE)

Boiling it down..

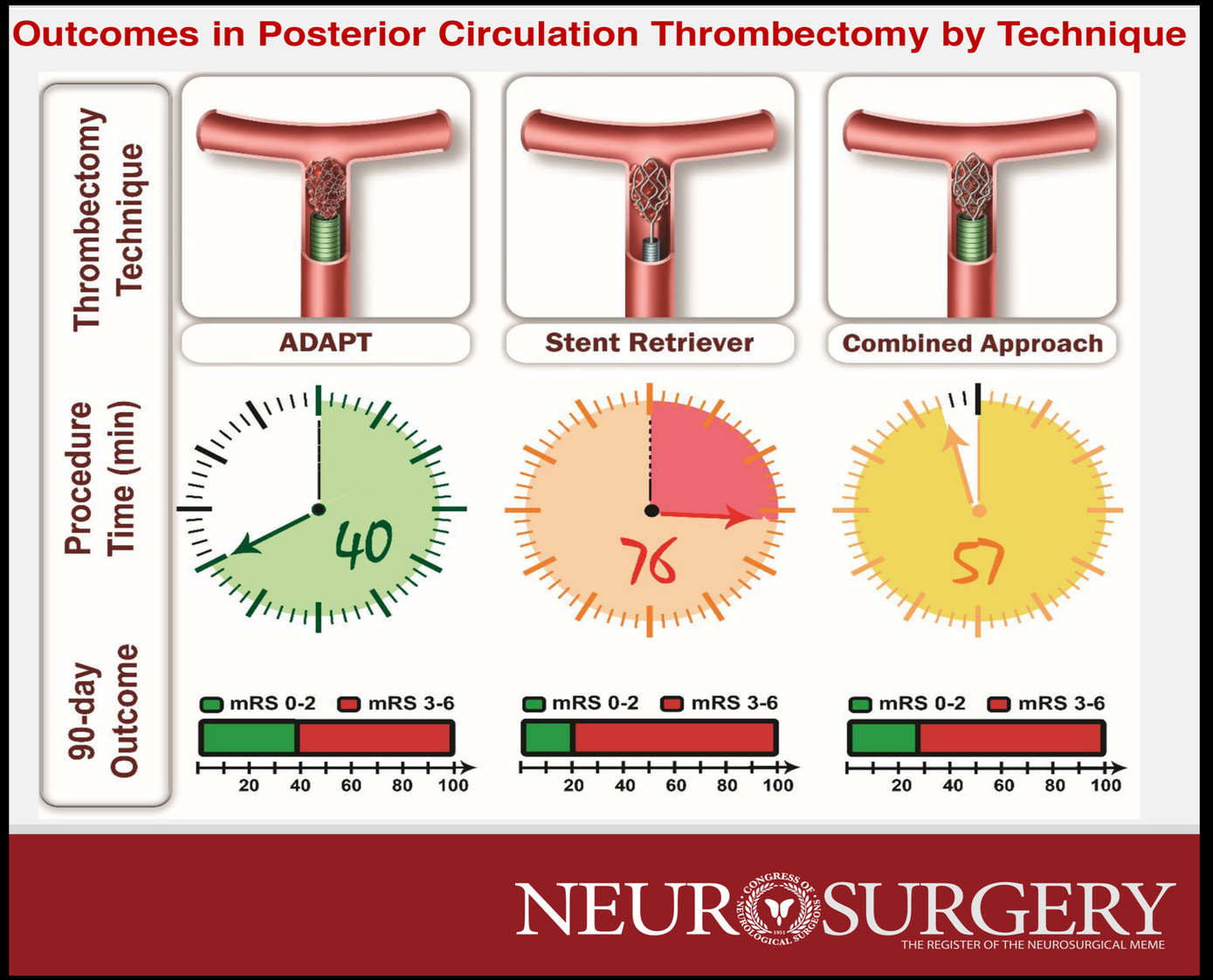
For EVT in basilar occlusions

- Significant deficits (ie NIHSS > 10) PLUS
- Reachable occlusion (LVO) PLUS
- Reasonable baseline PLUS
- Incomplete infarct



