ICCA STROKE 2019

WIST

MRI AS A PRIMARY IMAGING TOOL IN ACUTE STROKE

Sunithi Mani

Christian Medical College, Vellore

Department of Diagnostic Imaging, JPMC, Brunei, Darussalam

DISCLOSURE STATEMENT OF FINANCIAL INTEREST

Within the past 12 months, I or my spouse have no financial interest/arrangement or affiliation with any organization other than those I work at

AFFILIATION/FINANCIAL RELATIONSHIP	COMPANY
• Grant/Research Support • Consulting Fees/Honoraria • Major Stock Shareholder/Equity • Royalty Income • Ownership/Founder • Intellectual Property Rights • Other Financial Benefit	• **Nil**

Background

Concerns in Acute Stroke Imaging

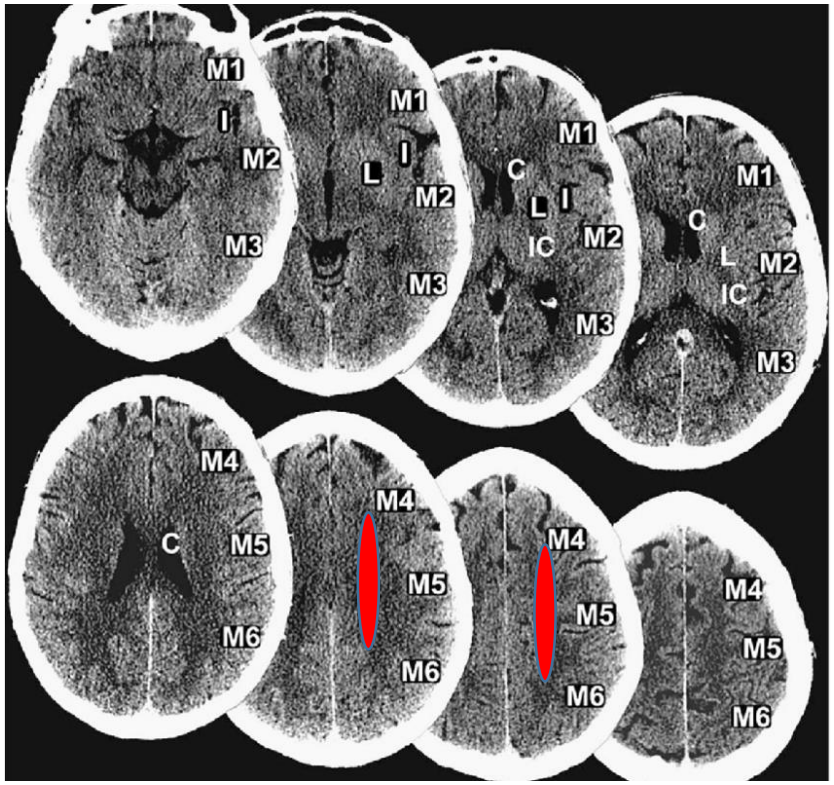
- Infarct Core
- Penumbra
- State of the Collaterals
- Risk of hemorrhage
- Presence and length of thrombus
- Mimics

"Parenchyma,Pipes,Perfusion,Penumbra" (4P's)*Srinivasan et al. RadioGraphics 2006; 26:S75–S95*

Infarct core

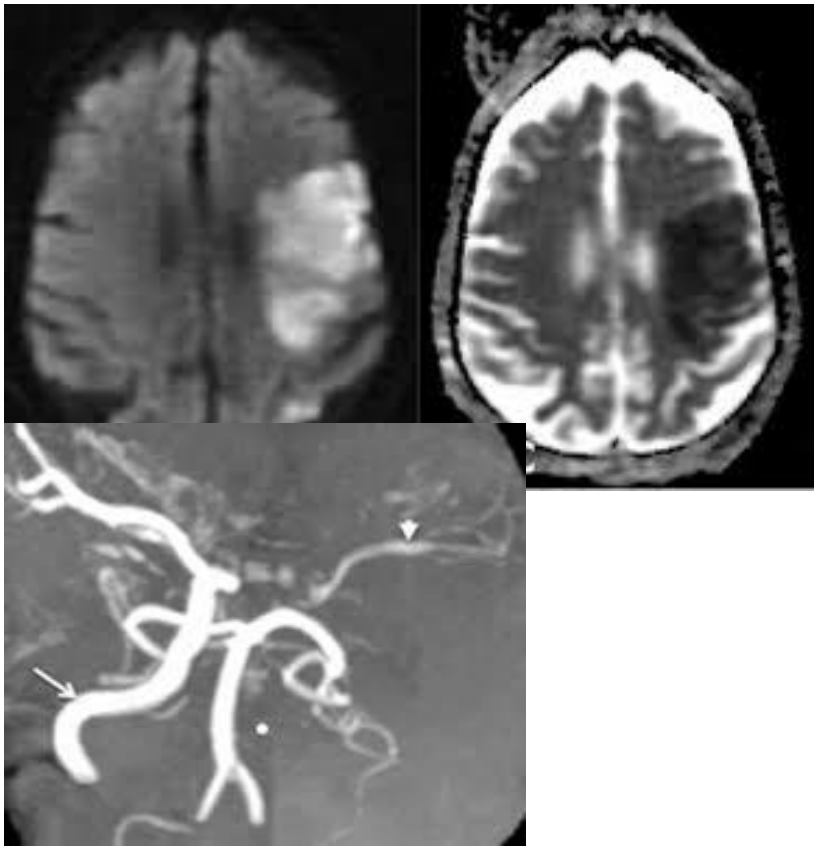
CT

- ASPECTS



MRI

- DWI



Penumbra

CT

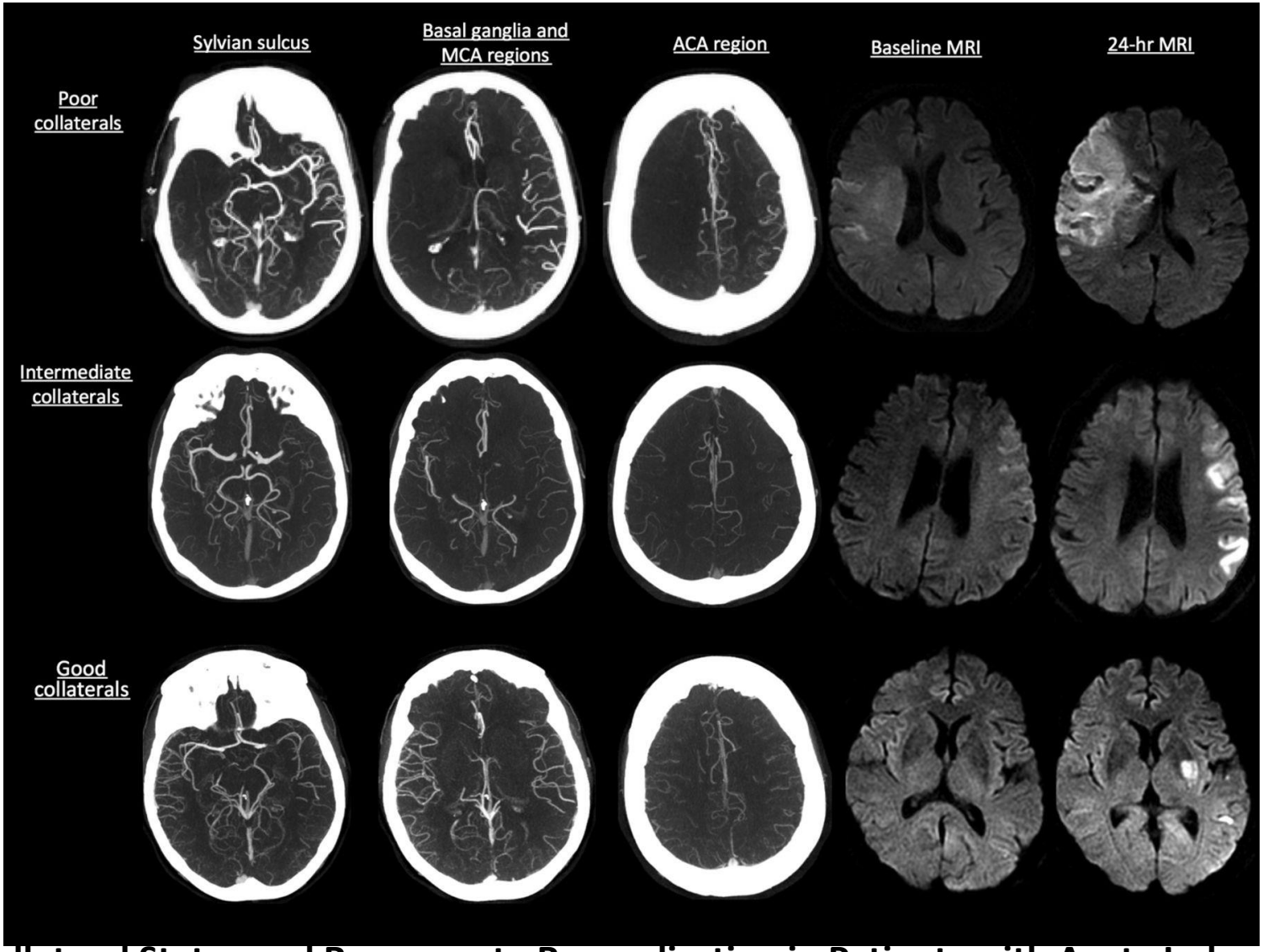
- Negative CT for acute infarct
- - Presumption
- - CTA required or CT Perfusion

- ASPECTS > 7 – can proceed for thrombolysis
- ICA occlusion related deep perforator infarct can be missed

