MEDICAL MANAGEMENT OF ACUTE STROKE

Dr Ganesh Subramanian, Stroke Physician

Objectives

To able to:

- Explain the Bamford classification of stroke, describing the prognostic difference between each stroke type
- Describe the acute management of stroke, with particular attention to examination, investigations, consideration/initiation of antiplatelet therapy, anticoagulation, thrombolysis, thrombectomy, blood pressure control, statins therapy
- List immediate non-pharmacological measures in management of stroke such as assessment of swallow, rehabilitative and nursing care
- Outline measures undertaken in secondary stroke prevention
- Outline methods of evaluating and managing patients with carotid stenosis
- Outline medical (and surgical) management for TIA
- Outline the commonest causes of disability in people with impaired mobility

What is Stroke/TIA?

- Acute onset
- Focal
- Neurological deficit(s)
- 24 hours or more
- Vascular origin

- But....

Stroke Mimics

- Migraine
- Space-occupying lesions
- Seizure
- Syncope
- Metabolic disturbance
- Peripheral neuropathy
- Cervical spine pathologies
- Transient global amnesia
- Psychiatric conditions

Why is stroke important?

- Common
  - 111000 first or recurrrent strokes/ year
- High morbidity
  - Commonest long term neurological disability
- High mortality
  - 3rd commonest killer, 1/3 of all strokes
- Expensive
  - £8+ billions/year (direct, informal care, loss of productivity)
- Highly treatable
- Largely preventable

Assessment (Pre-Hosp)

Time is brain!!!

Assessment (A&E)

- ROSIER
- *Has there been loss of consciousness: Y (-1) N (0)*
- *Has there been seizure activity: Y (-1) N (0)*
- *Is there a **new onset** (or waking from sleep)?*
  - *Asymmetric facial weakness :Y (+1) N (0)*
  - *Asymmetric arm weakness: Y (+1) N (0)*
  - *Asymmetric leg weakness: Y (+1) N (0)*
  - *Speech disturbance: Y (+1) N (0)*
  - *Visual field defect: Y (+1) N (0)*

- Stroke is likely if total score > 0
- Scores of < / = 0 have low probability of stroke but not excluded

Assessment (1)

- History taking – very similar in the main to any other condition
  - PMH
  - Drug Hx
  - Family Hx
  - Social Hx – very important
  - When?
  - How?
  - What?

What can be affected?

- Usually negative symptoms
- Motor
- Speech
- Vision
- Sensation
- Coordination
- Conscious level
- Memory

Assessment (2)

- For younger patients:
  - Dissection of cervical (carotid or vertebro-basilar) arteries
  - Illicit drugs
  - Oral contraceptives
  - Migraine – very rare
  - Genetic conditions – even rarer

Assessment (3)

- Clinical examination
  - General inspection
  - GCS
  - ABC
  - CVS – murmur, bruit, DVT, BP, pulse, HF, SBE, dissection
  - Resp – O_2 sats, RR, pneumonia
  - Gastro – mass
  - Neuro – UMN/LMN, Speech, Sensory, Cerebellar, CN

Assessment (4)

- NIHSS
- Validated, reliable, reproducible
- Provides insight to location of stroke
- Provides insight to severity of stroke
- Help identify those who will benefit from thrombolysis

NIH Stroke Scale

NUH01554N

Patient

Date of stroke _____ **Date of exam** _____

Level of Consciousness	0	1	2	3		
LOC Questions	0	1	2			
LOC Commands	0	1	2			
Best Gaze	0	1	2			
Visual	0	1	2	3		
Facial Palsy	0	1	2	3		
Motor Arm (a) Left	0	1	2	3	4	UN
(b) Right	0	1	2	3	4	UN

Motor Leg (a) Left	0	1	2	3	4	UN
(b) Right	0	1	2	3	4	UN
Limb Ataxia	0	1	2	UN		
Sensory	0	1	2			
Best Language	0	1	2	3		
Dysarthria	0	1	2	UN		
Inattention	0	1	2			
TOTAL						

Assessment (5)

- Infarct or haemorrhage?
  - On anticoagulation
  - Bleeding tendency
  - Depressed consciousness
  - Severe headache
  - Hypertension +++
  - Vomiting
  - BM >11
- Only imaging can tell!

Investigation (1)

- Bloods
  - FBC, U+E, LFT, TFT
  - Glucose
  - Lipids
  - Coagulation
  - ESR

- Other bloods
  - Thrombophilia screen
  - Vasculitic screen

Investigation (2)

- ECG
  - Sinus rhythm
  - Atrial fibrillation
  - LVH
  - Ischaemic changes
- Echo
  - Valvular heart disease, including SBE
  - Mural thrombus
  - LVH
  - PFO

Investigation (3)

- Neuroimaging
- Objectives:
  - Define arterial territory
  - Define pathology
  - Exclude stroke mimics
  - Guide further investigations
  - Aids treatment strategies
  - Aids prognostication

CT Brain (1)

- Easily accessible
- Quick, 256 slices
- Sensitive for bleeding
- High radiation burden 2mSv=100 CXR

