



Endovascular Thrombectomy 指引

Acute Ischemic stroke

< 4.5 h

Fit IV t-PA criteria?

Yes

IV t-PA

Yes

4.5-9 h or Wake-up

Fit EXTEND or WAKE-UP criteria?

4.5 - 6 h

- CTA or MRA

EVT criteria:

- Large artery occlusion
- NIHSS ≥ 8
- ASPECTS score ≥ 6
- \pm Perfusion

- CTA or MRA

No

- NIHSS ≥ 8

→ CTA or MRA

6 - 24 h

- NIHSS ≥ 8
- CTA/CTP
or MRA/MRP

EVT criteria:

- DAWN criteria
- DEFUSE-3 criteria

Fit EVT criteria?

No

Yes

EV Thrombectomy

Guidelines

- 2019 ASA/AHA guideline
- 2008 台灣腦中風防治指引
- 2013 靜脈血栓溶解劑治療急性缺血性腦中風指引
- 2019 急性缺血中風靜脈血栓溶解治療指引
- 2019 台灣腦中風學會急性缺血中風動脈內血栓移除治療指引

CLASS OF RECOMMENDATION

CLASS I	(STRONG)	Benefit >>> Risk
CLASS IIa	(MODERATE)	Benefit >> Risk
CLASS IIb	(WEAK)	Benefit \geq Risk
CLASS III: No Benefit	(MODERATE)	Benefit = Risk
CLASS III: Harm	(STRONG)	Risk > Benefit

LEVEL OF EVIDENCE

LEVEL A

LEVEL B-R **Randomized**

LEVEL B-NR **Nonrandomized**

LEVEL C-LD **Limited Data**

LEVEL C-EO **Expert Opinion**

EVT 健保規定

1. 前循環 < 8 小時、後循環 < 24 小時。
2. 影像診斷為顱內大動脈阻塞，包括 ICA, MCA(M1, M2), ACA, VA 和 BA。
3. NIHSS : 8 - 30。

EVT 收案條件

腦中風學會

健保規範	2019 AHA/ASA	COR	LOE
無限制	年齡 ≥ 18 歲	I	A
< 8 小時	< 6 小時		
NIHSS: 8-30	NIHSS: ≥ 6		
無	ASPECTS ≥ 6		
無	Pre-stroke mRS ≤ 1		
ICA or MCA(M1, M2)	ICA or MCA(M1)	IIb	B-R
	MCA(M2, M3)		C-LD
ACA, VA, BA	ACA, VA, BA, PCA	IIb	C-LD

EVT 收案條件

健保規範	2019 AHA/ASA	COR	LOE
無限制	年齡 ≥ 18 歲	I	A
< 8 小時	< 6 小時	IIb	B-R
NIHSS: 8-30	NIHSS: < 6	IIb	B-R
無	ASPECTS < 6	IIb	B-R
無	Pre-stroke mRS > 1	IIb	B-R
ICA or MCA(M1, M2)	ICA or MCA(M1)	IIb	B-R
	MCA(M2, M3)		
ACA, VA, BA	ACA, VA, BA, PCA		

EVT 收案條件

腦中風學會相同

健保規範

2019 AHA/ASA

COR LOE

前循環

< 8 小時

6-16 小時
(DAWN and DEFUSE-3 criteria)

I

A

16-24 小時
(DAWN criteria)

IIa

B-R

後循環 : VA, BA, PCA

< 24 小時

< 6 小時

IIb

C-LD

Endovascular thrombectomy

2019 AHA/ASA

COR LOE

Use of **stent retrievers**:
Solitaire, Trevo, Revive

I A

Direct aspiration: Penumbra

I B-R

Achieve a modified Thrombolysis in
Cerebral Infarction (**mTICI**) **2b/3**

I A

Use of a **proximal balloon guide catheter** or a
large-bore distal-access catheter

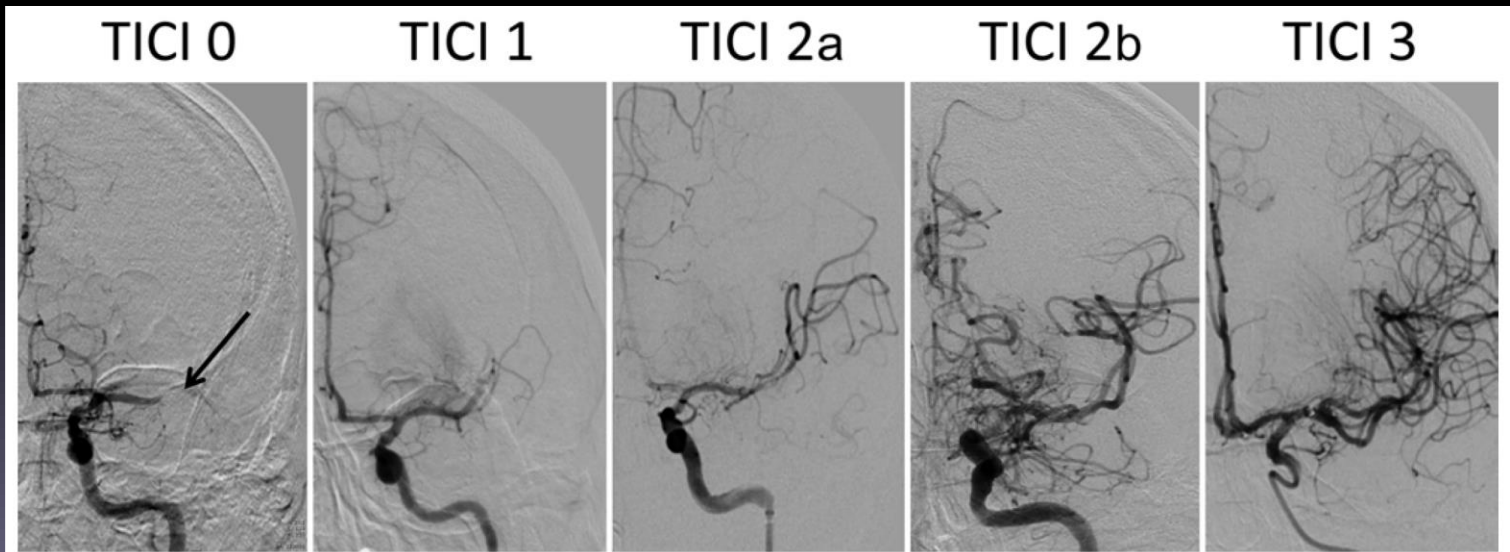
IIa C-LD

Tandem occlusions: both IC and EC

IIb B-R

mTICI score

- Grade **0**: no perfusion
- Grade **1**: limited antegrade reperfusion
- Grade **2**
 - **2a**: reperfusion of **< 50%** ischemic territory
 - **2b**: reperfusion of **$\geq 50%$** ischemic territory
- Grade **3**: complete antegrade reperfusion



