

CT imaging in acute stroke:

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Disclosures

- No financial or commercial disclosures
- Tertiary multidisciplinary Neurovascular service at Monash Health
- Cases involved with during clinical practice
- Thanks to my Neuroscience colleagues and mentors

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Outline

- Concepts in Stroke physiology
- Clinical goals in acute stroke imaging
- Myths and truths of CT imaging in acute stroke
 - Case-based approach

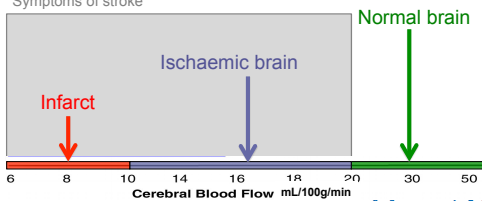
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CONCEPTS

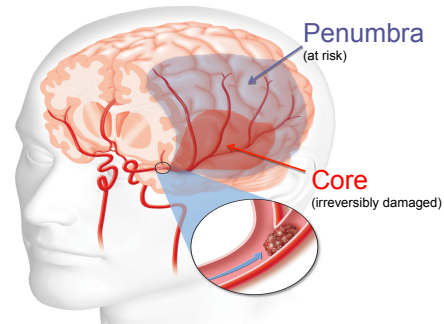
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Concepts

Symptoms of stroke



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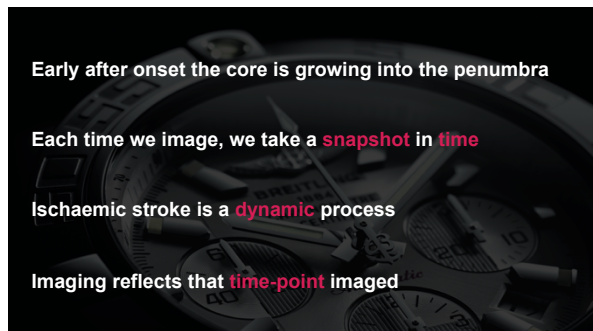


Early after onset the core is growing into the penumbra

Each time we image, we take a **snapshot in time**

Ischaemic stroke is a **dynamic** process

Imaging reflects that **time-point** imaged



Imaging goals

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Clinical goals of Neuroimaging

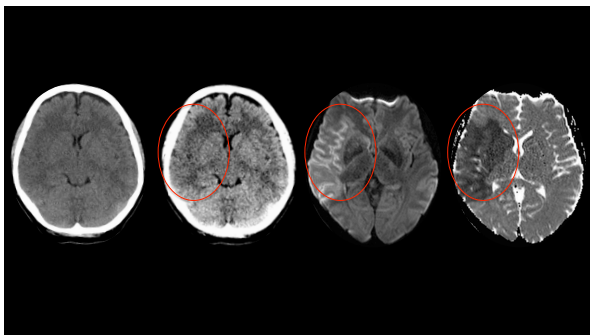
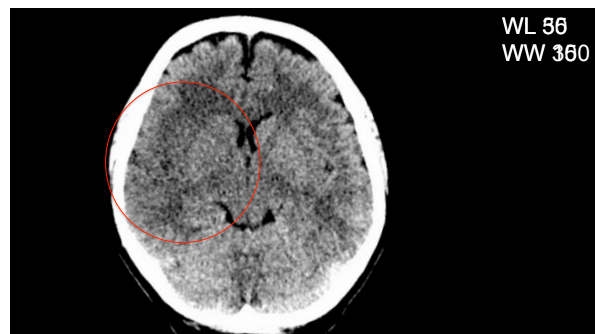
- What are we really interested in?
- Is it an ischaemic stroke?
- Is there a clot?
- How big is the core?
- Is there a penumbra?
- These are the main questions that impact on patient outcome

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Myth or truth?

Within 6 hours, NCCT has poor sensitivity for stroke diagnosis and core detection

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Myth or truth?

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Myth

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Truth?

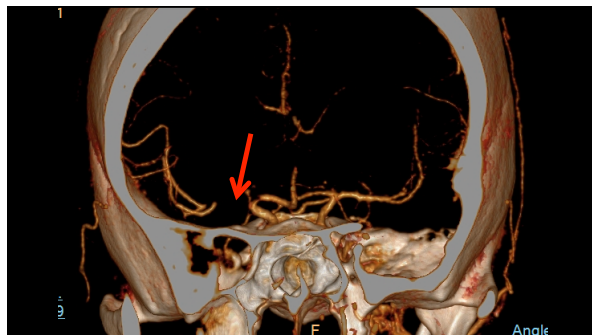
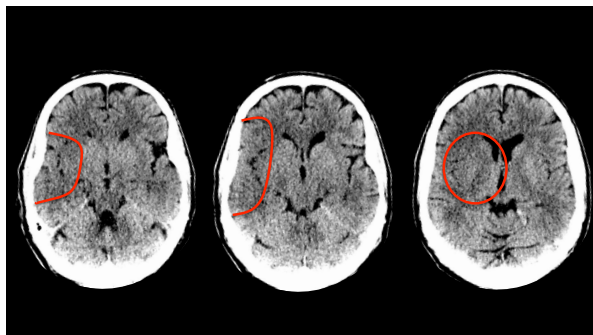
- Using non standard and variable WW and WL
 - Patients with <6 hour MCA stroke
 - Sensitivity increases by at least 10%
 - No loss of specificity