MRI

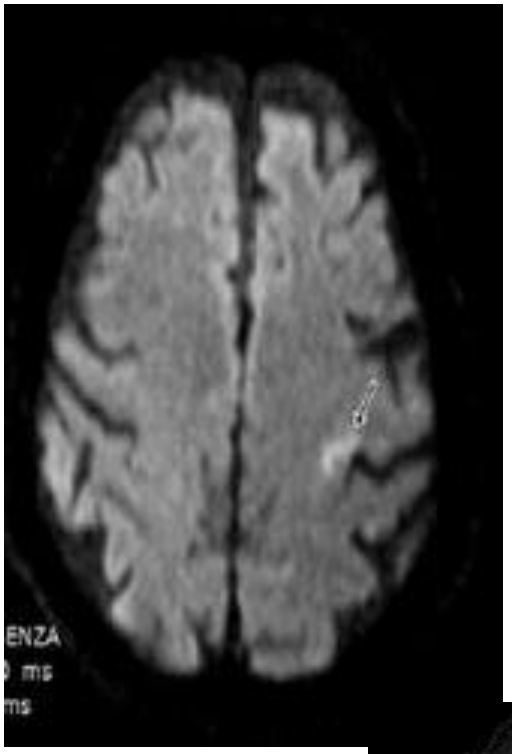
- Volume of acute infarct which cannot be salvaged can be identified

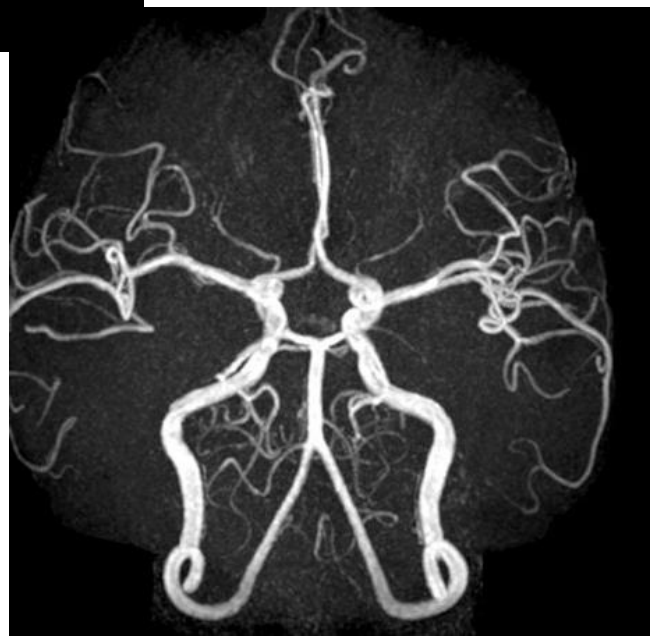
- Smaller the volume, better the outcomes



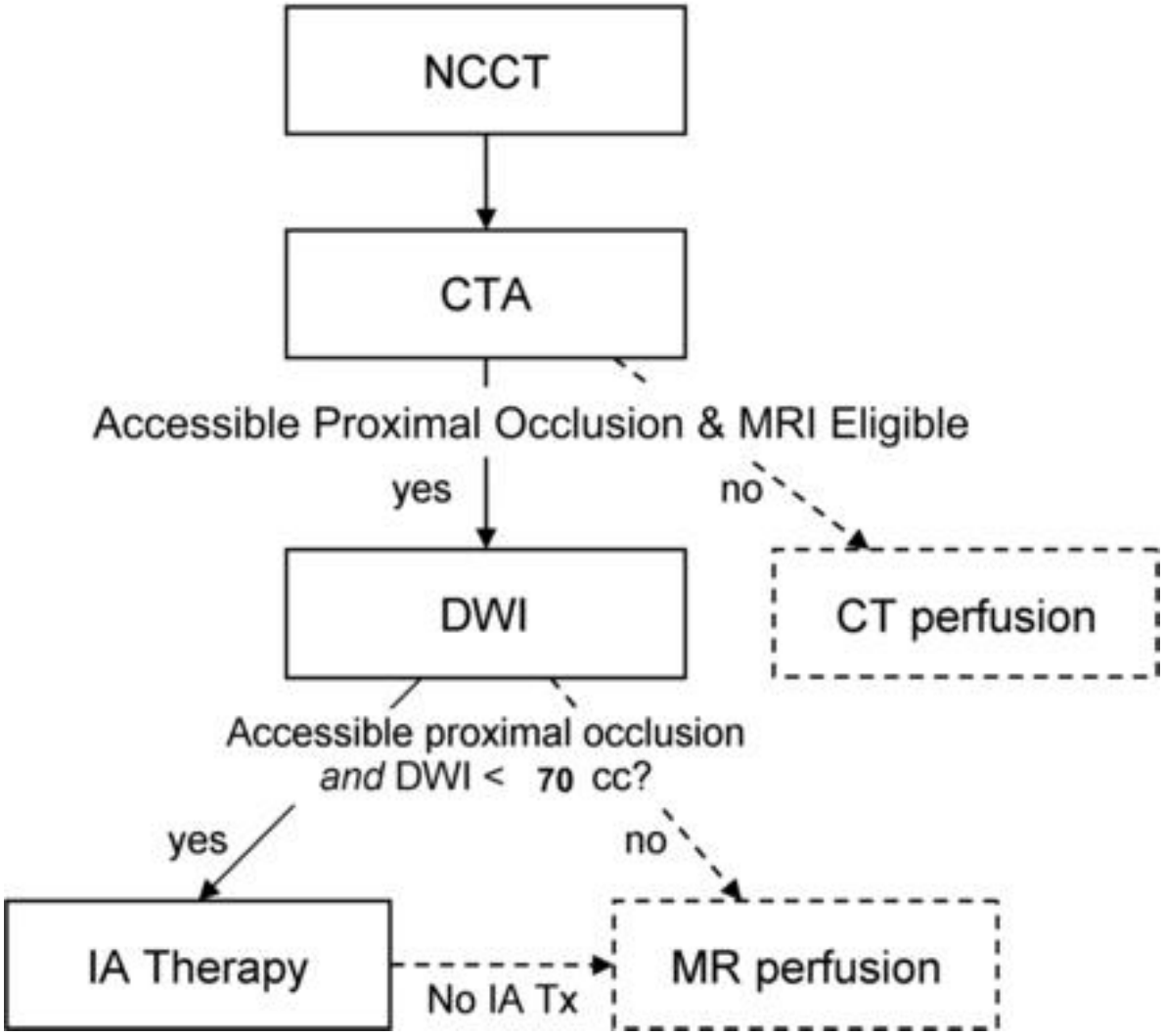
CTA Collateral Status and Response to Recanalization in Patients with Acute Ischemic Stroke V. Nambiar, S.I. Sohn, M.A. Almekhlafi, H.W. Chang, S. Mishra, E. Qazi, M. Eesa, A.M. Demchuk, M. Goyal, M.D. Hill and B.K. Menon. American Journal of Neuroradiology May 2014, 35 (5) 884-890; DOI: https://doi.org/10.3174/ajnr.A3817

- Young lady
- Weakness of hand only
- Within 2 hrs
- ?? Real or functional
- MRI -

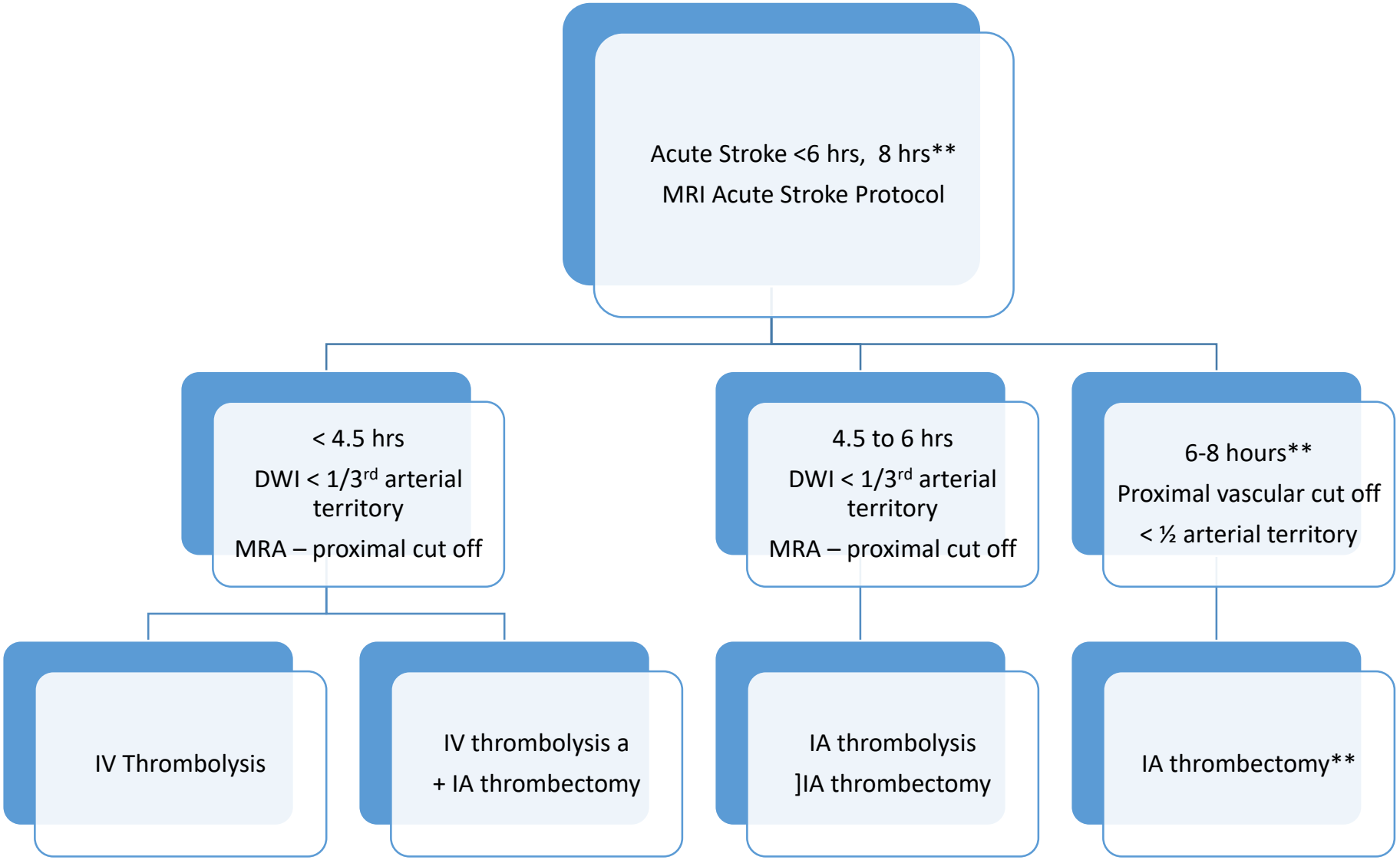




MGH Acute Stroke Imaging Algorithm



CMC Acute Stroke Algorithm



1 year data

- Number of patients imaged – 721
- Number of acute stroke – 432
- Number treated with IV thrombolysis – 66
- Number treated with IA thrombectomy – 22