EVT 收案條件

腦中風學會

COR

LOE

年齡 ≥ 80 歲

預期剩餘生命 < 1 年者

嚴重系統性疾病

腎功能異常 ($Cre > 2$ mg/dL)

2週內有接受過重大手術

血小板偏低 ($< 100K/mm^3$)

48小時內曾使用 **NOAC**

頑強性高血壓，經積極的治療(靜脈給藥)仍無法改善

血糖過高或過低 (> 400 mg/dL 或 < 50 mg/dL)

懷孕病人

增加腦出血風險的病人

IIb

B-R

Endovascular thrombectomy

2019 AHA/ASA

COR LOE

Observation after IV alteplase

III: Harm

B-R

IV glycoprotein IIb/IIIa inhibitors

IIb

C-
LD

Salvage with IA fibrinolysis

IIb

C-
LD

Endovascular thrombectomy

2019 AHA/ASA

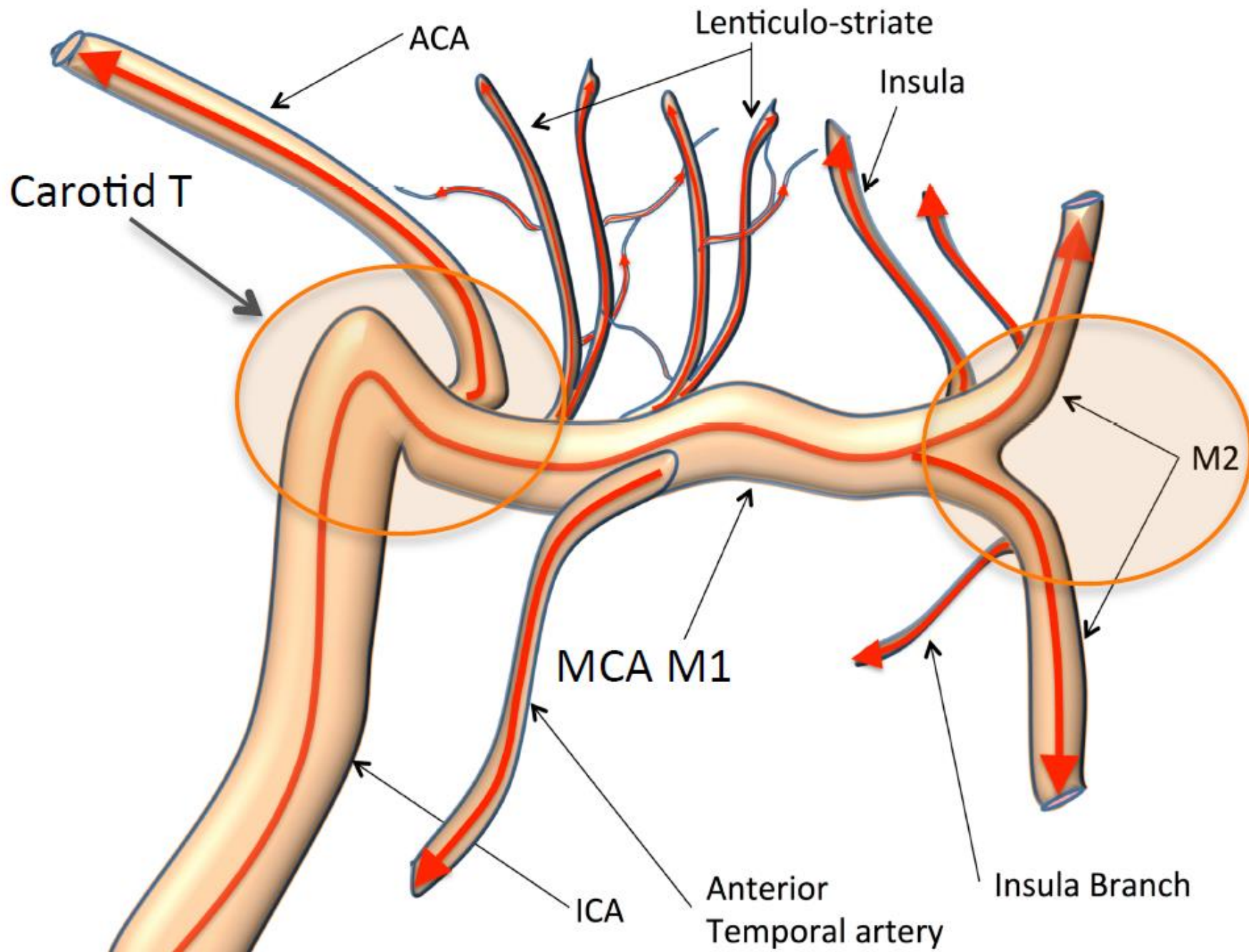
	COR	LOE
Receive IV t-PA first if eligible	I	A
Select conscious sedation or general anesthesia	IIa	B-R
Keep BP \leq 180/105 mmHg for 24 hrs after procedure	IIa	B-NR
Keep BP \leq 180/105 mmHg with successful reperfusion. (SBP < 140 mmHg in <i>DAWN trial</i>)	IIb	B-NR