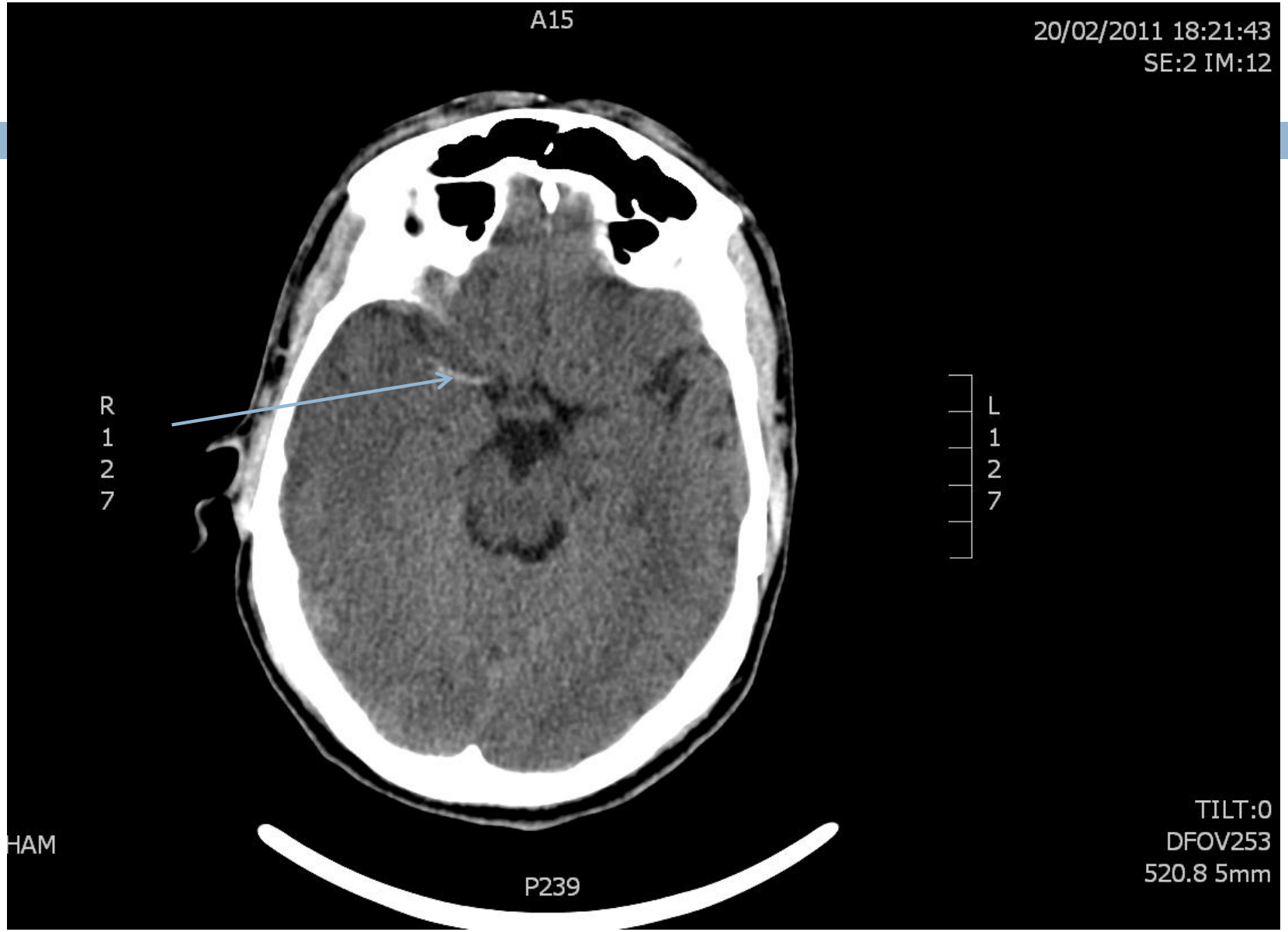
CT Brain (2)

- RCP guideline
  - All strokes to be scanned within 12 hrs (of which 50% within an hour)

- Indications for urgent scan
  - ? Thrombolysis/thrombectomy
  - On anticoagulants
  - Bleeding tendency
  - Unexplained progressive/fluctuating symptoms
  - Depressed conscious level
  - Suspicion of SAH/Head injury

CT Brain (3)

