

Effectively Managing Emergency Department Stroke Patients

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Objectives

- Improve stroke outcome
- Know how to quickly evaluate stroke pts
- Know how to use protocols
- Provide rational therapy in the ED
- Improve disposition and documentation
- Improve Emergency Medicine practice

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A Clinical Case

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Clinical History

A 62 year old female acutely developed aphasia and right sided weakness while in a store. The store clerk immediately called 911. Paramedics on the scene within 9 minutes, at 6:43 pm. She arrived in the ED at 7:05 pm... completed her head CT at 7:25 pm... and a neurology consult was obtained at 7:35 pm (approximately one hour after the onset of her symptoms).

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ED Presentation

VS: 98 F, 90, 16, 116/63, 98% RA, Wt = 50 kg
The patient appeared alert, and was able to slowly respond to simple commands. The patient had a patent airway, no carotid bruits, clear lungs, and a regular cardiac rate and rhythm. The pupils were midpoint and reactive, and there was neglect of the R visual field. There was facial weakness of the R mouth, and R upper and lower extremity motor paralysis. DTRs were 2/2 on the L and 0/2 on the R.

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Critical Questions

- How is the NIHSS used?
- How can an ED NIHSS be estimated?
- How can the ED neurological exam be systematically performed & documented?
- What must be documented when considering tPA use in the ED?
- How should elevated blood pressure be handled in ischemic stroke?

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Stroke

- 3rd most common cause of death
- Leading cause of dependence
- Most expensive disease overall
- Over \$50 billion per year

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CT: What are we looking for?

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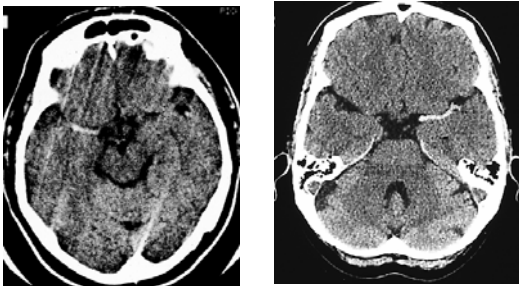
The hyperdense MCA sign

- 40-60% in angiographically proven occlusion
- 17% in unselected stroke patients



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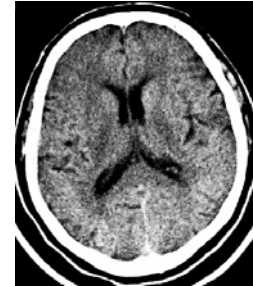
The hyperdense MCA sign



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Sulcal Effacement

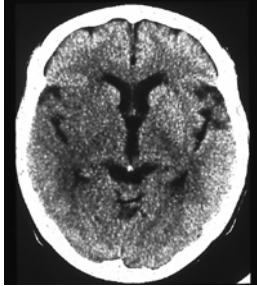
- Sulcal Effacement due to focal swelling
- Loss of grey/white differentiation



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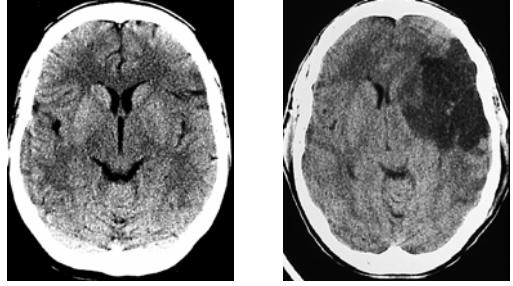
Loss of the Insular Ribbon and Basal Ganglia Hypoattenuation

- Obscuration of the right basal ganglia
- Loss of demarcation of the insular cortex



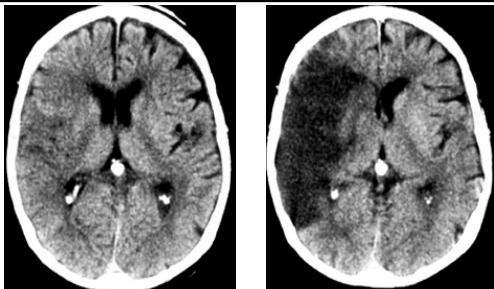
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Early Infarct Signs and follow up



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Early Signs of a large infarction (> 1/3 MCA sign)



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NINDS:

Are Early CT signs relevant?