EVT principles

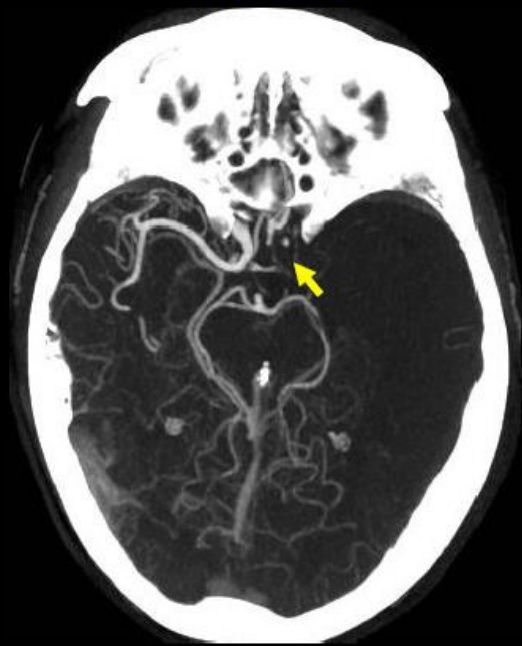
1. IV t-PA first
2. Large intracranial artery occlusion
3. Severe stroke severity
4. Within treatment time window
5. With large salvaged tissue
6. Exclude large infarct core
7. Baseline condition matter

確定大血管阻塞

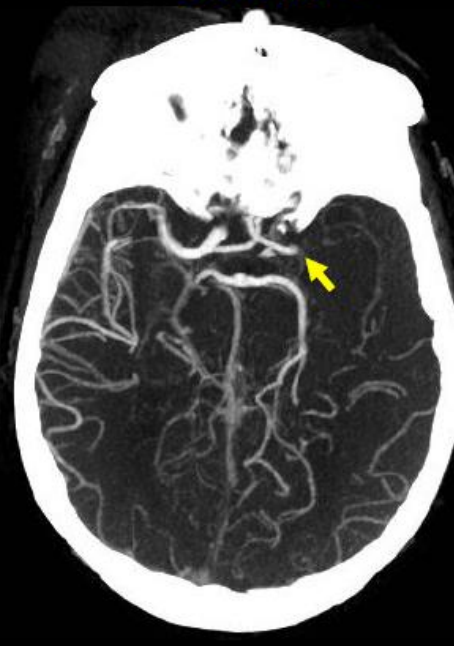
1. CT angiography: -
multiphase CTA or
quantitative CTP simultaneously
2. MR angiography
+ quantitative perfusion simultaneously