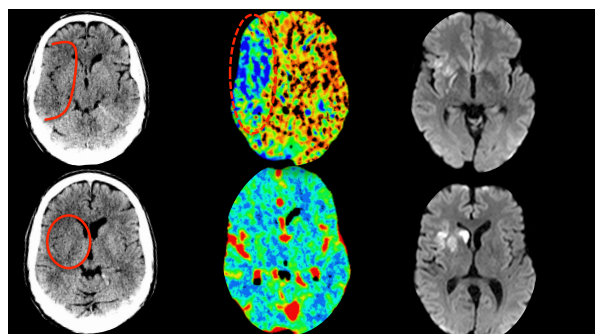
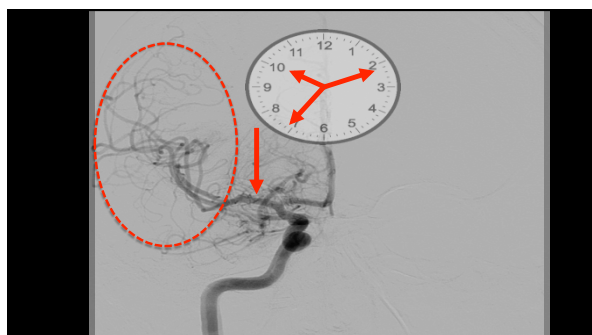
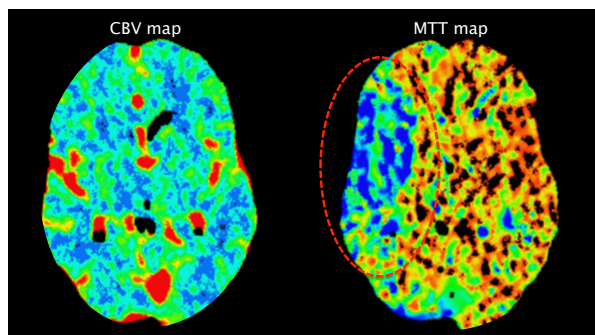
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Myth or truth?

Abnormal tissue on NCCT = core ie “dead brain”

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Myth

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Truth?

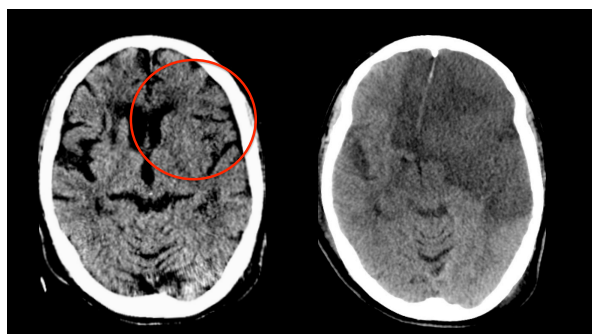
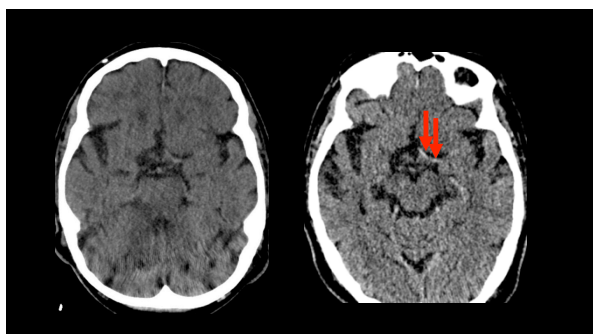
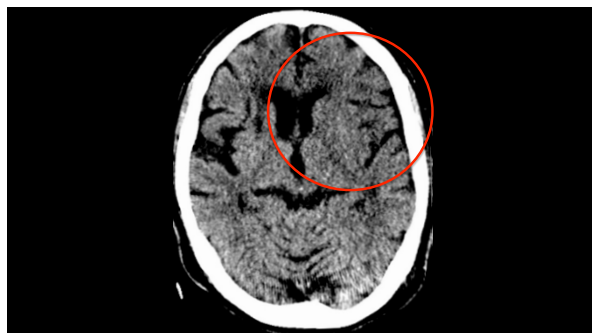
- Abnormal tissue on NCCT is ischaemic tissue
- Is a snapshot in time
- In early (0-6 hours) may contain “core” and “penumbra”

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Myth or truth?