- Critical role = to exclude haemorrhage
- Early signs of infarct
  - Hyperdense MCA
  - Loss of grey-white differentiation
  - Sulcal effacement
  - Loss of insular ribbon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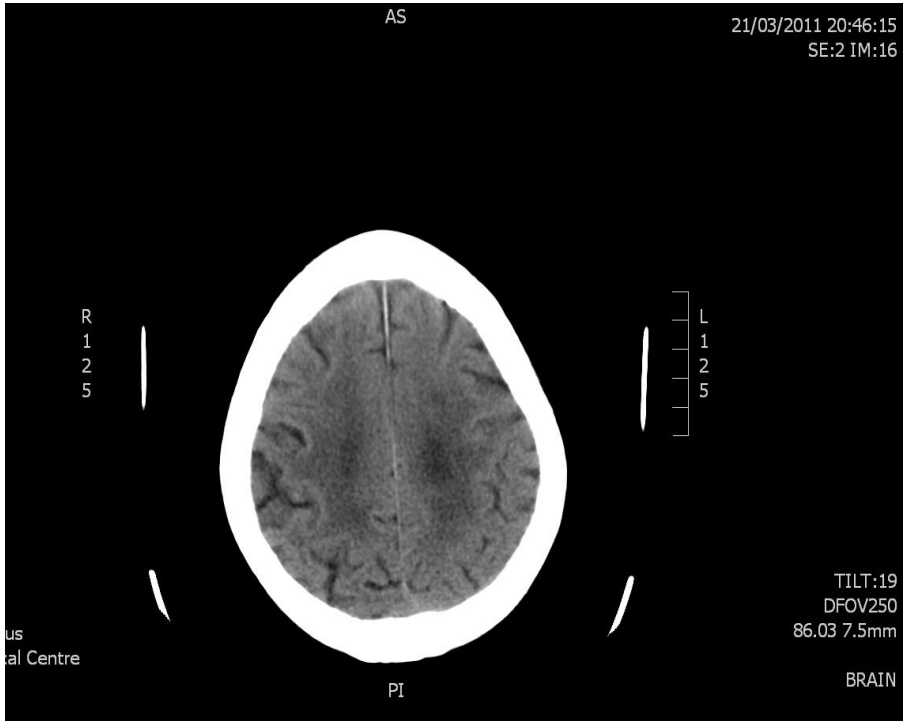
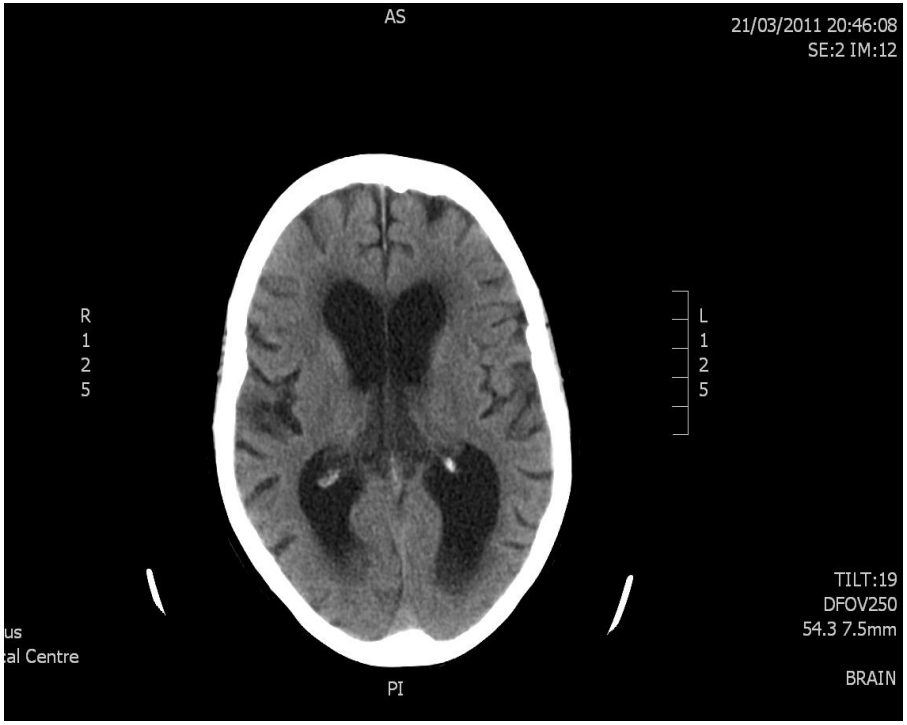
530.8 5mm

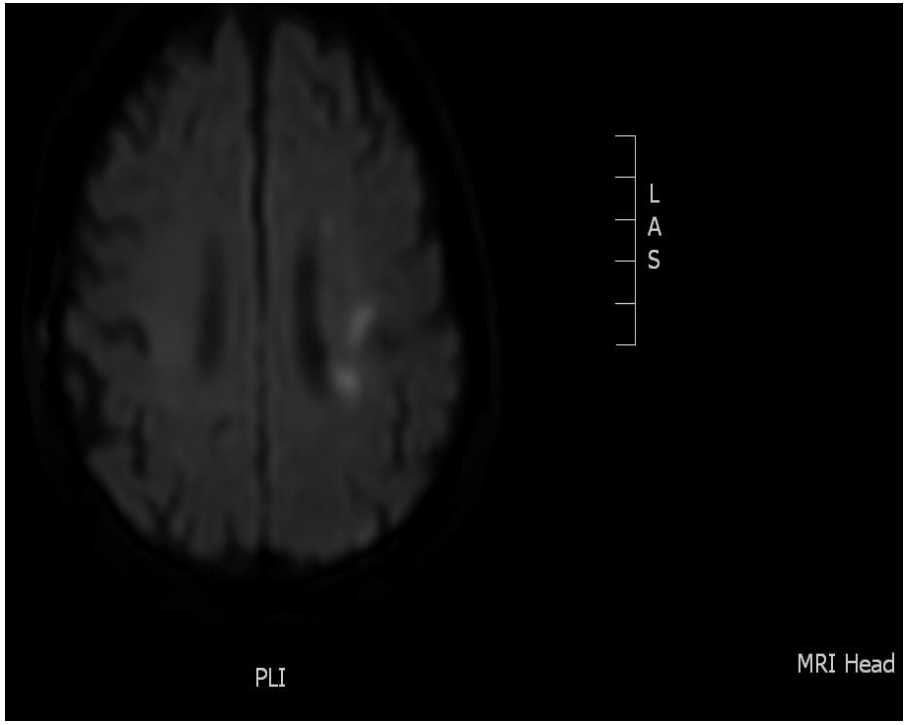
MRI brain

- Less accessible
- Longer procedure
- Contraindications
- More detailed, better images
- Define pathologies and arterial supplies
- DWI