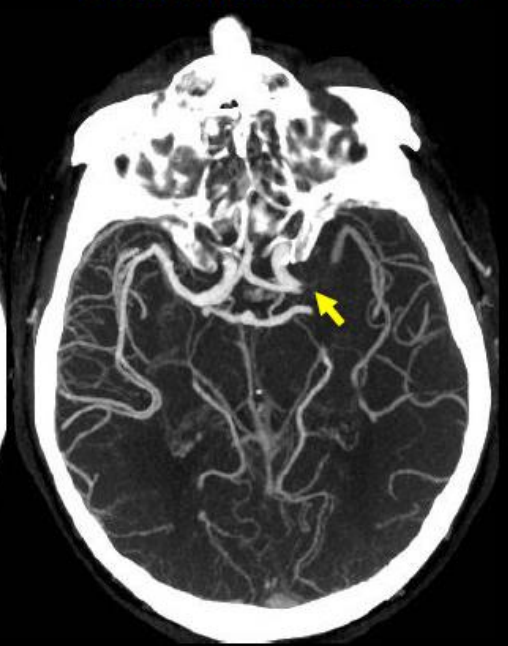
Carotid T



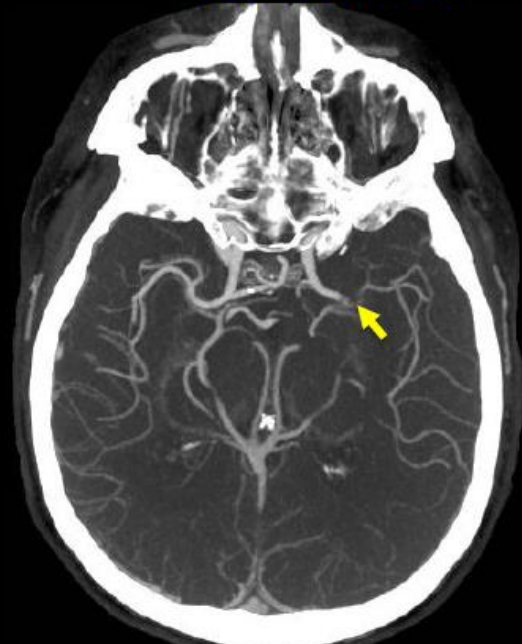
Carotid L



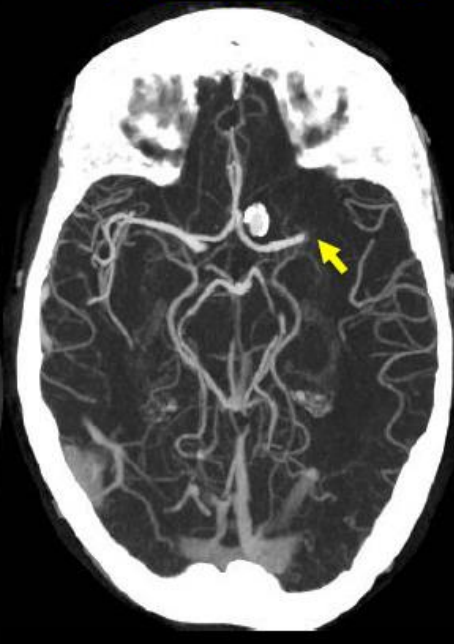
Proximal M1 MCA



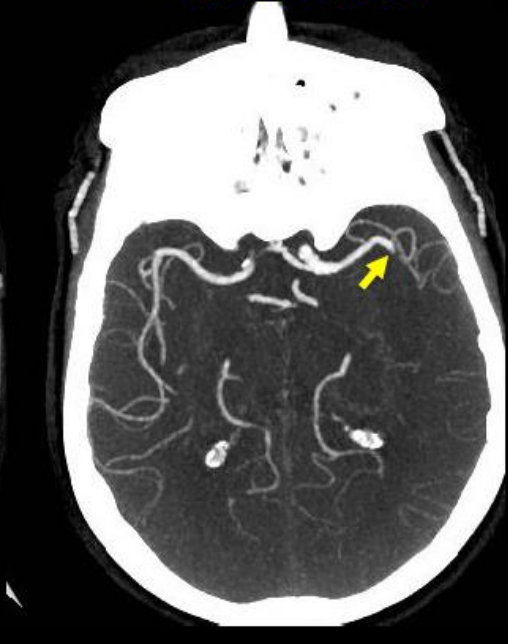
Mid M1 MCA



Distal M1 MCA



All M2 MCA

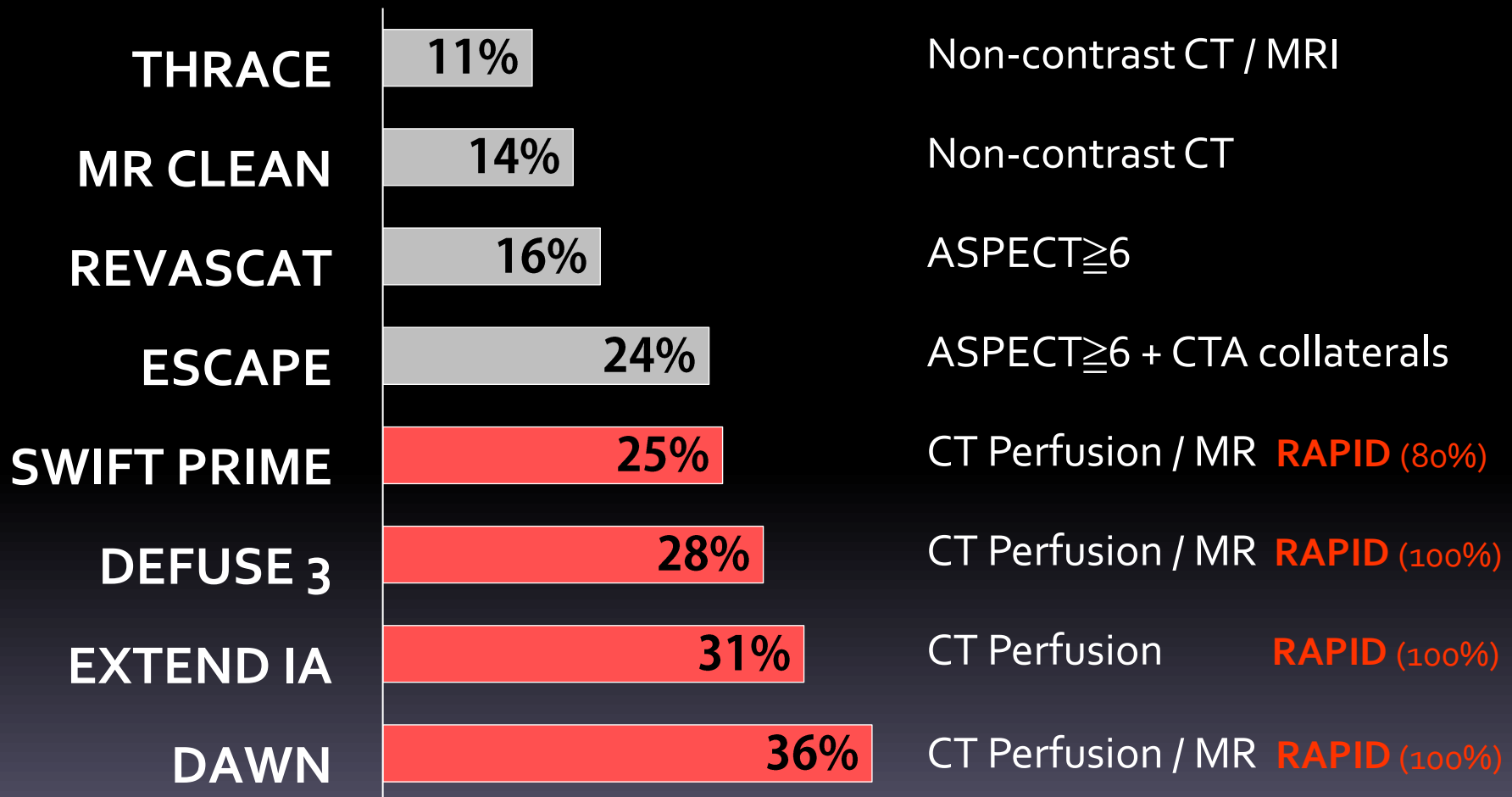


排除 Large Infarct Core

1. ASPECTS in Non-Contrast CT
2. MRI (ADC < 620)
3. CT Perfusion or MR Perfusion
 - rCBF < 30%
 - T-max delay > 6s

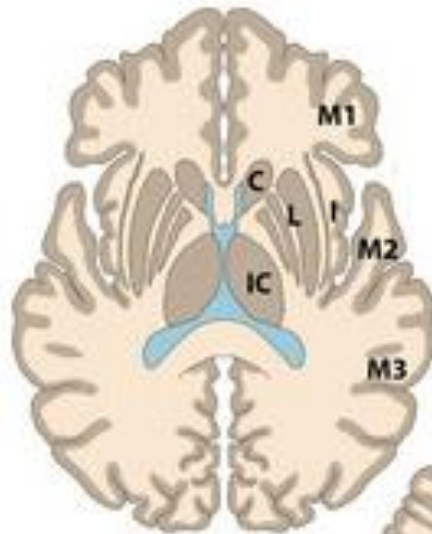
Imaging selection for thrombectomy trials