EVT Technique

Alaweih, 2020



Case

Case

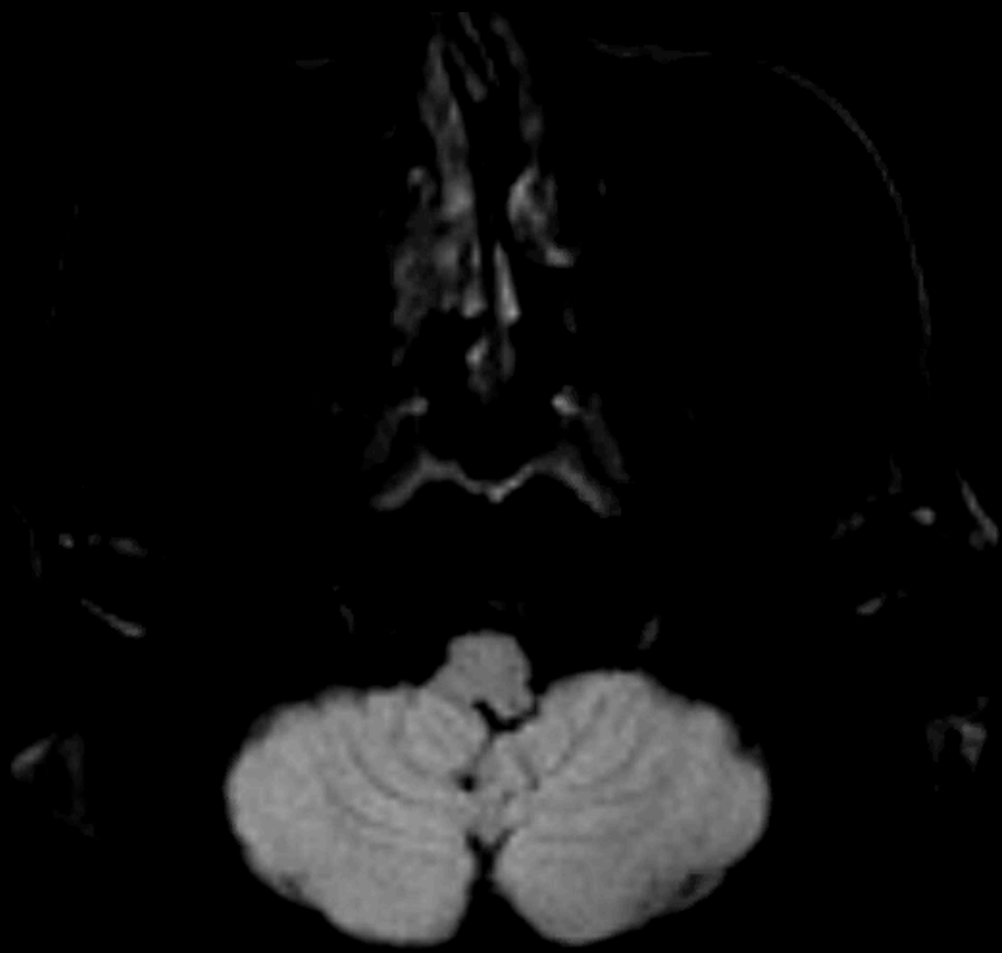
#radialfirst?

Case

- 1st pass recanalization
- Stent/aspiration used
- Residual severe stenosis (ICAD)

Case

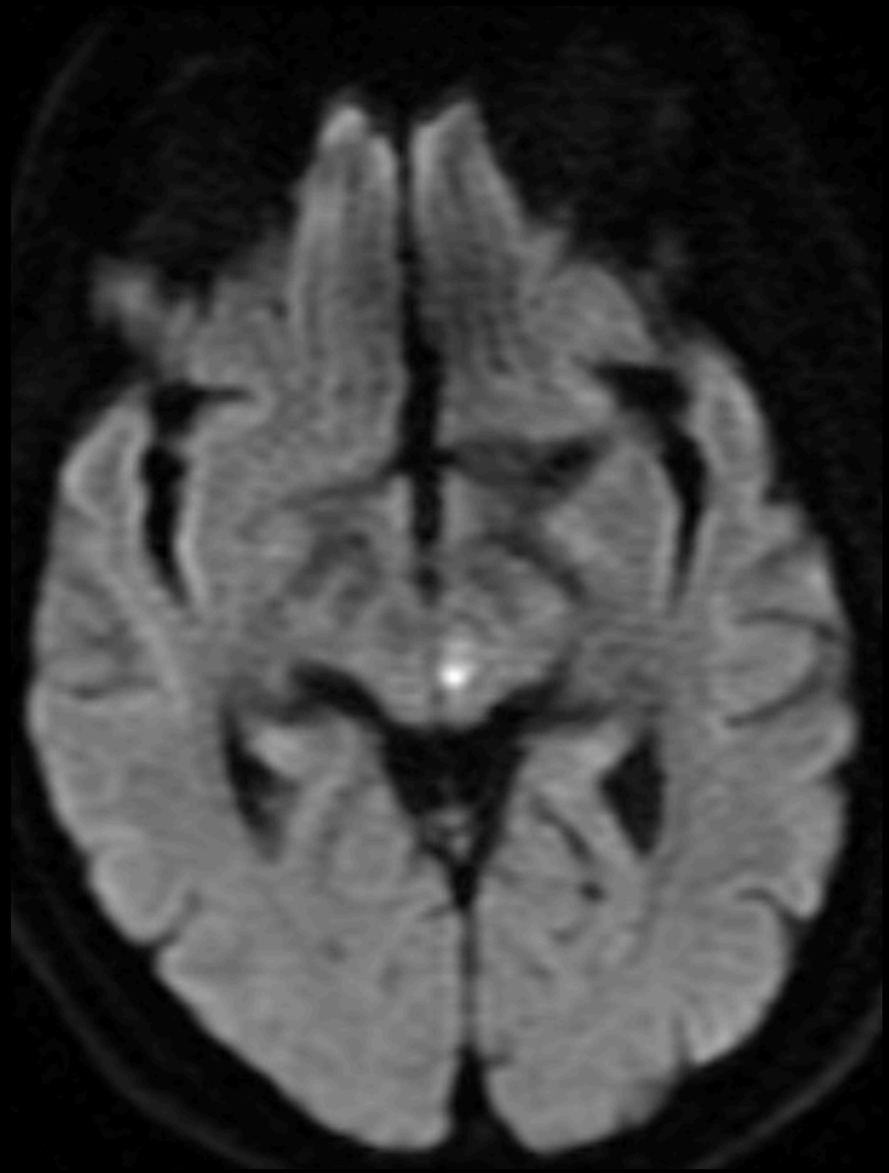
- Integrillin drip x 12h
- Loaded ASA in angio
- Loaded Plavix in ICU
- Extubated within 48h
- NIHSS 4



Remembered sudden change in his hearing before he lost consciousness

Conclusions

- This is a challenging pathology
- Thrombolysis is standard of care - it works!
- For severe posterior circulation LVO, EVT is a treatment option



Thank you!

christine.hawkes@medportal.ca