Number of Stroke codes activated 80	
1. Acute ischemic strokes	31
2. Transient ischemic attacks	7
3. Acute Haemorrhagic strokes	9
4. Stroke Mimics (imaging done)	8
5. Not considered as strokes by stroke team (imaging not done)	3
Admitted under Neurology	3
Admitted under Medicine / other units	14
In Hospital Strokes	3
DISCHARGE/DAMA From Casualty	14
6. IV Thrombolysis	.....-
7. Mechanical thrombectomy (+/- IV)	3

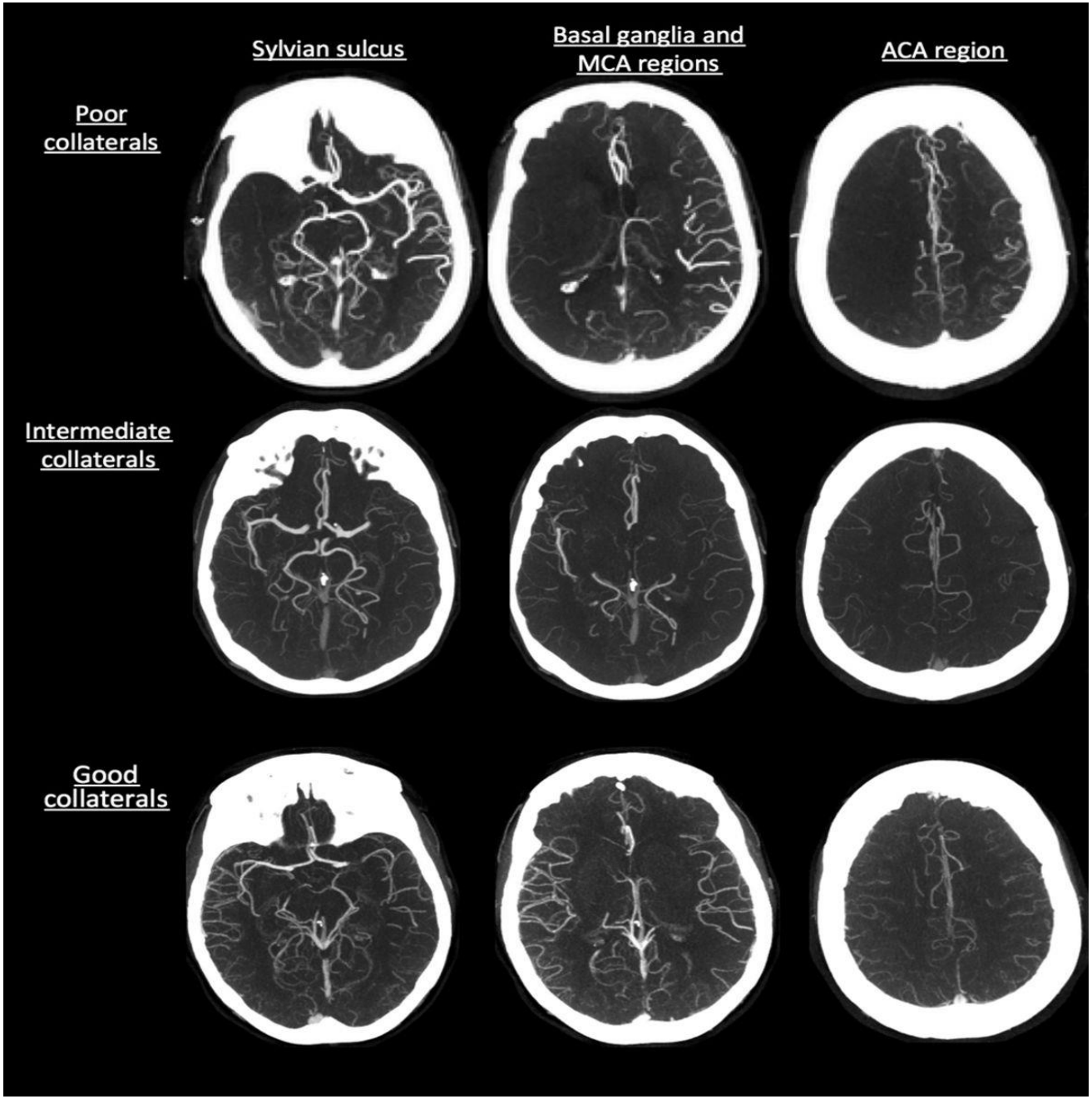
State of the Collaterals

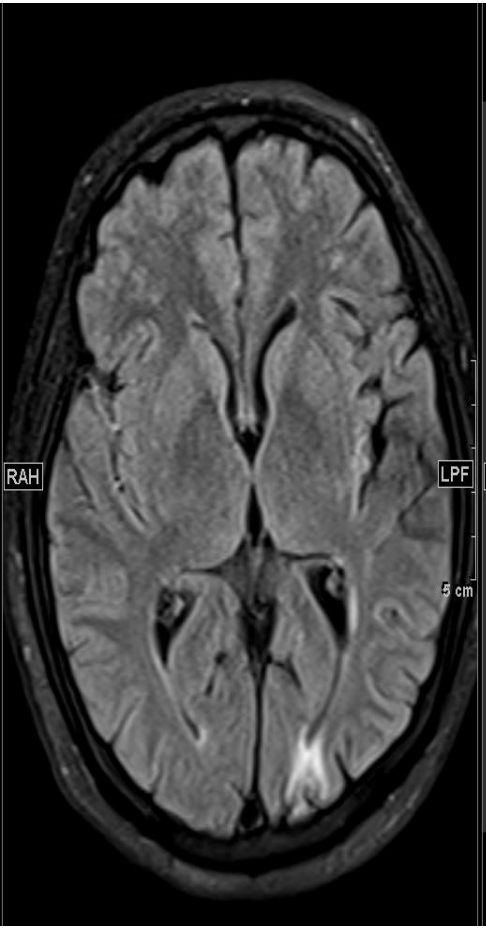
CT Angio

- Proximal vascular compromise
- Triple phase CT
- Contrast load

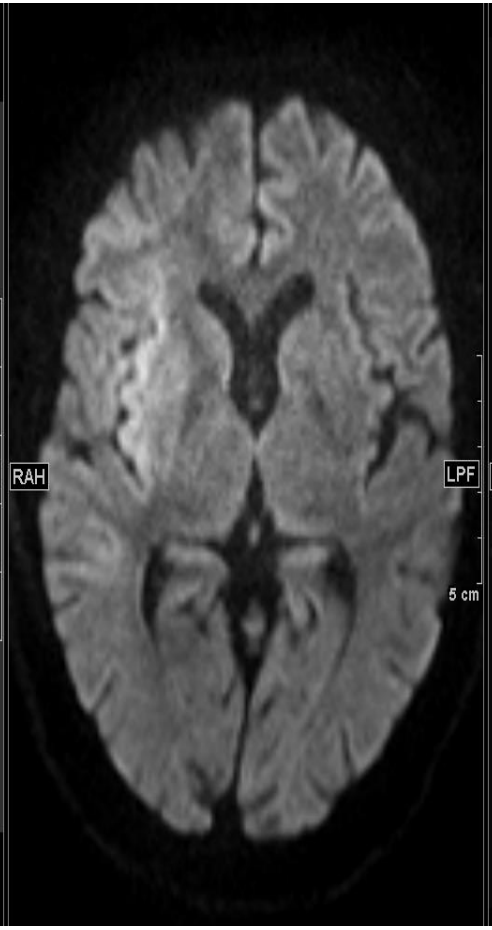
MRI FLAIR (2D with axial acquisition)

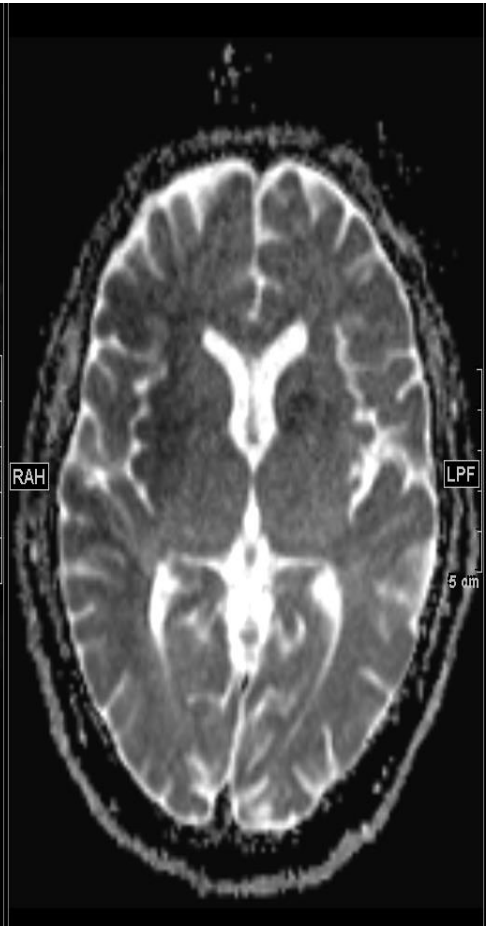
- No Contrast needed
- Slow flow picked up

