What’s New In Neurology?

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We make a difference
What’s new?

- **Subarachnoid hemorrhage**
  - Best practices

- **Intracerebral hemorrhage**
  - Blood pressure

- **Traumatic brain injury**
  - Are we chillin’ yet?

- **Stroke**
  - Interventional madness?
Exam, exam, exam
Hunt/Hess
Intubate if needed
Reverse coagulopathy
Manage blood pressure
Treat pain

Think about hydrocephalus
Antifibrinolytic agents
Seizure prophylaxis
Exam, exam, exam
Hunt/Hess
<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>Asymptomatic, minimal headache slight nuchal rigidity</td>
</tr>
<tr>
<td>Grade 2</td>
<td>Moderate to severe headache, nuchal rigidity; no neurological deficit (except 3rd n. Palsy)</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Drowsiness, confusion, or mild focal deficit</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Stupor, moderate to severe hemiparesis; possible early decerebrate posturing</td>
</tr>
<tr>
<td>Grade 5</td>
<td>Deep coma, decerebrate posturing, moribund</td>
</tr>
</tbody>
</table>
Exam, exam, exam
Hunt/Hess

- Intubate if needed
- Reverse coagulopathy
- Manage blood pressure
- Treat pain

Think about hydrocephalus
- Antifibrinolytic agents
- Seizure prophylaxis
We make a difference
Malhotra: CT/LP most effective in most settings.
Acad Emerg Med. 2016 Jan 4 (epub ahead of print)

Wu: CT/CTA not effective

CT is extremely sensitive in certain cases
Stroke 2016;47:00-00

Meurer: CT/CTA is reasonable approach
hemorrhage J Emerg Med 2016 (epub ahead of print)
Take this home

CT/LP is still the standard
...but not for long

Exam, exam, exam

Hunt/Hess

Intubate if needed

Reverse coagulopathy

Manage blood pressure

Treat pain

Think about hydrocephalus

Antifibrinolytic agents

Seizure prophylaxis
We make a difference
Airway

Imaging

Blood pressure management

Anticoagulation reversal

Osmotic therapy

Transfer to appropriate level of care

Surgical interventions

Goals of care
# NICU Intubation - Nursing checklist

<table>
<thead>
<tr>
<th>Medication (concentration)</th>
<th>Dose to Prepare</th>
<th>Administration instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl (100 mcg/2ml)</td>
<td>200 mcg = 4 ml</td>
<td>Undiluted IV push over 60 sec</td>
</tr>
<tr>
<td>Propofol (10mg/1ml)</td>
<td>200 mg = 20 ml (10 ml x 2 syringes)</td>
<td>RNs can’t administer Propofol IVP. MD to administer the medication.</td>
</tr>
<tr>
<td>Vecuronium (1mg/ml) (dose: 0.1mg/kg)</td>
<td>10 mg = 10 ml</td>
<td>Dilute each 10mg with 10ml STERILE Water IV push over 30sec *Usual dose range 5-15mg</td>
</tr>
<tr>
<td>Neosynephrine (500 mcg/5 ml)</td>
<td>50 mcg = 0.5ml</td>
<td>IV push over 60 sec Refrigerator stock – premixed in a 5cc syringe</td>
</tr>
<tr>
<td>Labetalol (5 mg/ml)</td>
<td>20mg = 4 ml</td>
<td>Undiluted IV push over 2 min</td>
</tr>
<tr>
<td>Etomidate (2 mg/ml)</td>
<td>30mg = 15 ml</td>
<td>Give over 30-60 sec *Usual dose range 15-30mg</td>
</tr>
<tr>
<td>Sodium chloride 0.9% saline</td>
<td>1 L bag</td>
<td>Ready on pressure bag (off pump)</td>
</tr>
<tr>
<td>Propofol infusion (1000mg/100 ml)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Airway Imaging
Blood pressure management
Anticoagulation reversal
Osmotic therapy
Transfer to appropriate level of care
Surgical interventions
Goals of care
Airway Imaging

Blood pressure management

Anticoagulation reversal

Osmotic therapy

Transfer to appropriate level of care

Surgical interventions

Goals of care
NOACS
Idarucizumab reverses dabigatran
Andexanet reverses apixaban and rivaroxaban