82 female, sudden onset of R limb weakness and expressive dysphasia



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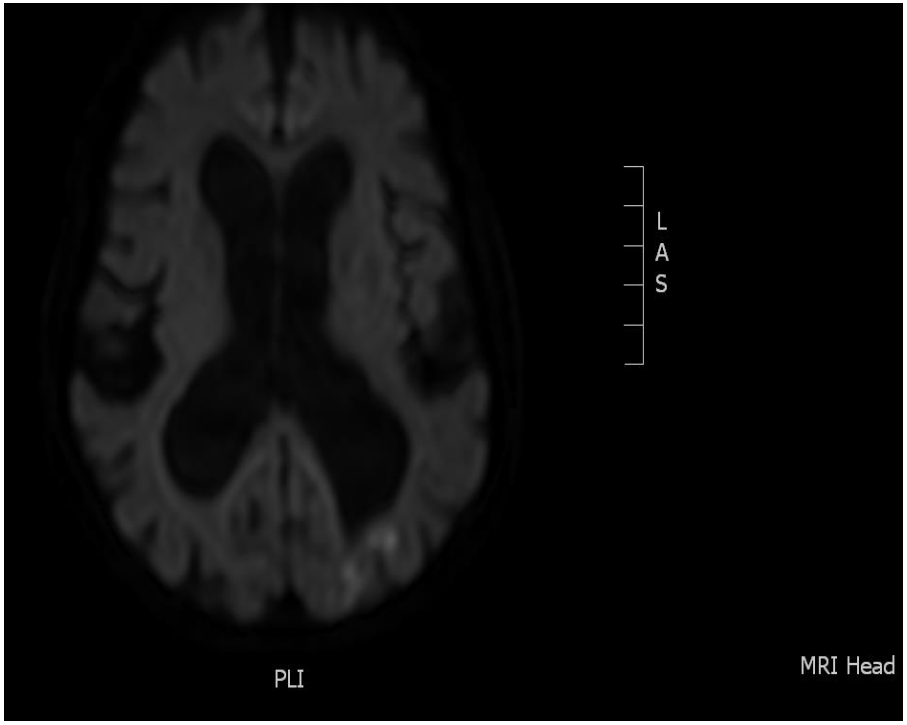
MRI Head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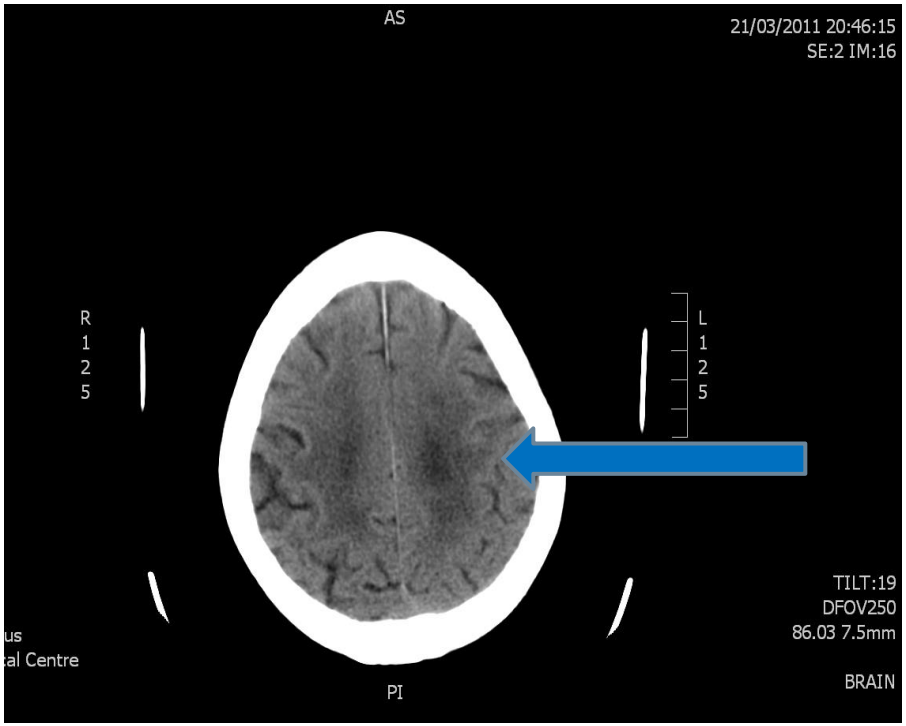
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BRAIN