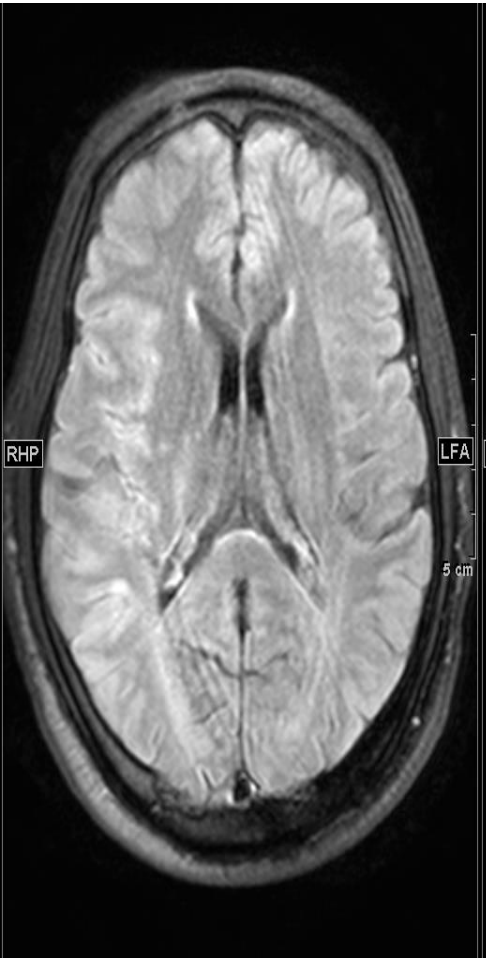

Sylvian sulcus
Basal ganglia and MCA regions
ACA region
Poor collaterals
Intermediate collaterals
Good collaterals