- Analysis of all baseline CTs: 616/624 NINDS patients
- Incidence of Early CT Signs: 31%
- Significant Association: Initial NIHSS + Time Window
- No Association: Outcome, Infarct size, sICH Rate
- Conclusion: Early CT signs do not influence the effect of rt-PA (within 3h time window !!!)
- Problem: „One-Third-MCA-territory“ criterion not tested

Patel et al, JAMA 2001

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NIHSS Estimation: *The Procedure*

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NIHSS: Driving Principles

- NIHSS: anatomic neurologic examination
- Quantification directs therapies
- Estimation helps to categorize patients
 - Low NIHSS, thrombolysis less indicated
 - Mid-range NIHSS, thrombolysis indicated
 - High NIHSS, thrombolysis less indicated
- NIHSS 10-20 optimal for thrombolysis?

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NIHSS Estimation

- Perform a systematic neurological exam

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NIHSS Estimation

- Perform a systematic neurological exam
- Focus on four areas of deficit:
 - Unilateral motor deficit
 - Speech and language deficit
 - CN and visual field deficit / neglect
 - Depressed level of consciousness

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NIHSS Estimation

- Perform a systematic neurological exam
- Focus on four areas of deficit:
 - Unilateral motor deficit
 - Speech and language deficit
 - CN, neglect and visual field deficit
 - Depressed level of consciousness
- Grade/add: mild (2), mod (4), severe (8)

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NIH Stroke Scale

- 13 item scoring system, 7 minute exam
- Integrates neurologic exam components
- CN (visual), motor, sensory, cerebellar, inattention, language, LOC
- Maximum scale score is 42
- Maximum ischemic stroke score is 31
- Minimum score is 0, a normal exam
- Scores > 15-20: severe stroke

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NIHSS & Outcome

- Does the baseline NIHSS predict outcome?

- Yes.

Adams HP Neurology 1999;53:126-131
Baseline NIH Stroke Scale score strongly predicts outcome after stroke (TOAST)

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NIHSS & Outcome

- NIHSS < 12-14: 80% good, excellent outcome
- NIHSS > 20-26: < 20% good, excellent outcome
- Lacunar infarct patients: best outcomes.

Adams HP Neurology 1999;53:126-131
Baseline NIH Stroke Scale score strongly predicts outcome after stroke (TOAST)

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NIHSS Composite

- CN (visual): 8
- Unilateral motor: 8
- LOC: 7
- Language: 5
- Ataxia: 2
- Sensory: 2
- Inattention: 2

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Four Main NIHSS Areas

- CN/Visual: Facial, gaze palsy
Visual field deficit
- Unilateral motor: Hemiparesis
- LOC: Depressed LOC, AMS
- Language: Aphasia, dysarthria
- 28 total points

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NIHSS ED Estimate

- CN/Vision/Neglect: 8
- Unilateral motor: 8
- LOC: 8
- Language: 8
- Mild: 2, Moderate: 4, Severe: 8

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NIHSS: Driving Principles

- NIHSS: anatomic neurologic examination
- Quantification directs therapies
- Estimation helps to categorize patients
 - Low NIHSS, thrombolysis less indicated
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Case NIHSS Estimate

- CN/Vision/Neglect:
R vision loss & neglect, no fixed gaze 4
- Unilateral motor: complete hemiparesis 8
- LOC: mild decrease in LOC 2
- Language: expressive aphasia 4
- Approx 18 points total
- Mod-severe stroke range, worse if MS impaired