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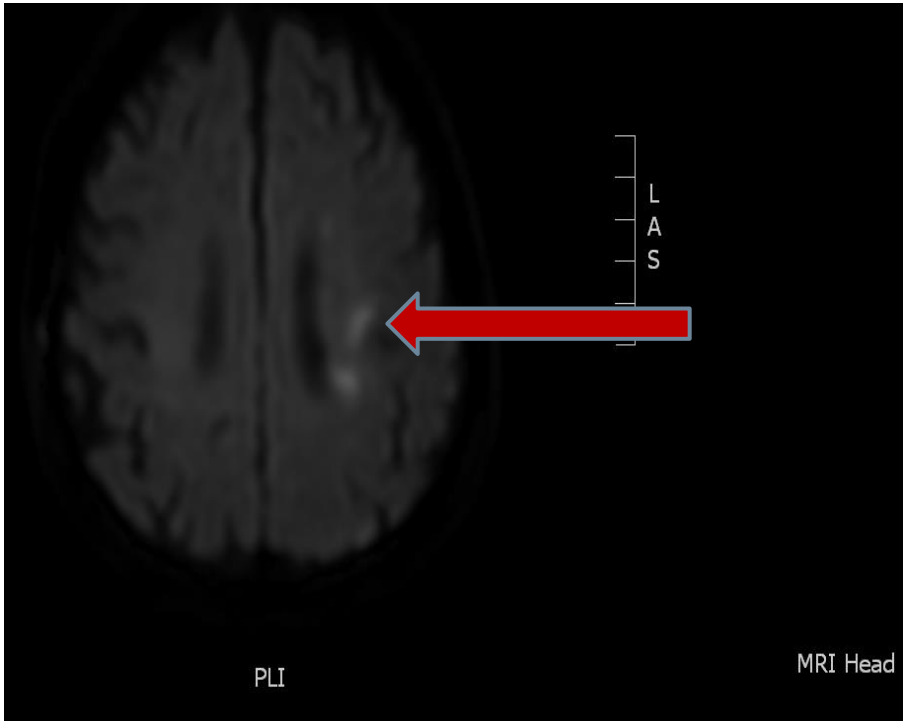
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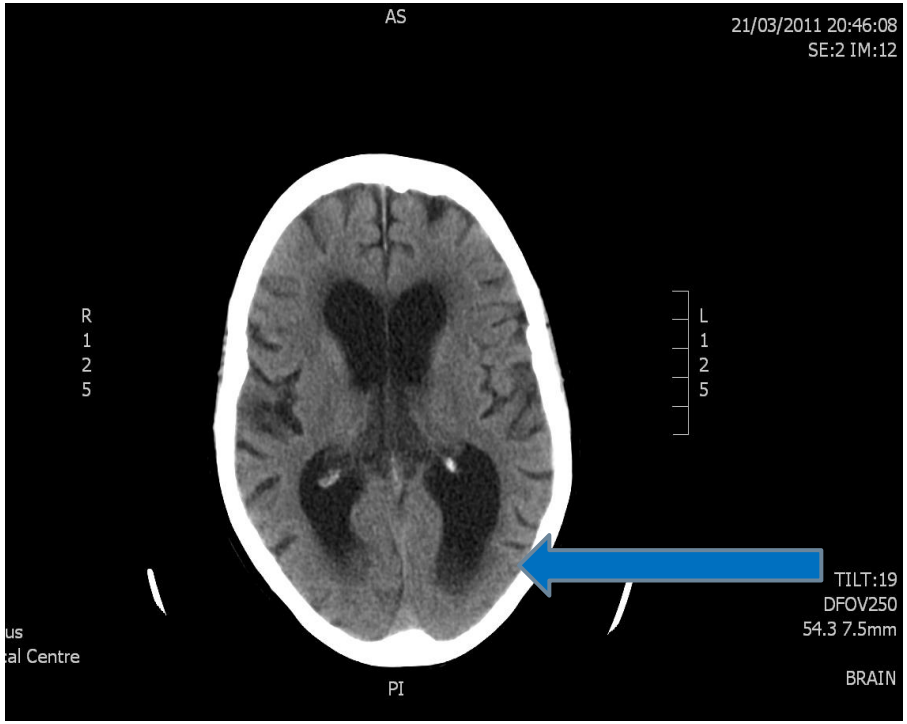
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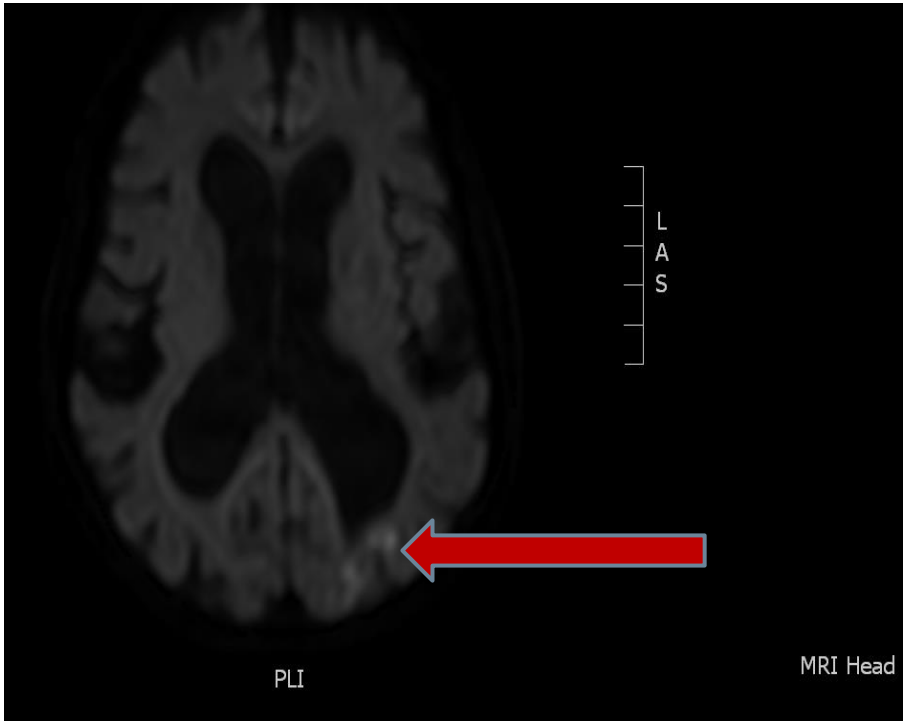
BRAIN
PI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MRI Head