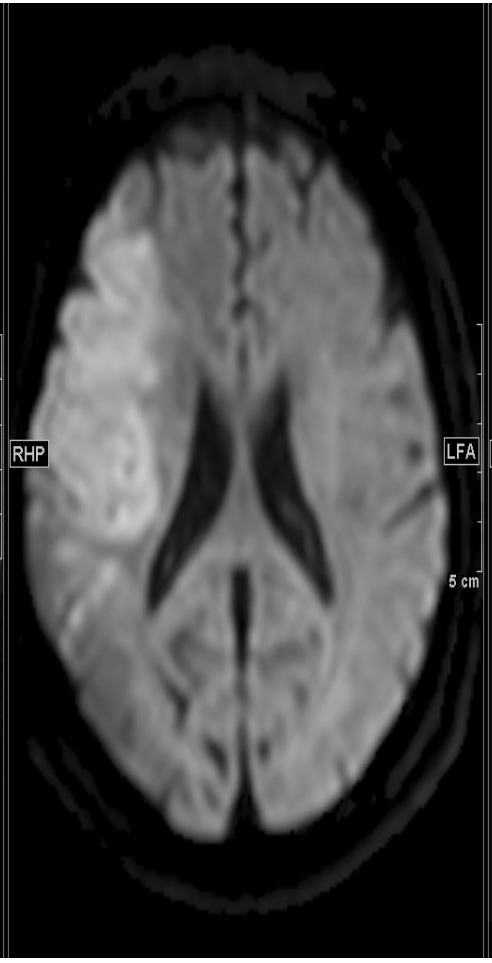

RAH
LPF
5 cm

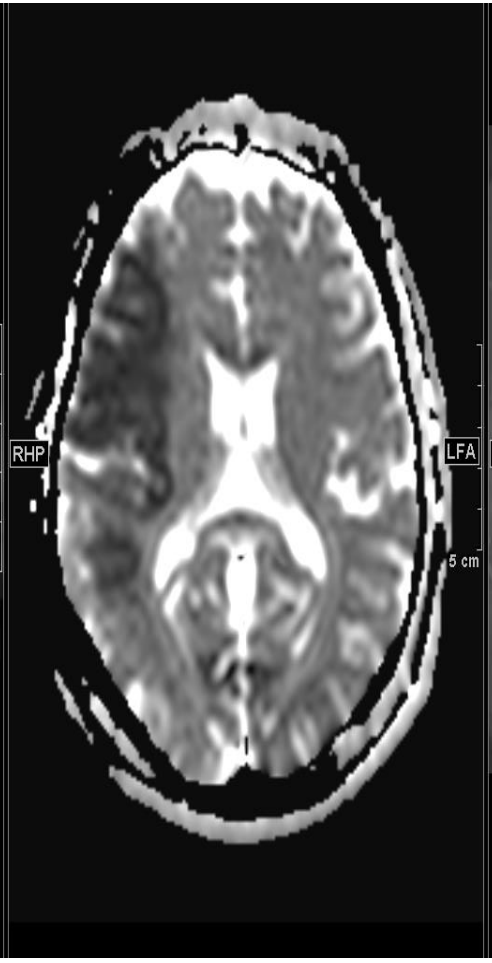

RAH
LPF
5 cm


RAH
LPF
5 cm


RAH
LPF
5 cm

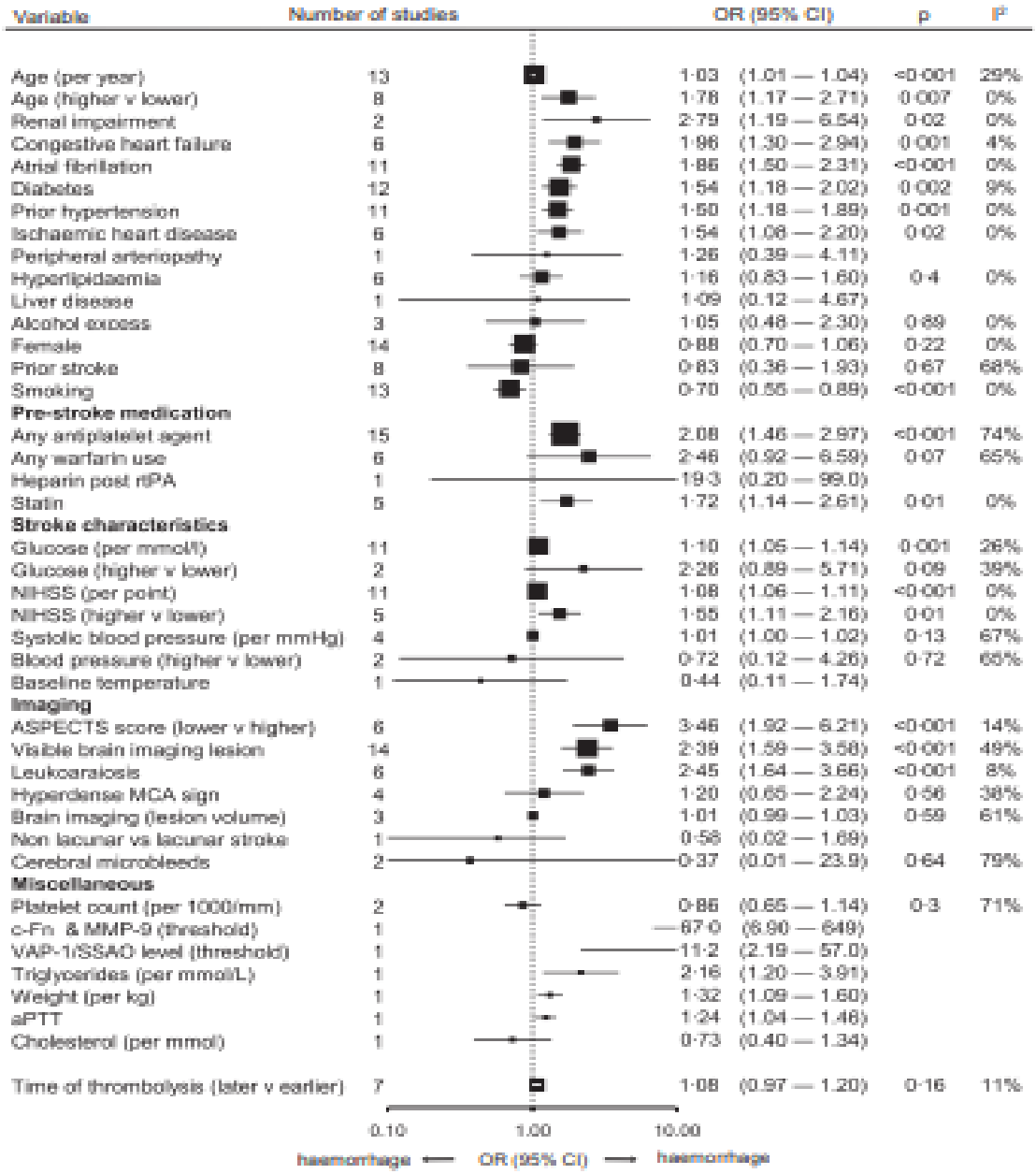

RHP
LFA
5 cm


RHP
LFA
5 cm

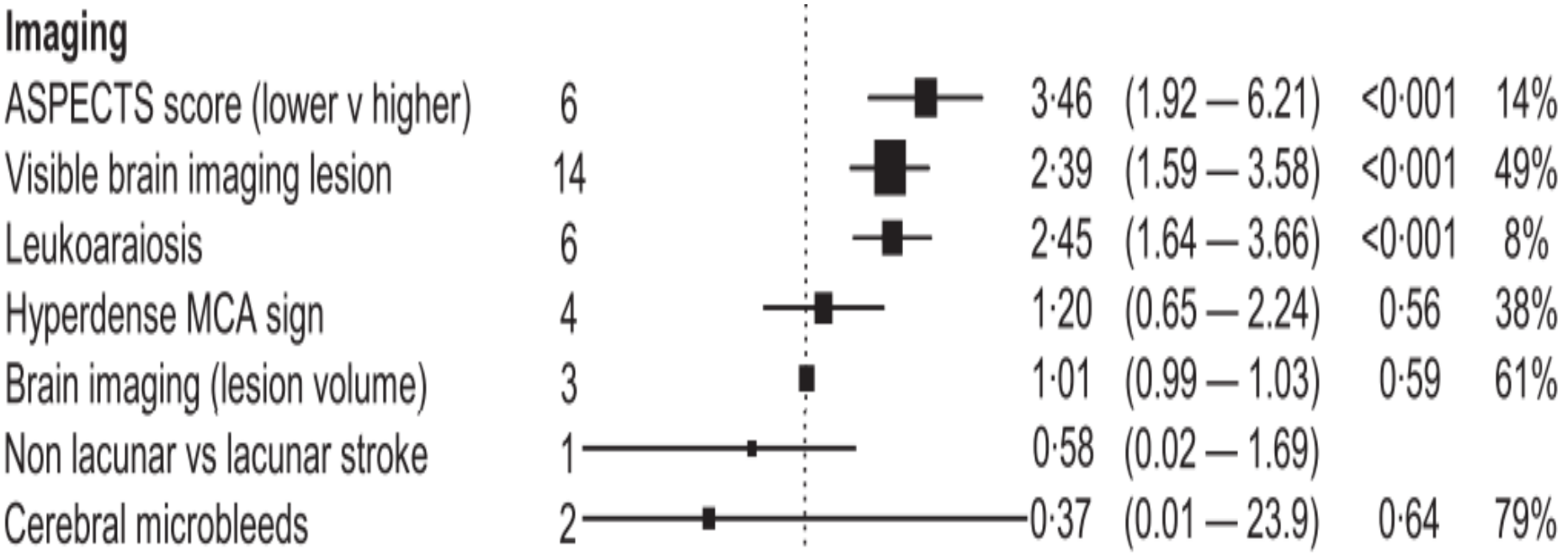

RHP
LFA
5 cm


RHA
LFP
5 cm

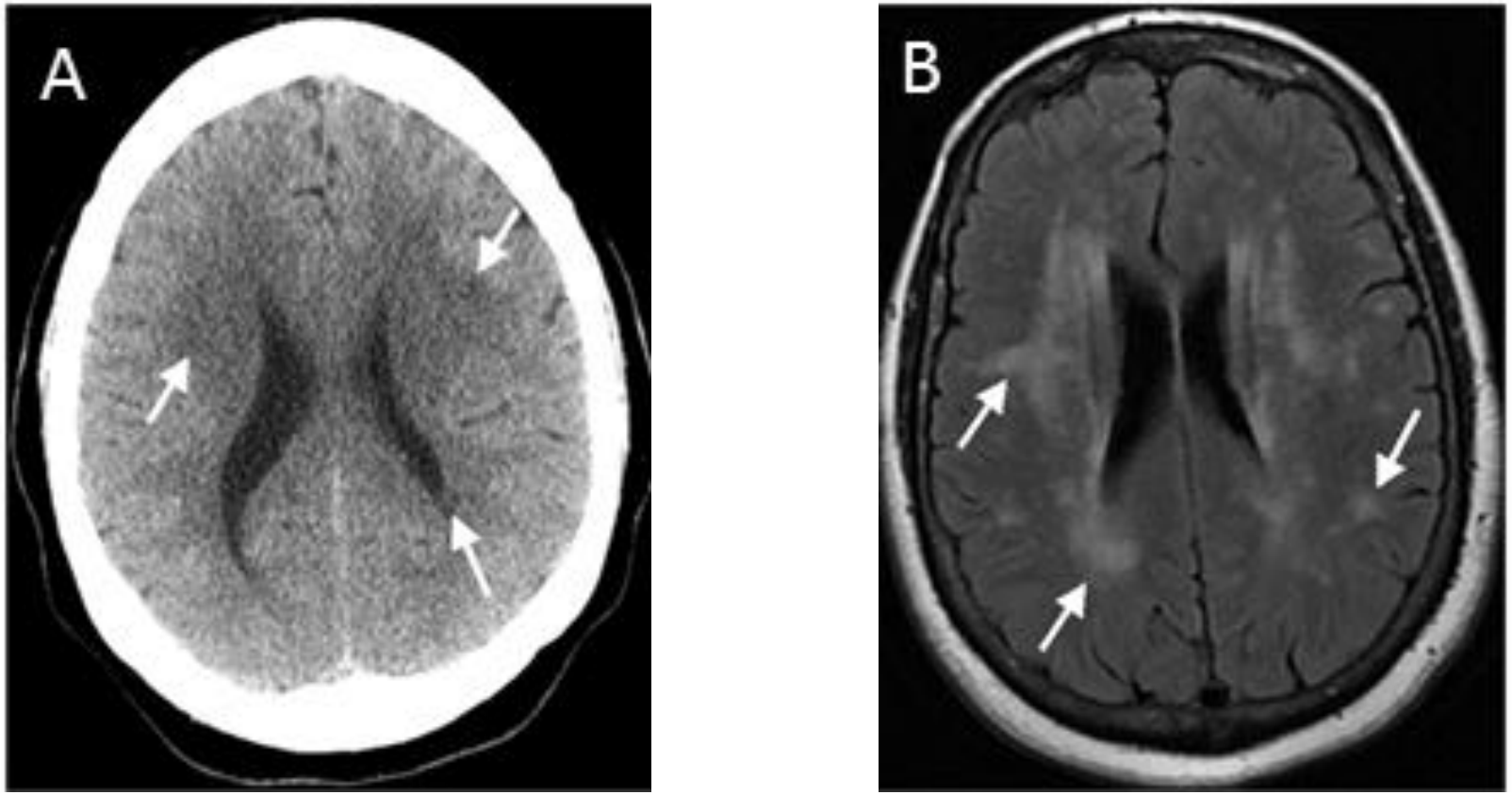
Risk of hemorrhage:



Whiteley et al Risk Factors for Intracranial Hemorrhage After rtPA

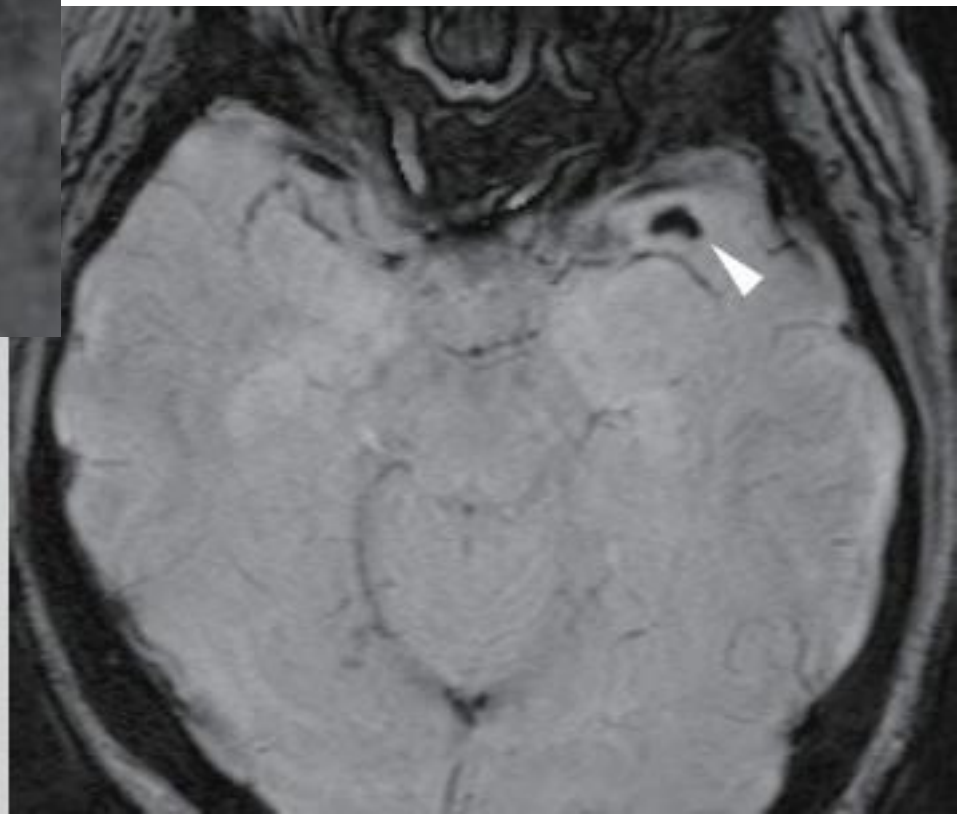

Imaging
ASPECTS score (lower v higher) 6 3·46 (1.92 — 6.21) <0·001 14%
Visible brain imaging lesion 14 2·39 (1.59 — 3.58) <0·001 49%
Leukoaraiosis 6 2·45 (1.64 — 3.66) <0·001 8%
Hyperdense MCA sign 4 1·20 (0.65 — 2.24) 0·56 38%
Brain imaging (lesion volume) 3 1·01 (0.99 — 1.03) 0·59 61%
Non lacunar vs lacunar stroke 1 0·58 (0.02 — 1.69)
Cerebral microbleeds 2 0·37 (0.01 — 23.9) 0·64 79%