- NCCT has poor sensitivity for thrombus

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NCCT and thrombus

- Thin section NCCT improves sensitivity for thrombus
 - 58 patients with CTA proven proximal M1 MCA occlusion
 - 1.25 mm, 2.5 mm, 3.75 mm and 5 mm
 - 5 mm NCCT, 1 in 4 missed
 - 2.5 mm or less, all thrombi detected
 - Increases diagnostic confidence

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29 Riedel Stroke 2010

NCCT and thrombus

Pathologic validation of clot length determined using thin section non-contrast CT

Albert J Yoo^{1,2}, Thabele M Leslie-Mazwi¹, Christian H Riedel³, Ronil V Chandra¹

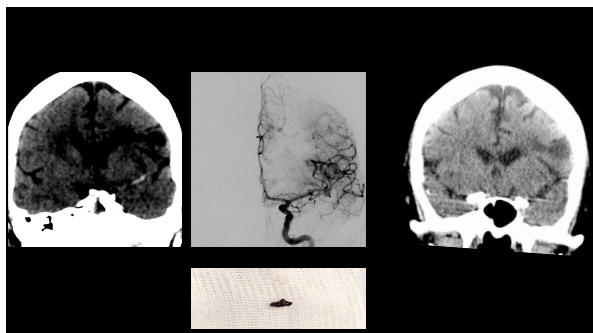
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Myth or truth?

- NCCT has poor sensitivity for thrombus

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Myth

- NCCT has poor sensitivity for thrombus

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Truth?

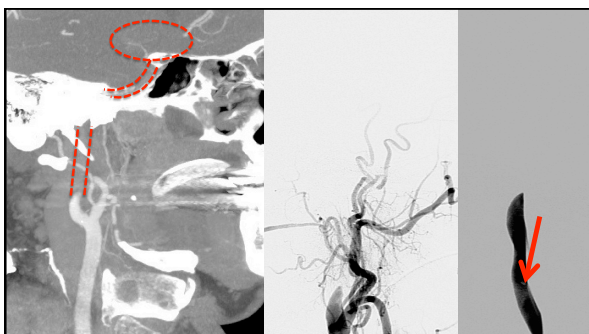
- Thin section (2.5 mm or less) has good sensitivity for thrombus detection

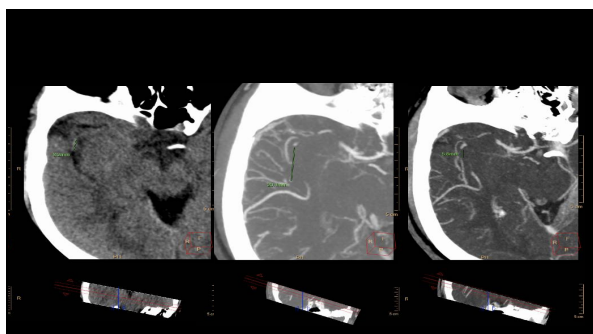
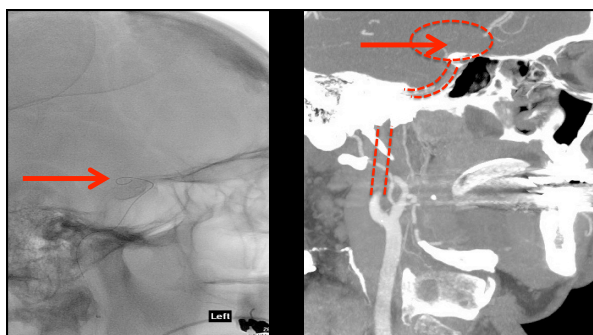
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Myth or truth?

- Non opacification on CTA = clot

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Myth or truth?

- Non opacification on CTA = clot

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Myth

- Non opacification on CTA = clot

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Truth?

- CTA can overestimate clot length
- Single pass CTA provides a snapshot in time
- Pre/Post CT can be useful in clot assessment

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Myth or truth?

CTP is only useful for assessment of core and penumbra

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Perfusion imaging for stroke diagnosis

- Stroke mimics account for 20% of presentations
- Perfusion imaging to confirm stroke diagnosis
 - 20-30% increase in sensitivity over CT
 - 10% increase in sensitivity over CT / CTA
 - Normal CTP in majority of stroke mimics
 - Could support withholding of thrombolytics

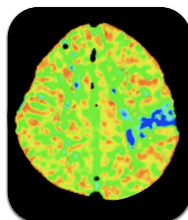
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44 Libman et al. Arch Neurol 1995; Hopjan et al. Radiology 2010; Campbell et al. J Neurol Neurosurg Psychiatry 2013

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Perfusion imaging for clot detection

- CTA / MRA typically performed
 - Vascular imaging can be extracted from CTP
 - Distal occlusions?
 - May increase sensitivity over MRA / CTA



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45 Frolich et al Stroke 2012

Myth or truth?

CTP is only useful for assessment of core and penumbra

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Myth

CTP is only useful for assessment of core and penumbra

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Truth?

CTP is useful for confirmation of stroke diagnosis and identifying distal occlusions

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Summary

- Concepts and clinical goals of acute stroke imaging
- Myths and truths of CT imaging
 - Adjust width and level of NCCT to increase detection
 - Early on abnormalities on NCCT may not be dead brain
 - Thin sections increase sensitivity for clot detection
 - Non opacification on CT does not mean clot
 - CTP multiple uses

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Thank you

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