Carotid Imaging

- Carotid Doppler
- CTA
- MRA

- NASCET >50%
- ECST >70%
- Carotid endarectomy asap (within 12 weeks)

Classifications (1)

- Left or right
- Ischaemic or haemorrhagic
- Frontal, parietal, temporal or occipital
- ACA, MCA or PCA
- TOAST
- Oxford

Classifications (2)

- Trial of Org 10172 in Acute Stroke Treatment (TOAST)
  - Large-artery atherosclerosis
  - Cardioembolic
  - Small vessel occlusion
  - Stroke of other determined aetiology
  - Stroke of undetermined aetiology

Classifications (3)

- Oxford (Bamford) classification

- LAC – pure motor, pure sensory, mixed, ataxic-hemiparetic
- PAC
- TAC
- POC

Outcome of Stroke

		TACS	PACS	LACS	POCS
30 Days	Dead	40	5	5	5
	Dependent	55	40	30	30
	Independent	5	55	65	65
1 Year	Dead	60	15	10	20
	Dependent	35	30	30	20
	Independent	5	55	60	60

Where do you manage?

- ? EAU
- ? General medical ward
- ? Health care of elderly ward
- ? Somewhere else

Stroke Unit (1)

- A discrete area in hospital
- Staffed by specialist stroke MDT
- Access to equipment for monitoring & rehabilitating patients
- Regular MDM for goal setting

Stroke Unit (2)

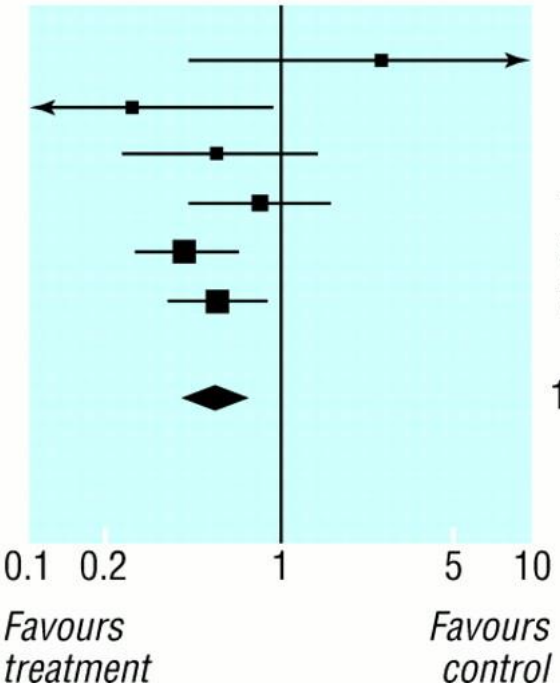
- Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews 2007;CD000197*.
- NSF for the Elderly (Standard 5): "all stroke patients should be admitted to organised stroke units"
- RCP/NICE guidelines (2016 and 2019 respectively)

- More likely to
  - Receive measures to reduce aspiration
  - Receive early nutrition
- Shorter LOS
- Less death
- More likely to discharge independent

Thrombolysis (1)

Study	No showing poor outcome/No at follow up: Treatment	Control	Odds ratio	Weight (%)	Odds ratio (95% CI)
Atlantis A	8/10	7/12		2.3	2.59 (0.45 to 15.08)
Atlantis B	4/13	17/26		4.2	0.26 (0.07 to 0.96)
ECASS 1	30/49	26/36		9.1	0.57 (0.24 to 1.4)
ECASS 2	47/81	48/77		17.9	0.84 (0.44 to 1.58)
NINDS Trial 1	76/144	107/147		32.1	0.43 (0.26 to 0.68)
NINDS Trial 2	103/168	122/165		34.4	0.56 (0.36 to 0.69)
Total (95% CI)	266/465	329/465		100.0	0.56 (0.42 to 0.73)

Test for heterogeneity χ^2=7.07, df=5, P=0.22
Test for overall effect z=4.29; P=0.00002



Thrombolysis (2)

Thrombolysis (3)

Indications:

- Up to 3 hours
- ECASS-3 (2008): 3-4½ hours
- IST-3: ? 6 hours
- Clear time of onset
- Clinical symptoms & signs of acute stroke
- Haemorrhage excluded
- Age 18-80
- NIHSS <25

Thrombolysis (4)

Contraindications:

- Rapidly improving or minor stroke symptoms
- Stroke or serious head injury 3 months
- Major surgery, obstetrical delivery, external heart massage last 14 days,
- Seizure at onset of stroke
- Prior stroke and concomitant diabetes
- Severe haemorrhage last 21 days
- Bleeding tendency
- History of central nervous damage (neoplasm, haemorrhage, aneurysm, spinal or intracranial surgery or haemorrhagic retinopathy)
- Many more....

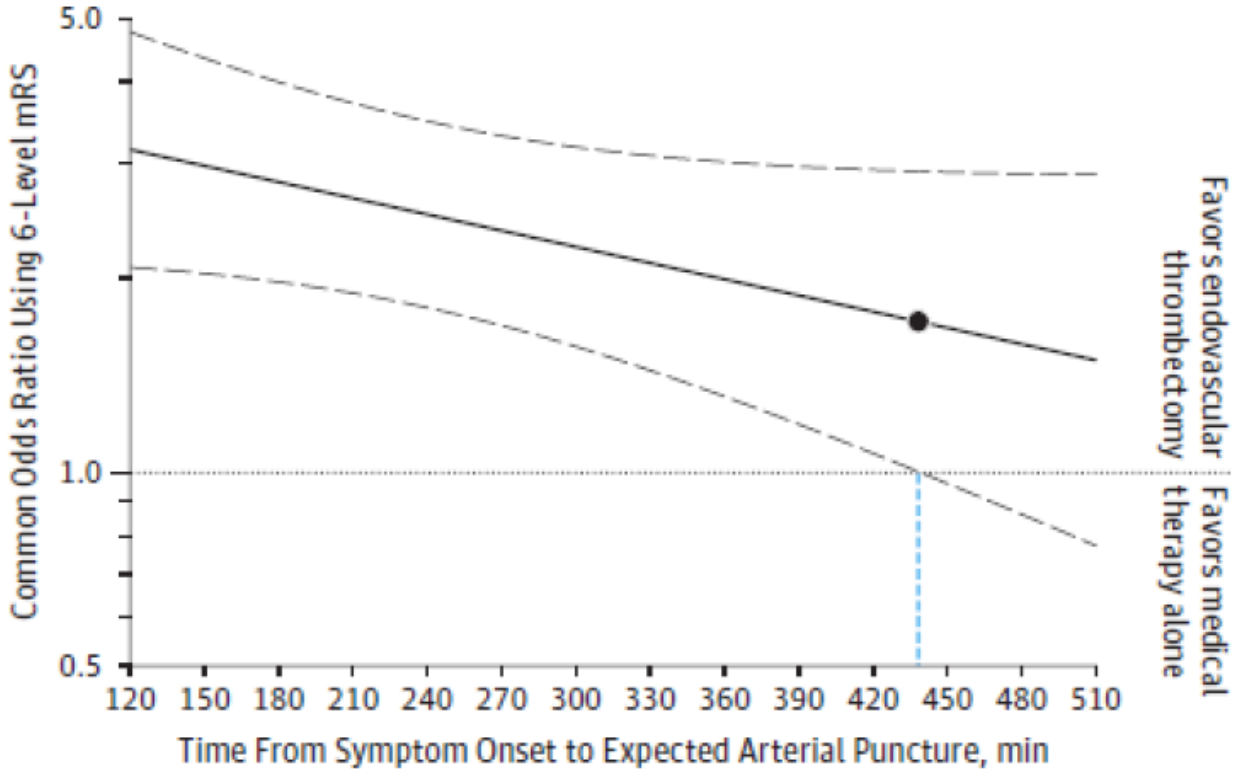
Thrombolysis

- Alteplase
- 0.9mg/kg, up to max 90mg
- Dilute with sterile water 1mg/ml
- 10% bolus
- 90% over 1 hour