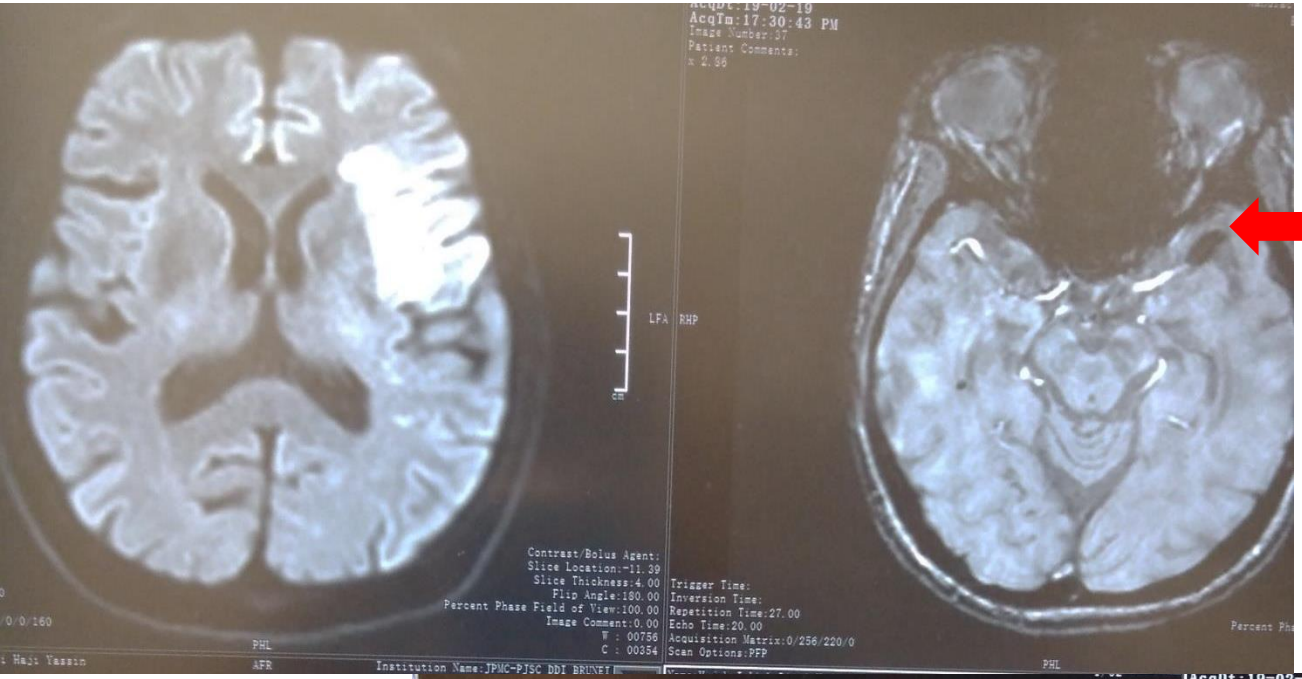
Leukoariosis

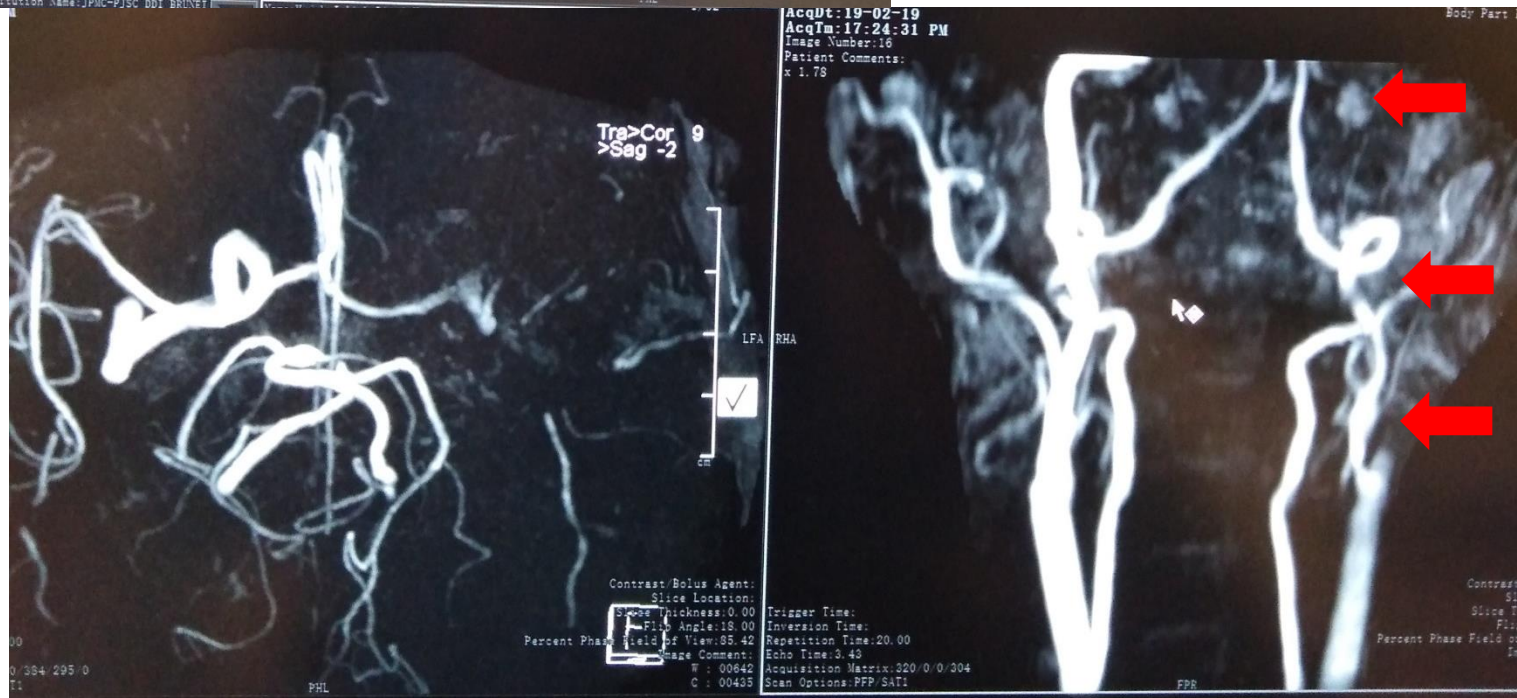


Presence and length of thrombus

- CT hyperdensity
- MR – SWI sequence picks up thrombus




AcqTm:17:30:43 PM
Image Number:37
Patient Comments:
x 2.96
LFA RHP
Contrast/Bolus Agent:
Slice Location:-11.39
Slice Thickness:4.00
Flip Angle:180.00
Percent Phase Field of View:100.00
Image Comment:0.00
W : 00756
C : 00354
Trigger Time:
Inversion Time:
Repetition Time:27.00
Echo Time:20.00
Acquisition Matrix:0/256/220/0
Scan Options:PFP
PHL
AFR


Tra>Cor 9
>Sag -2
LFA RHA
AcqDt:19-02-19
AcqTm:17:24:31 PM
Image Number:16
Patient Comments:
x 1.78
Contrast/Bolus Agent:
Slice Location:
Slice Thickness:0.00
Flip Angle:18.00
Percent Phase Field of View:85.42
Image Comment:
W : 00642
C : 00435
Trigger Time:
Inversion Time:
Repetition Time:20.00
Echo Time:3.43
Acquisition Matrix:320/0/0/304
Scan Options:PFP/SAT1
PHL
FPR

Mimics

STROKE MIMICS

A TERTIARY CARE TEACHING HOSPITAL EXPERIENCE

ALEXANDER P. T., NANDISH A., SIVADASAN A., MATHEW V., AARON S., SUNITHI M. A., ALEXANDER M.
Department of Neurosciences & Radiodiagnosis, Christian Medical College, Vellore

MATERIAL & METHODS

Study
- Retrospective, observational

Location
- Christian Medical College, Vellore

Duration
- 1 year [01/06/17 – 31/05/18]

Total subjects
- 721

Inclusion
- ≥ 18 years
- acute stroke presentation ≤ 6 h
  - accident and emergency
  - ward
- diffusion restriction on MRI, not limited to arterial territory
- shine through on ADC

Exclusion
- < 18 years
- diffusion restriction on MRI limited to arterial territory

Presented by **Dr. P. T. Alexander**, DM Senior Registrar, Department of Neurosciences, **CMC, Vellore** as E-Poster at the **26th Annual Conference of the Indian Academy of Neurology**, Pandit Deendayal Upadhyay Auditorium, Science College, Raipur, September 27-30, 2018

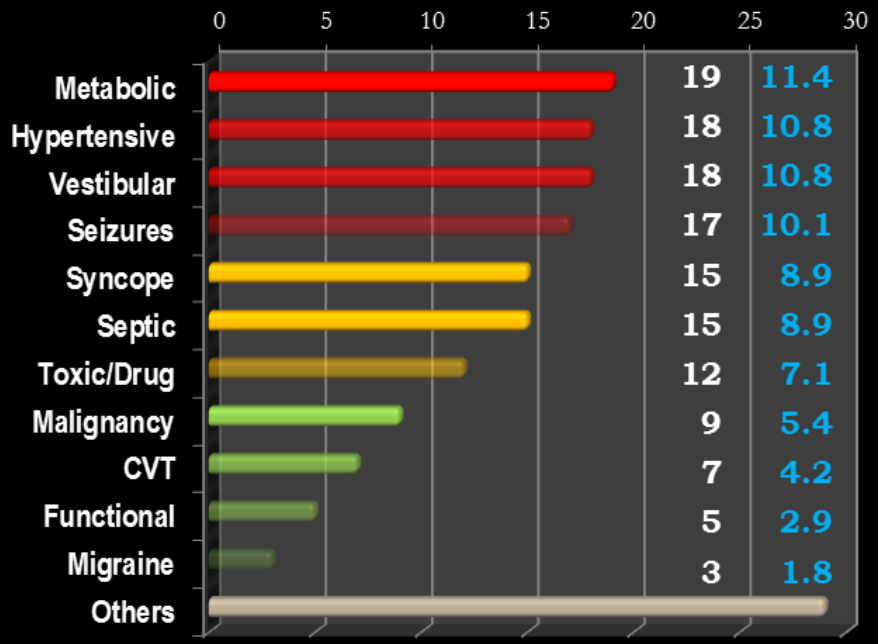
Mimics

STROKE MIMICS

A TERTIARY CARE TEACHING HOSPITAL EXPERIENCE

ALEXANDER P. T., NANDISH A., SIVADASAN A., MATHEW V., AARON S., SUNITHI M. A., ALEXANDER M.
Department of Neurosciences & Radiodiagnosis, Christian Medical College, Vellore

RESULTS



CONCLUSION

This study highlights

-the significance of the number and variety of mimics that can present with clinically similar presentation as an acute ischemic stroke.