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Elevated BP Therapy: *The Procedure*

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BP Rx: Key Principles

- Identify hypertensive emergency situation
- Be aware of chronic HTN, systolic HTN
- Use BP meds that can be titrated
- Goal BP < 185 / 110
- Be more aggressive with ICH, elevated ICP
- Do not lower BP to a MAP < 110 mmHg
- Remember CPP = MAP- ICP

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First Things First: Verify BP

- Recheck the patient's blood pressure
- Perform it yourself
- Measure after supine, arm rested
- Validate with a manual cuff
- Measure in both arms
- Recheck a second time after 10 minutes

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Elevated BP Rx Procedure

- Establish HTN emergency: BP 230/140

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Elevated BP Rx Procedure

- Establish HTN emergency: BP 230/140
- IV bolus medications
 - Labetalol 10-40 mg IVP
 - Hydralazine 10-20 mg IVP
 - Enalapril 0.625-1.25 IVP

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Elevated BP Rx Procedure

- Establish HTN emergency: BP 230/140
- IV bolus medications
 - Labetalol 10-40 mg IVP
 - Hydralazine 10-20 mg IVP
 - Enalapril 0.625-1.25 IVP
- Continuous IV infusions
 - Esmolol 500 µg IV load, 50 µg/kg/min
 - Nitroprusside 0.5-10 µg/kg/min

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Elevated BP Rx Procedure

- Consider NTG in cardiac ischemia pts
- Calcium channel blockers also useful
- Goal CPP >70 mmHg, SBP > 90 mmHg
- If hypotensive, consider NS and pressors
 - Dopamine 2-20 µg/kg/min
 - Norepinephrine 0.05-2 µg/kg/min
 - Phenylephrine 2-10 µg/kg/min


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ED Treatment and Patient Outcome

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Clinical Case: CT Result



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Clinical Case: ED Rx

- CT: no low density areas or bleed
- No contraindications to tPA, BP OK
- NIH stroke scale: approx 18-20
- Neurologist said OK to treat
- tPA administered, no complications

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tPA Use & Repeat Exam

- tPA dosing:
 - 8:21 pm, approx 1'45" after CVA sx onset
 - Initial bolus: 5 mg slow IVP over 2 minutes
 - Follow-up infusion: 40 mg infusion over 1 hour
- Repeat neuro exam at 90 minutes:
 - Repeat Exam: Increased speech & use of R arm, decreased mouth droop & visual neglect
 - Repeat NIH stroke scale: approximately 12-14

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Hospital Course & Disposition

- Hospital Course: No hemorrhage, improved neurologic function
- Disposition: Rehabilitation hospital
- 3 Month Exam: Near complete use of RUE, speech & vision improved, slight residual gait deficit
- Able to live at home with assistance

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ED tPA Documentation

- With tPA, there is a 30% greater chance of a good outcome at 3 months
- With tPA use, there is 10x greater risk of a symptomatic ICH (severe bleeding stroke)
- Mortality rates at 3 months are the same regardless of whether tPA is used
- Discuss the rationale, risk/benefit assessment for using or not using tPA?
- Discuss what was done to expedite Rx... consult neurology... radiology early on?

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ED tPA Documentation

- Patient was explained risks and benefits of tPA use and was able to understand and provide verbal consent (as able), and signature with L hand.
- Risk/benefit favored tPA given clear onset time, young patient with no significant morbidities or factors that would preclude tPA use, and approx NIHSS that suggests OK use.
- Rapid CT obtained, neurology aware of pt status, agreed with expedited tPA use, to follow.

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ED tPA Documentation

- Just as important
- “The patient is NOT a candidate for tPA because...”

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ED Stroke Patient Dx & Rx

- Rapid diagnosis is critical
- NIHSS estimation guides therapies
- BP management procedure defined
- tPA use can appropriately occur and be documented
- Stroke pt outcome can be optimized

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Questions?

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