- Risk of anaphylaxis <1.5%

Time is Brain

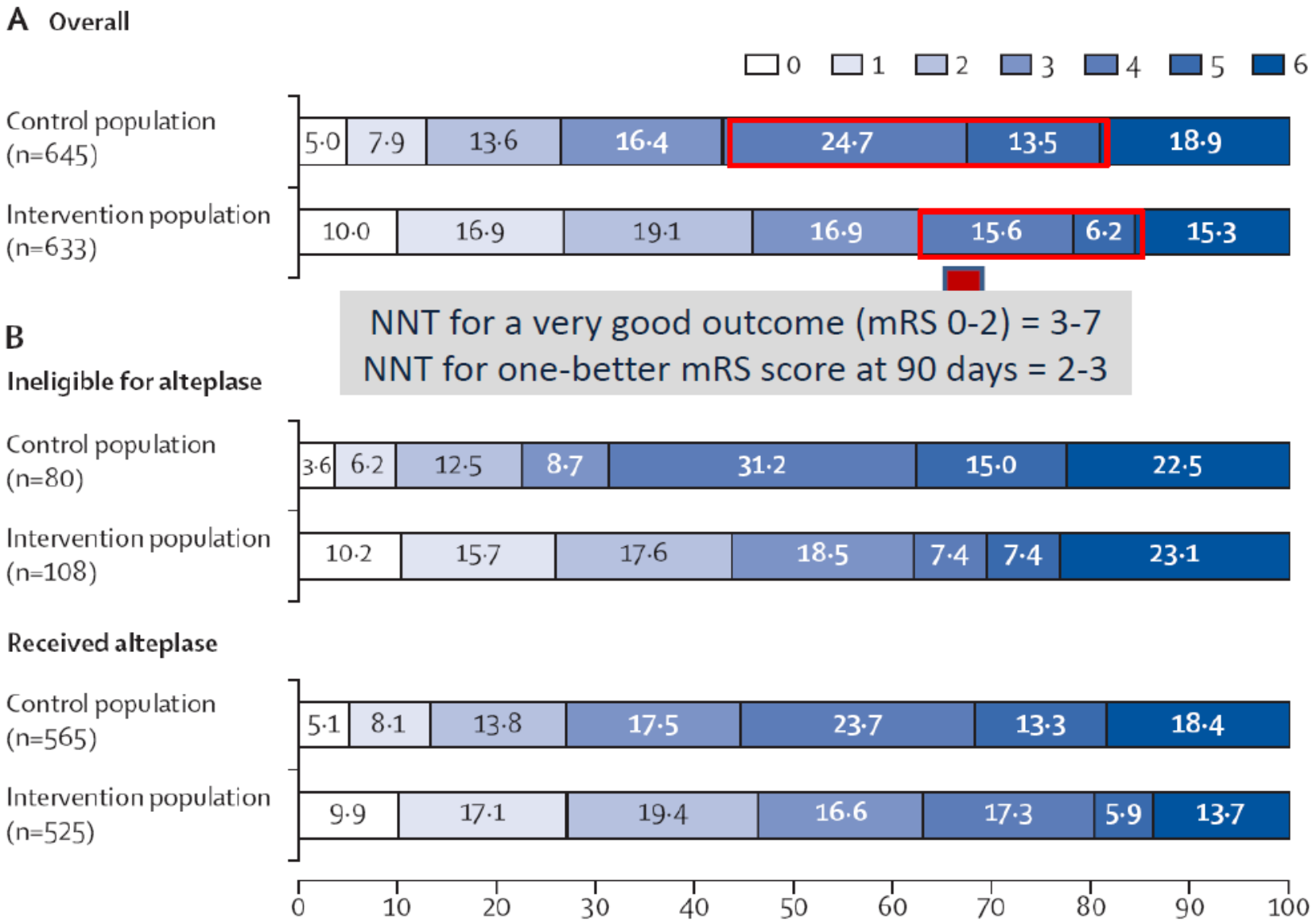
A Odds ratio for less disability at 3 mo in endovascular thrombectomy vs medical therapy alone groups by time to treatment



HERMES – 5 trials (2015)

Saver et al. JAMA 2016

Number Needed to Treat
HERMES Individual Patient Meta-Analysis



Goyal et al, Lancet 2015


SAR
IPL


IPL

DAWN trial

- 49% of thrombectomy patients had an mRS of 0, 1, or 2 at 90 days compared to 13% of control patients

  No significant difference in stroke related deaths at 90 days, but significant (P = 0.04) reduction in neurological deterioration in thrombectomy group