Absolute benefit: % increase in mRS 0-2 at 90 d

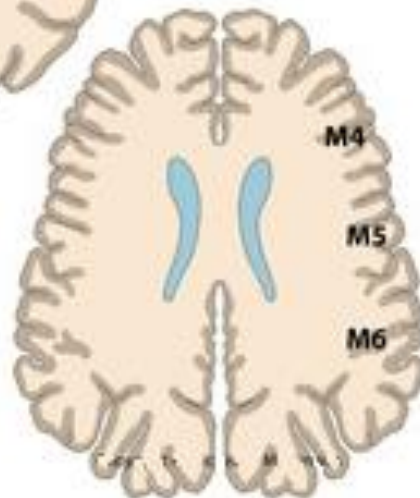


Alberta Stroke Program Early CT Score

Ganglionic Level



Supraganglionic Level



ASPECTS

- C- Caudate
- L- Insular ribbon
- IC- Internal Capsule
- L- Lentiform nucleus
- M1- Anterior MCA cortex
- M2- MCA cortex lateral to the insular ribbon
- M3- Posterior MCA cortex
- M4- Anterior MCA superior territory
- M5- Lateral MCA superior territory
- M6- Posterior MCA superior territory

ASPECTS Score = /10

8-10 small core

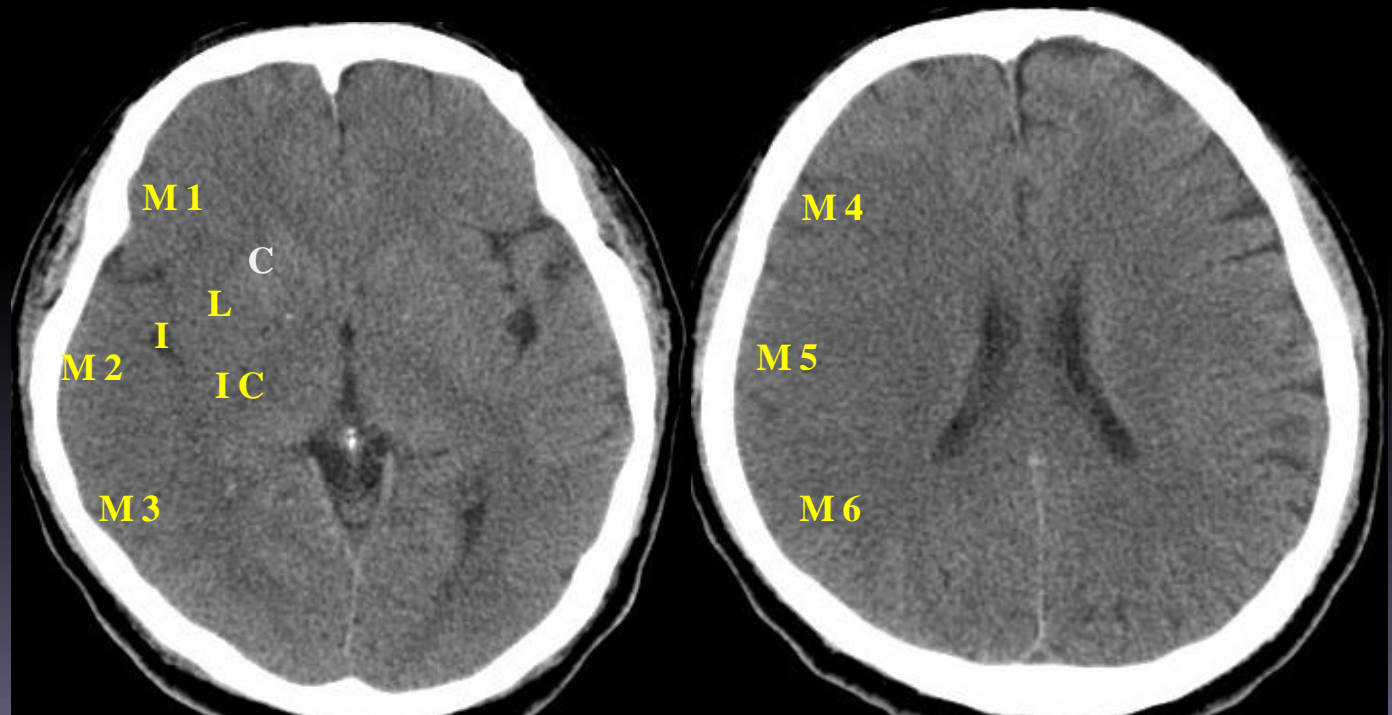
6-7 moderate core

0-5 large core

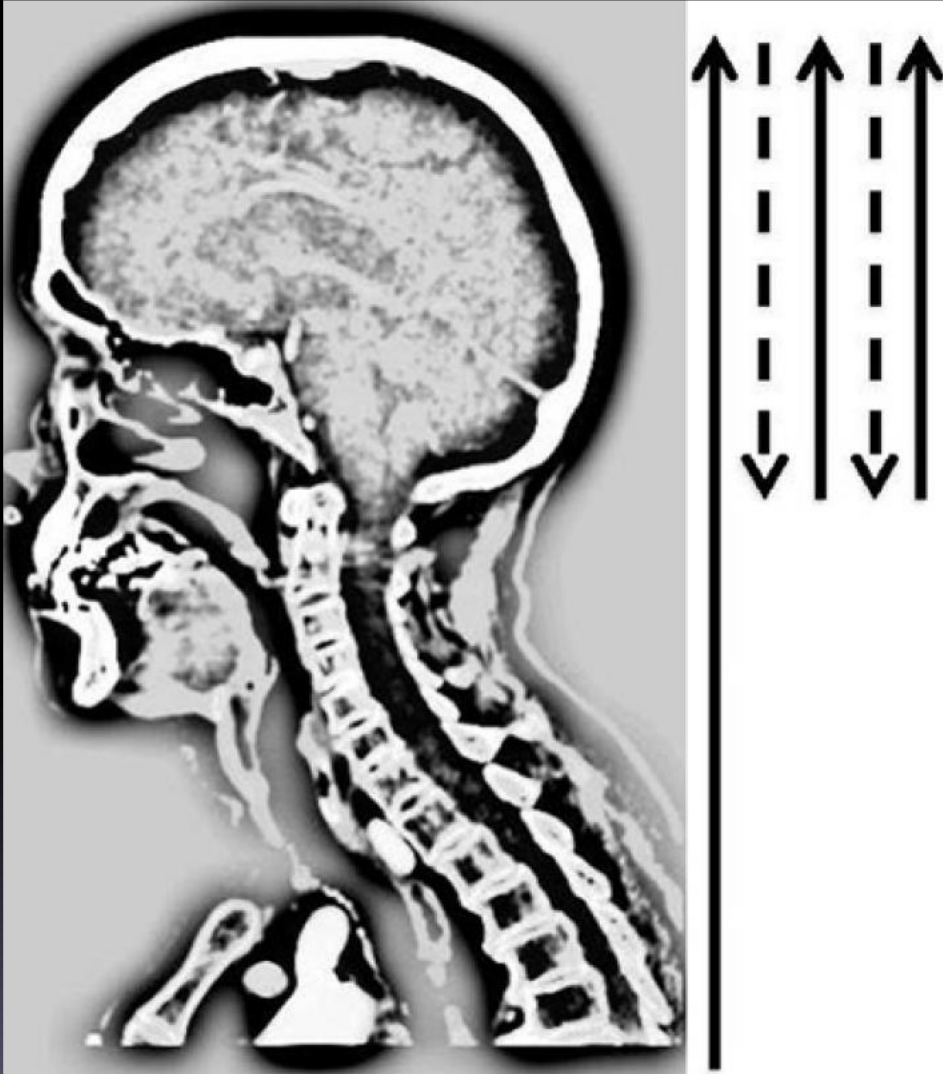
Early ischemic changes in NCCT