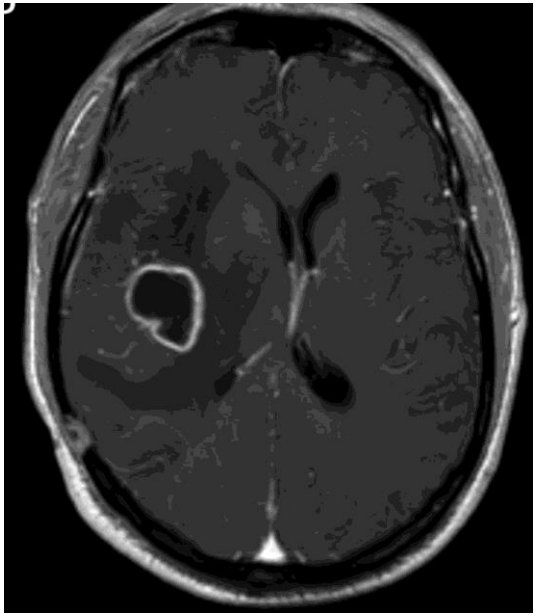
-the importance of identifying them using a thorough clinical history and examination, and supported by radiological evidence and laboratory parameters

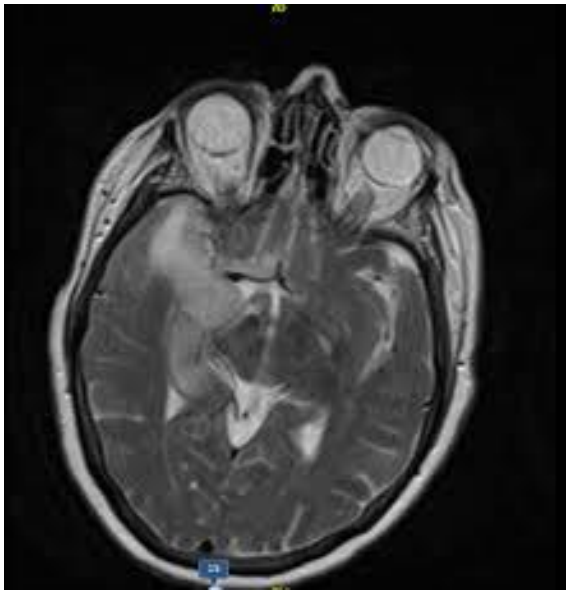
-as their management will follow an entirely different algorithm, not involving thrombolysis or thrombectomy – which is the essence of using MRI acute stroke protocol as a screening tool for acute ischemic strokes.

Presented by **Dr. P. T. Alexander**, DM Senior Registrar, Department of Neurosciences, **CMC, Vellore** as E-Poster at the **26th Annual Conference of the Indian Academy of Neurology**, Pandit Deendayal Upadhyay Auditorium, Science College, Raipur, September 27-30, 2018

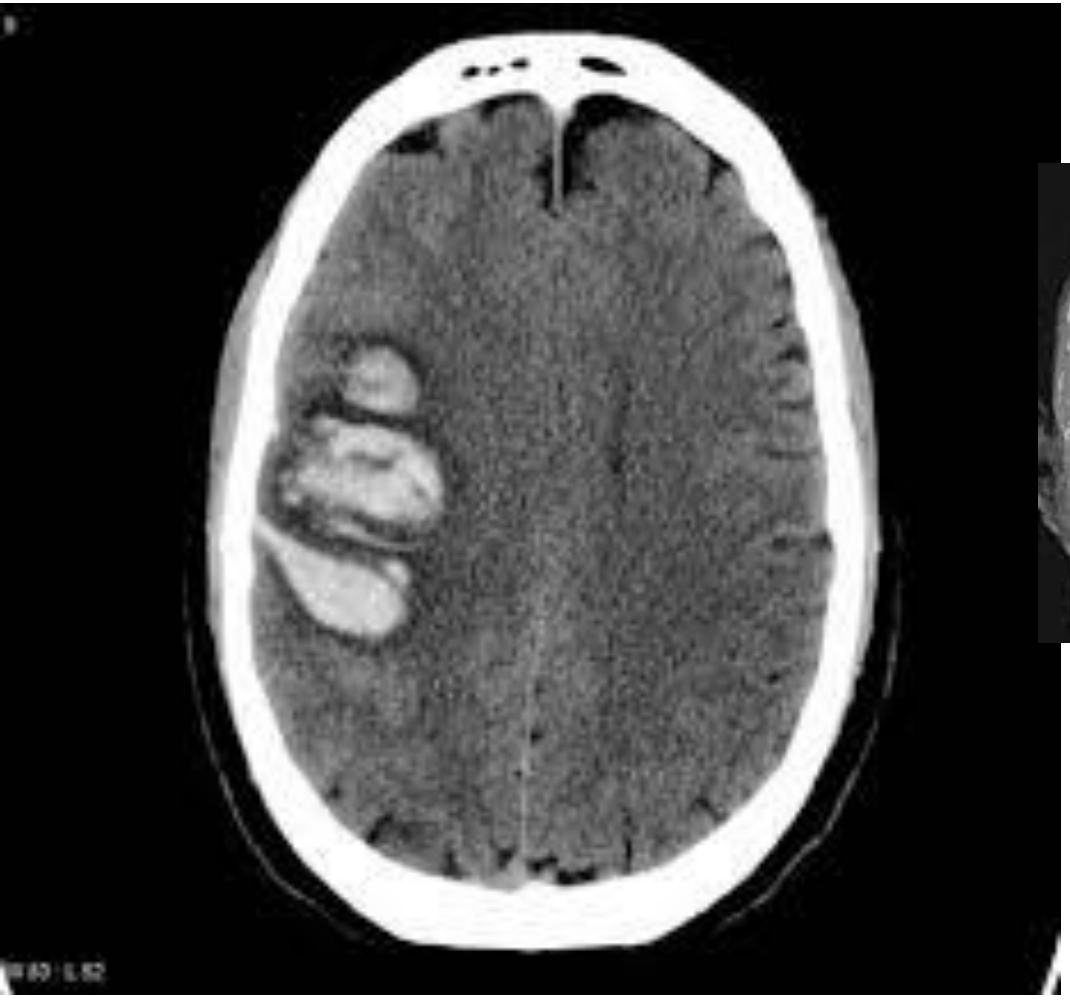
Is every stroke a ‘stroke’

- Mimics: normally ~ 10 %
- Adding MRI to protocol – Less specific on clinical history and more pick up of mimics