DEFUSE Trial

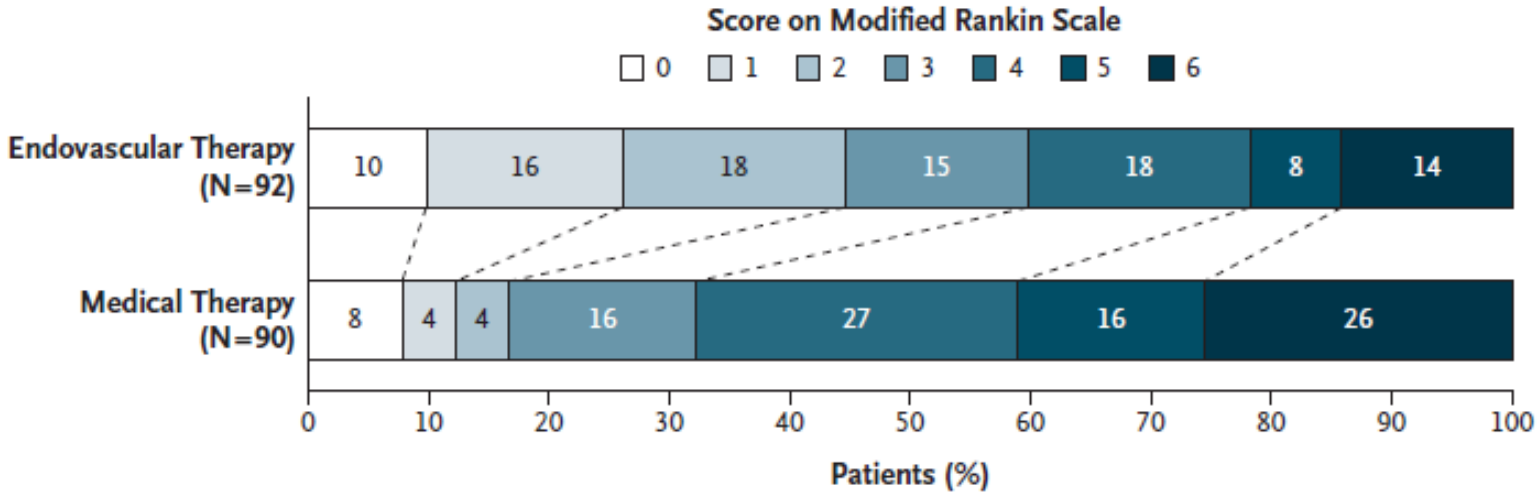


Figure 2. Scores on the Modified Rankin Scale at 90 Days.

Patients in the endovascular-therapy group received endovascular therapy plus standard medical therapy. Patients in the medical-therapy group received standard medical therapy alone. Scores on the modified Rankin scale range from 0 to 6, with 0 indicating no symptoms, 1 no clinically significant disability, 2 slight disability, 3 moderate disability, 4 moderately severe disability, 5 severe disability, and 6 death. There was a significant difference favoring the endovascular-therapy group over the medical-therapy group in the overall distribution of scores (unadjusted common odds ratio, 2.77; 95% CI, 1.63 to 4.70; P<0.001).

Antiplatelets

- Clopidogrel 75mg
- Aspirin 300mg + Dipyridamole MR 200mg
- Aspirin PR

- Risks & benefits
- Side effects

If they are in atrial fibrillation

- Heparin (UF/LMWH) increases risks of bleeding
- Warfarin for AF – 12% → 4%
- $CHADS_2$ vs. $CHADS_2VA_2SC$
- Antiplatelets for 2 weeks, then switch
- Risks & benefits
- DOAC (rather than warfarin) – RELY, ROCKET-AF, ARISTOTLE, ENGAGE).
- No role for antiplatelets

Acute Stroke Evidence Based Treatments

	% ischaemic stroke patients that benefit	Prevention death/dependency per 100 treated	Prevention death/dependency per 100 admitted
Acute Stroke Unit	100%	5	5
Thrombolysis 0-3 hr	15%	10	1.5
Thrombolysis 3-4.5 hr	3%	7	0.2
Thrombectomy 0-6 hr	10%	20	2.0
Aspirin 0-48 hr	65%	1	0.5
IPC Stockings 0-72 hr	50%	3 (death)	1.5
Hemicraniectomy 0-48 hr	0.5%	22	0.1

Adapted from Gilligan AK et al. Cerebrovascular Diseases 2005

Dos and Don’ts

- Do
  - Give aspirin after CT
  - Start statins
  - IPC stockings (for DVT prevention)

- Don’ts
  - Start new antihypertensives for ischaemic strokes unless advised by a Stroke specialist
  - Start LMWH for DVT prophylaxis
  - Test swallowing

Physiological parameters

- Oxygen
- Glucose
- Blood pressure
- Pulse
- Temperature

ANY DETERIORATION IN THE FIRST 48 HOURS, CONSIDER CT BRAIN (MAY BE A CANDIDATE FOR HEMICRANIECTOMY)

What about non-pharmacological measures?

- Nursing – from time 0 – rehab, pressure areas, swallow screen
- Speech therapist – swallow within 24 hrs (full assessment if necessary), speech within 72 hrs
- Physiotherapy – within 24 hrs
- Occupational therapy – within 72 hrs
- Psychology/Dietician/Orthoptist/Orthotist if necessary

Secondary Prevention

- Antiplatelets/Anticoagulants
- Treat hypertension, diabetes, etc.
- Carotid surgery (as discussed earlier)
- Smoking
- Alcohol
- Improved lifestyle (e.g exercise, wt loss, etc.)

How about ICH?

- Common causes – hypertension, amyloid angiopathy, anticoagulants
- CT scan is very sensitive to diagnose ICH
- Not every one needs neurosurgeons - indications
- Maintain BP at 140 mmHg or less (cf. ischaemic stroke) – use iv drugs if possible
- Stop antiplatelets/reverse anticoagulants if possible
- If they survive early stages, they do quite well (so, don't have a nihilistic attitude!)

Complications

- DVT
- Pulmonary embolism
- Aspiration & Hypostatic pneumonia
- Pressure sores
- Depression
- Seizure
- Incontinence
- Many more…

Objectives

I am now able to…

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