- Sulcal effacement
- Loss of insular ribbon
- Loss of gray-white interface
- Basal ganglia hypodensity

ASPECT score = 1



Multiphase CTA



Phase **1**: peak-arterial

Phase **2**: peak-venous

Phase **3**: late-venous

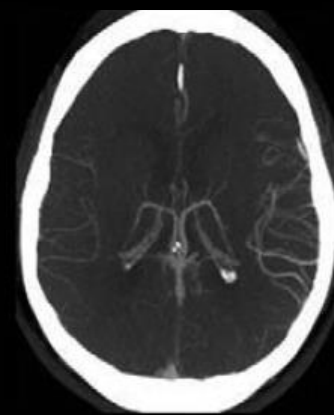
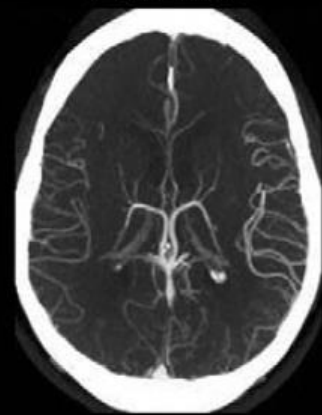
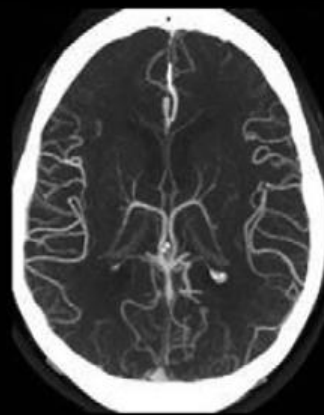
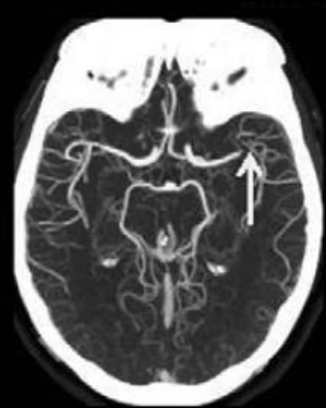
Occlusion Site

Phase 1

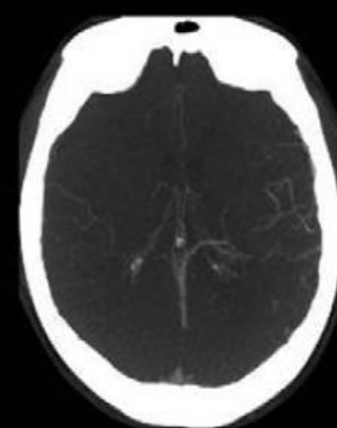
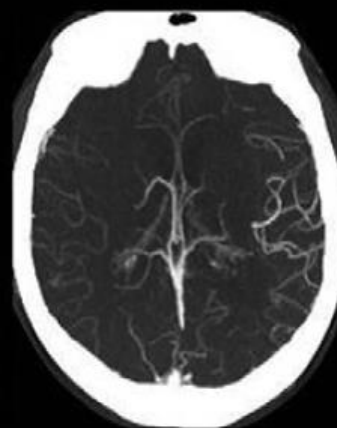
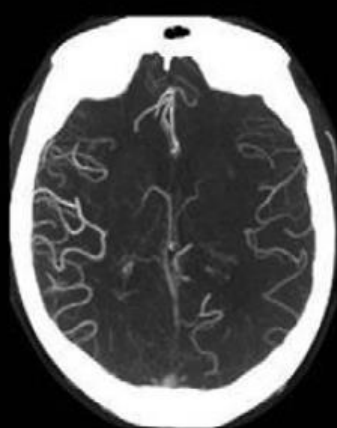
Phase 2

Phase 3

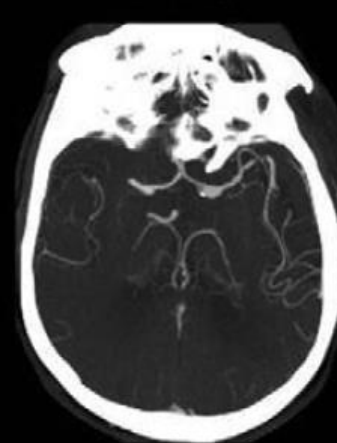
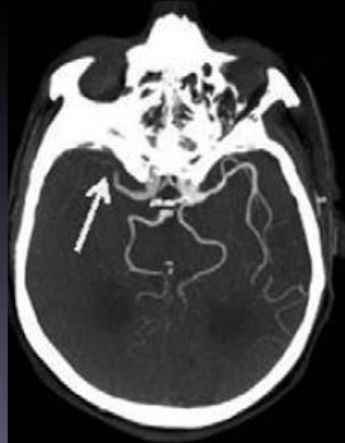
Good