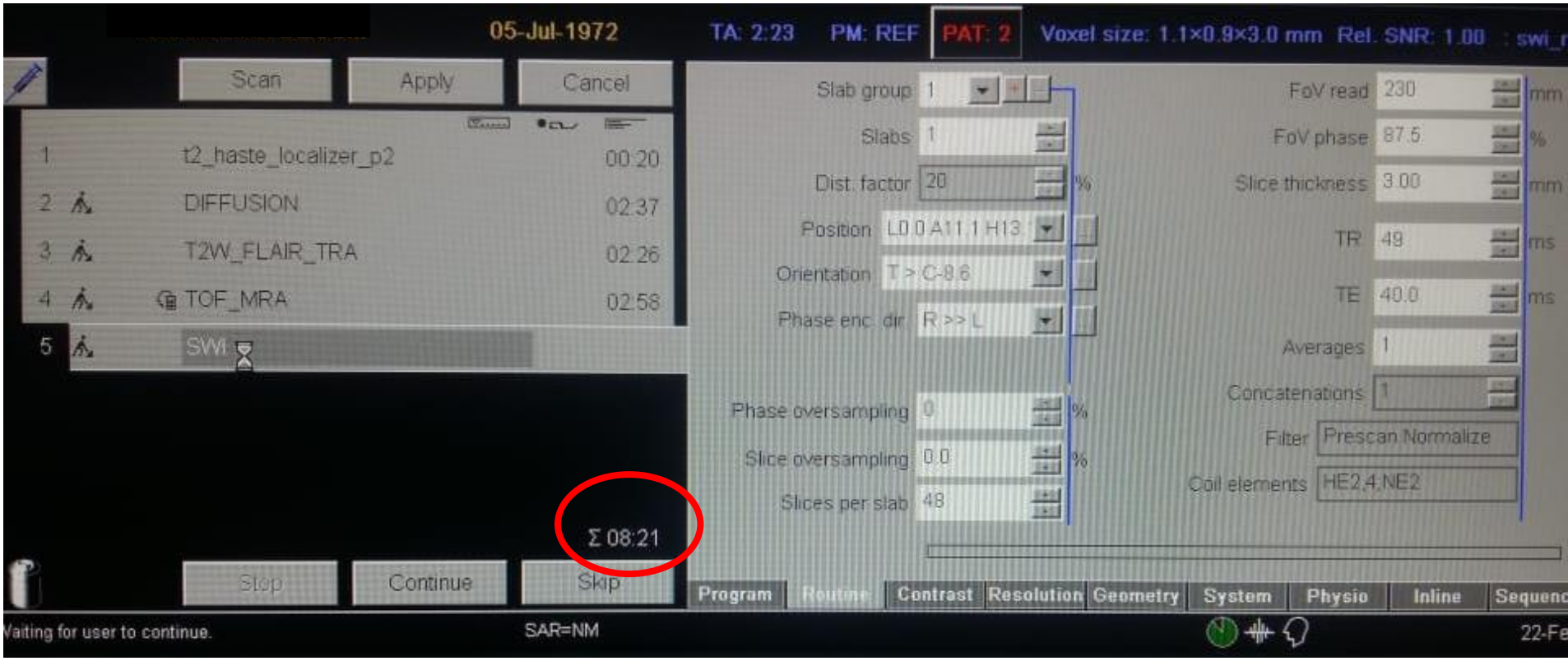


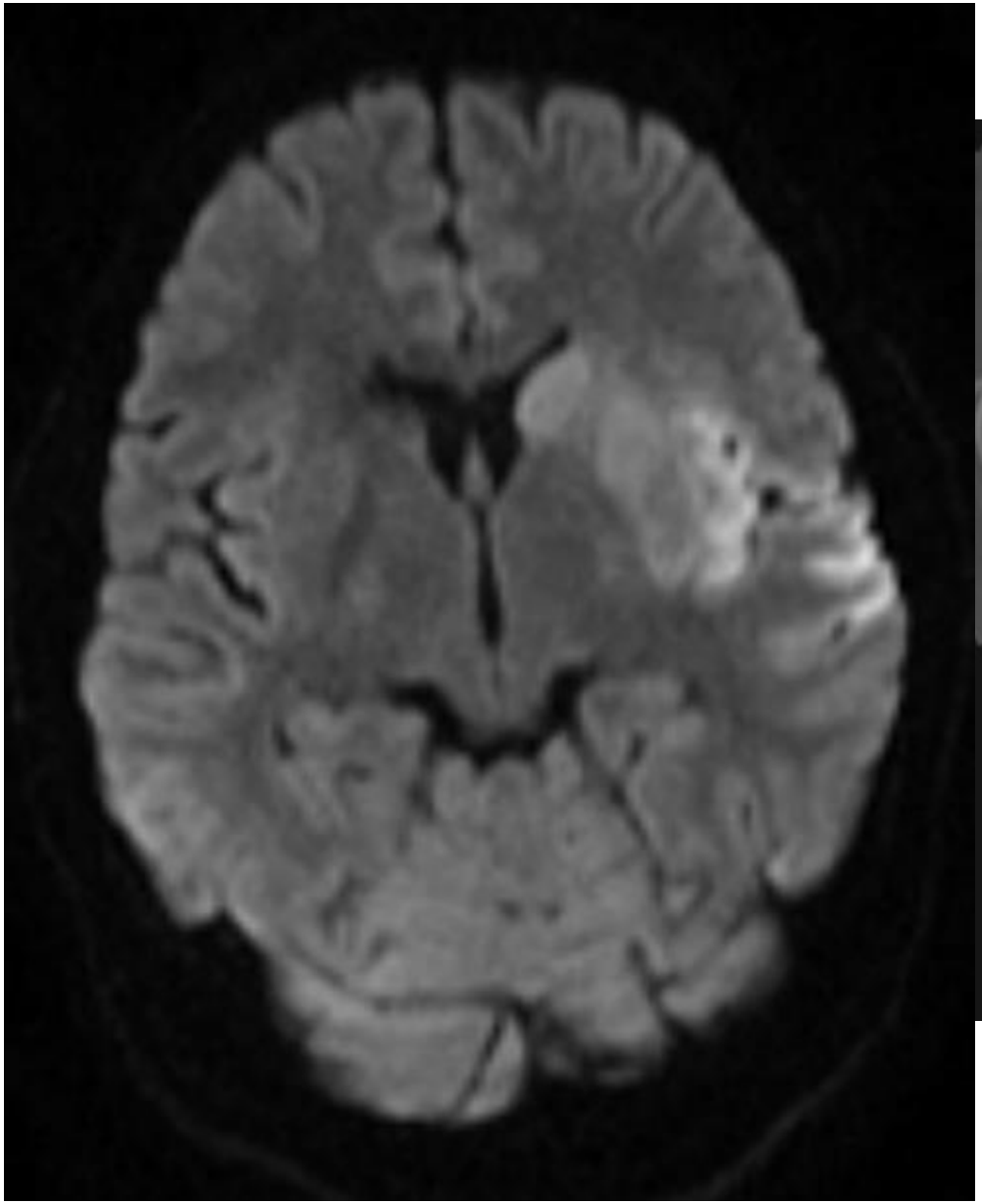


Venous thrombosis and venous infarct



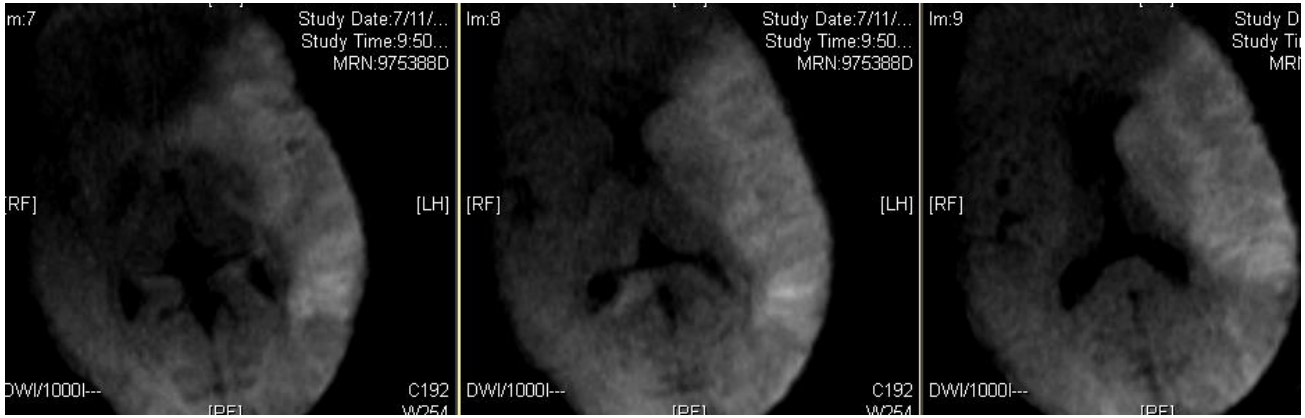
Protocol


05-Jul-1972
TA: 2:23
PM: REF
PAT: 2
Voxel size: 1.1×0.9×3.0 mm
Rel. SNR: 1.00
Scan
Apply
Cancel
1 t2_haste_localizer_p2 00:20
2 DIFFUSION 02:37
3 T2W_FLAIR_TRA 02:26
4 TOF_MRA 02:58
5 SWI
Σ 08:21
Stop
Continue
Skip
Slab group 1
Slabs 1
Dist. factor 20 %
Position L0.0 A11.1 H13
Orientation T > C-8.6
Phase enc. dir R >> L
Phase oversampling 0 %
Slice oversampling 0.0 %
Slices per slab 48
FoV read 230 mm
FoV phase 87.5 %
Slice thickness 3.00 mm
TR 49 ms
TE 40.0 ms
Averages 1
Concatenations 1
Filter Prescan Normalize
Coil elements HE2,4;NE2
Program
Routine
Contrast
Resolution
Geometry
System
Physio
Inline
Sequenc
Waiting for user to continue.
SAR=NM
22-Fe



FLAIR few hyperintense vessels
< 4.5 hrs, IV TPA. No progression.

Gradual improvement.



< 4.5 hrs, No thrombolysis

Recommendation

- ‘The expansion of the acute stroke protocol to include MRI altered the therapy plan in 26% of patients.’
- The utility of MRI is in improving patient stratification into best-treatment options

Heindenreich et al. Acta Radiol. 2008 Jun;49(5):550-7

Time·taken·¤	¶ Average¤	¶ Range¤
Door·to·stroke·code·Activation¶¤	8min¤	·2·–·8min¤
Door·to·imaging·completion·MRI¶¤	46min¤	20min·–·1hr·12min¤
Door·to·imaging·completion·CT¶¤	45min¤	20·–·57min¤

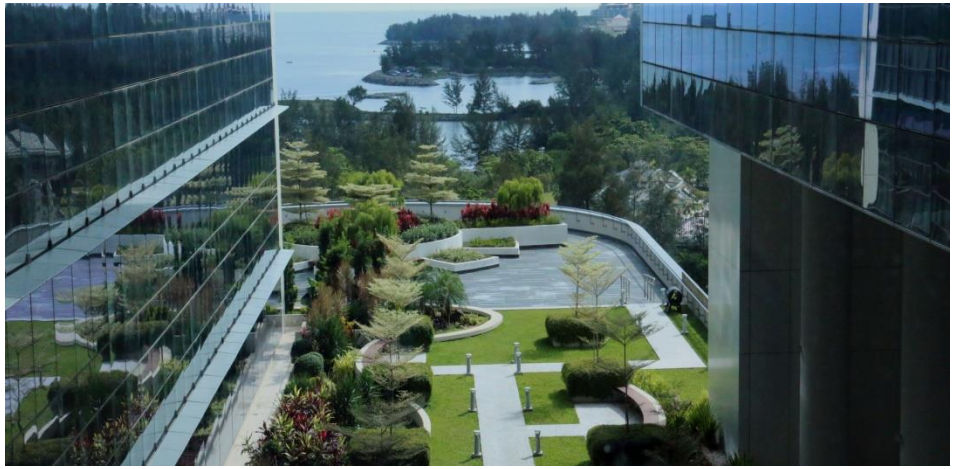
Conclusions

- MRI is a robust technique for determining the features concerning the Clinician at the time of decision making.

- The overwhelming evidence for infarct core and thrombus makes MRI the more favorable imaging before starting intervention.
- - Time is the only factor which is more than CT.

- Short imaging time is possible with MRI and where possible and available, MRI can be used for the primary imaging in Acute Stroke.

- Stroke mimics can be immediately identified and treatment started based on limited imaging where appropriate.



Thank you

References

- KP Park et al.Susceptibility-Weighted Imaging for Detection of Thrombus in Acute Cardioembolic Stroke. J Stroke. 2016 Jan; 18(1): 73–79
- Haacke EM, Mittal S, Wu Z, Neelavalli J, Cheng Y-CN. Susceptibility-weighted imaging: technical aspects and clinical applications, part 1. AJNR Am J Neuroradiol. 2009;30:19–30.
- Ishimaru H, Ochi M, Morikawa M, Takahata H, Matsuoka Y, Koshiishi T, et al. Accuracy of pre- and postcontrast 3D time-of-flight MR angiography in patients with acute ischemic stroke: correlation with catheter angiography. AJNR Am J Neuroradiol. 2007;28:923–926.
- 14. Flacke S, Urbach H, Keller E, Träber F, Hartmann A, Textor J, et al. Middle cerebral artery (MCA) susceptibility sign at susceptibility-based perfusion MR imaging: clinical importance and comparison with hyperdense MCA sign at CT. Radiology. 2000;215:476–482.
- 15. Schellinger PD, Chalela JA, Kang D-W, Latour LL, Warach S. Diagnostic and prognostic value of early MR Imaging vessel signs in hyperacute stroke patients imaged <3 hours and treated with recombinant tissue plasminogen activator. AJNR Am J Neuroradiol. 2005;26:618–624.