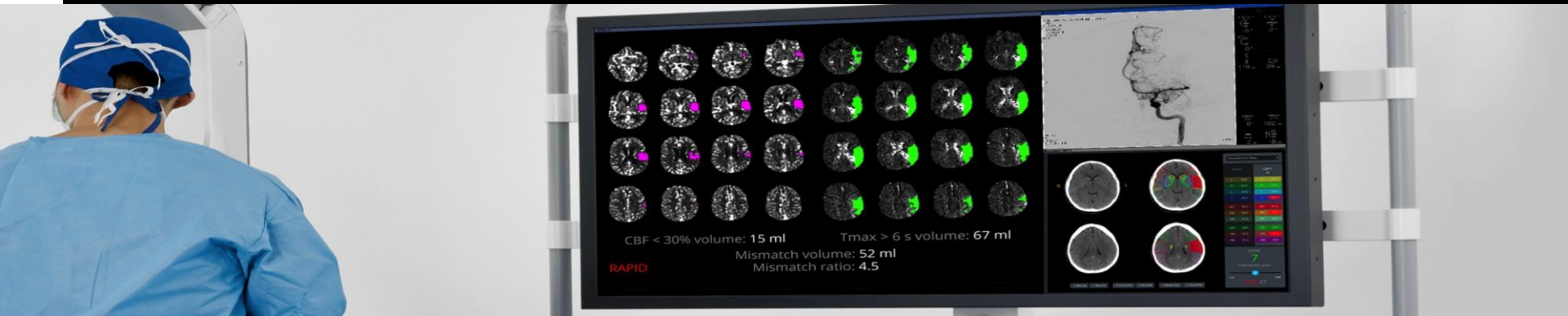
Intermediate



Poor

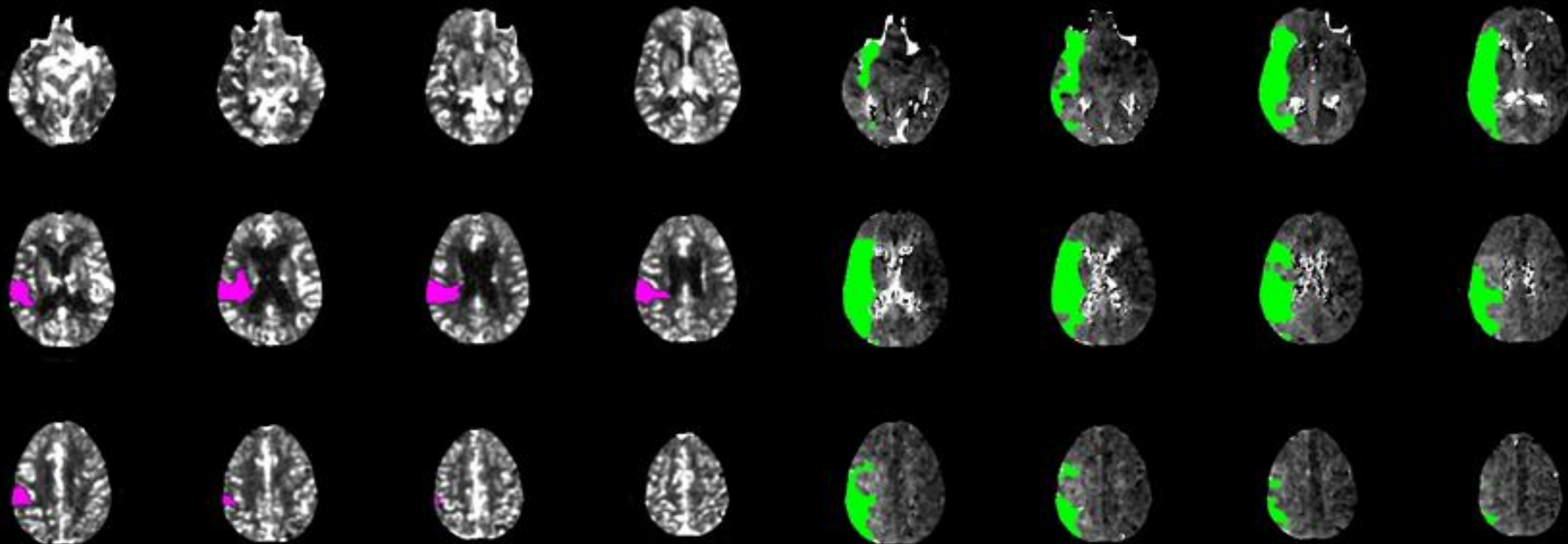


RAPID



- RAPID processing (30 sec – 2 min)
- Fully automated, zero-click workflow
- Quantified outputs
- Intuitive maps, emailed instantly to the team
- CT/MRI, manufacturer independent
- Proven accuracy in numerous clinical trials

RAPID CTP



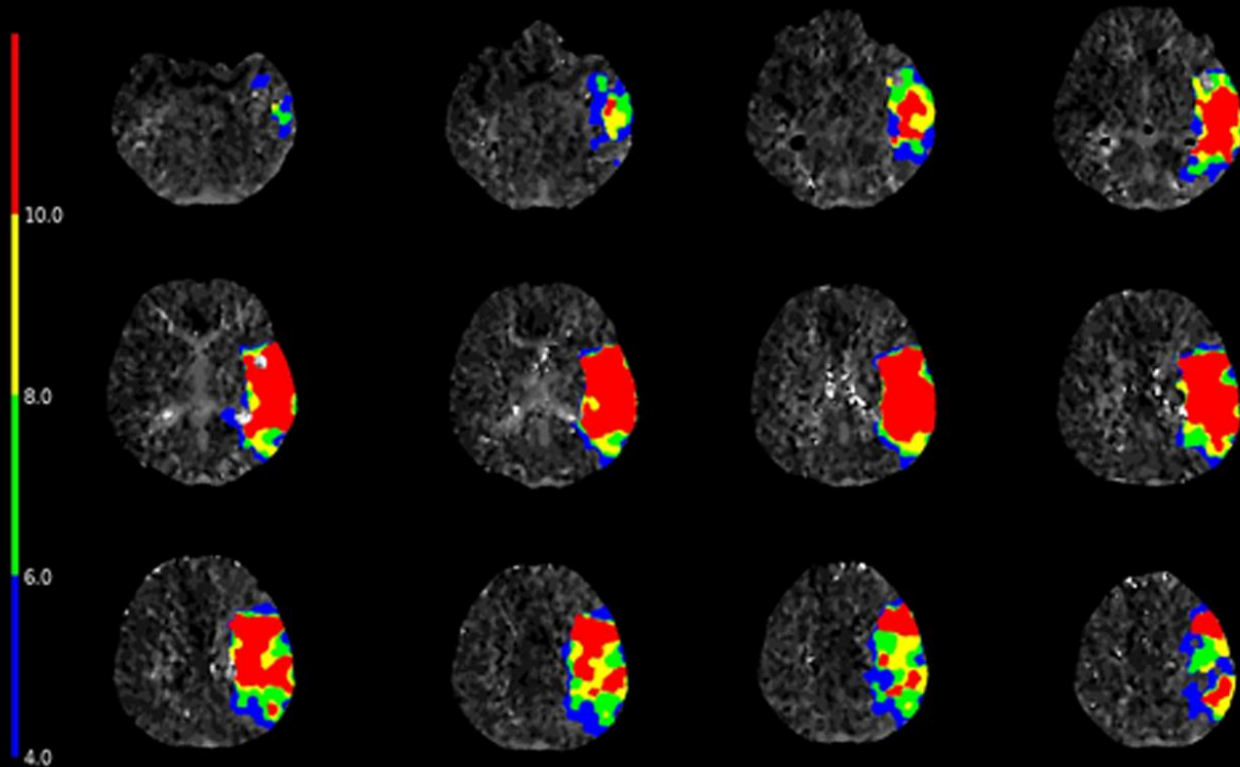
CBF (<30%) volume: 14.9 ml

Perfusion (Tmax>6.0s) volume: 105.4 ml

Mismatch volume: 90.5 ml

Mismatch ratio: 7.1

RAPID Collateral Maps



T_{max}>10s volume: 67 ml

T_{max}>8s volume: 88 ml

T_{max}>6s volume: 112 ml

T_{max}>4s volume: 142 ml

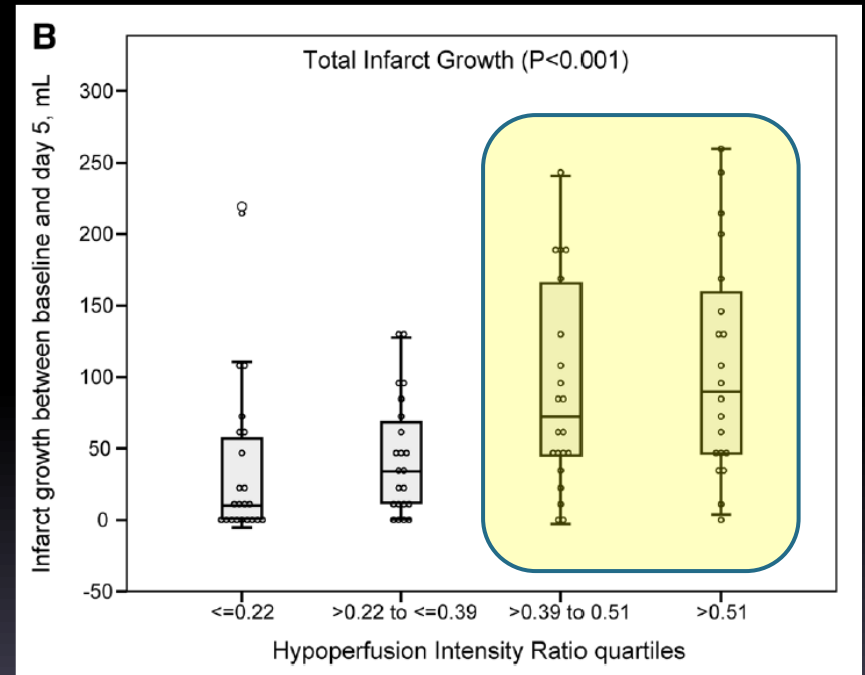
Hypoperfusion Index (T_{max}>10s/T_{max}>6s): 0.6

Hypoperfusion Intensity Ratio (HIR)

- DEFUSE 2 Cohort

~ *Stroke*. 2014;45:1018-1023.

$(T_{\max} > 10s) / (T_{\max} > 6s)$ ratio: **> 0.4**



→ **HIR > 0.4** predicts infarct progression.

Imaging Criteria - **DAWN** < 24 hours

Clinical Imaging Mismatch

Measured by MR-DWI or CTP-rCBF maps:

Age	NIHSS	Infarct Volume
≥ 80	≥ 10	<21 ml
< 80	≥ 10	<31 ml
< 80	≥ 20	<51 ml

Imaging Criteria – DEFUSE 3 < 16 hours

Target Mismatch Profile

Measured by MR or CT Perfusion maps:

Core volume	$T_{\max} > 6s$ / Core Ratio	Mismatch Volume
<70 ml	>1.8	>15 ml

rCBF<30% or DWI

Imaging Criteria – **EXTEND** 4.5 - 9 hours

Target Mismatch Profile

Measured by MR or CT Perfusion maps:

Core volume	$T_{\max} > 6s$ / Core Ratio	Mismatch Volume
<70 ml	>1.2	>10 ml

rCBF<30% or DWI

Imaging Criteria – **WAKE-UP** > 4.5 hours

DWI-FLAIR Mismatch by MRI