C Apixaban Study, Andexanet Bolus plus Infusion

D Rivaroxaban Study, Andexanet Bolus plus Infusion

Airway
Imaging
Blood pressure management
Anticoagulation reversal
**Osmotic therapy**
Transfer to appropriate level of care
Surgical interventions
Goals of care
Airway
Imaging
Blood pressure management
Anticoagulation reversal
Osmotic therapy
Transfer to appropriate level of care
Surgical interventions
Goals of care
Neurosurgical considerations

Ventriculostomy
Clot evacuation
Craniectomy
Airway Imaging
Blood pressure management
Anticoagulation reversal
Osmotic therapy
Transfer to appropriate level of care
Surgical interventions

Goals of care

Take this home

rebleed
TBI
Avoid hypotension and hypoxia
Avoid hypotension and hypoxia
C-spine precautions
Head of bed up 30 degrees
Airway
Hyperventilation?
Osmotics
Anticoagulation reversal
Seizure prophylaxis
Consider ventriculostomy
**Adult**

- Salvageable TBI
- GCS 3-8 after resuscitation
- Abnormal CT

- TBI with normal CT with:
  - Age > 40
  - Posturing
  - SBP < 90
Increasing ICP treatment

- Hyperventilation
- Mannitol
- Hypertonic saline
- Ventriculostomy/drainage
- Maintain CPP > 50
- Vasoactives as needed
- Craniectomy
- Paralytics
- Phenobarbital burst suppression
- Therapeutic hypothermia
Hypothermia for Intracranial Hypertension after Traumatic Brain Injury

Standard therapy favored over therapeutic hypothermia

Fever is BAD
Take home

Avoid hypotension and hypoxia
CPP = MAP - ICP
Dont hyperventilate
Osmotics
Anticoagulation reversal
Seizure prophylaxis
Consider ventriculostomy
Acute Ischemic Stroke
Rapid assessment and treatment
Blood pressure = perfusion
Endovascular therapy is an option
Consider Goals of Care
Advance hospital notification by EMS
Rapid triage protocol and stroke notification
Single call activation system
Stroke tools
Rapid acquisition/interpretation of imaging
Rapid lab testing
Mix tPA ahead of time
Rapid access to IV tPA
Team-based approach
Prompt data feedback
<table>
<thead>
<tr>
<th>Study Period</th>
<th>Preintervention (n = 27,319)</th>
<th>Postintervention (n = 43,850)</th>
<th>Adjusted Odds Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPA DTN time, median (IQR), min</td>
<td>77 (60-98)</td>
<td>67 (51-87)</td>
<td></td>
<td>&lt; .001</td>
</tr>
<tr>
<td>tPA DTN time ≤ 60 min, % (95% CI)</td>
<td>26.5 (26.0-27.1)</td>
<td>41.3 (40.8-41.7)</td>
<td></td>
<td>&lt; .001</td>
</tr>
<tr>
<td>End of each period</td>
<td>29.6 (27.8-31.5)</td>
<td>53.3 (51.5-55.2)</td>
<td></td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Improvement in tPA DTN time ≤ 60 min, % per year (95% CI)</td>
<td>1.36 (1.04-1.67)</td>
<td>6.20 (5.58-6.78)</td>
<td></td>
<td>&lt; .001</td>
</tr>
<tr>
<td>In-hospital all-cause mortality, %</td>
<td>9.93</td>
<td>8.25</td>
<td>0.89 (0.83-0.94)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Discharge to home, %</td>
<td>37.6</td>
<td>42.7</td>
<td>1.14 (1.09-1.19)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Independent ambulatory status, %</td>
<td>42.2</td>
<td>45.4</td>
<td>1.03 (0.97-1.10)</td>
<td>.31</td>
</tr>
<tr>
<td>Symptomatic intracranial hemorrhage within 36 h, %</td>
<td>5.68</td>
<td>4.68</td>
<td>0.83 (0.76-0.91)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>
Her exam improved from global aphasia to near-normal language examination on the table.
## Endovascular Treatment for Acute Ischemic Stroke — Still Unproven

Marc I. Chimowitz, M.B., Ch.B.

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### Table 1. Key Features and Results of Trials Comparing Endovascular Procedures with Medical Treatment for Acute Ischemic Stroke.*

<table>
<thead>
<tr>
<th>Trial</th>
<th>No. of Patients and Sites</th>
<th>Enrollment Period</th>
<th>Key Patient Characteristics</th>
<th>Test Treatment†</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMS III7</td>
<td>656 Patients enrolled (target, 900) at 58 sites</td>
<td>2006–2012</td>
<td>NIHSS score, ≥10; anterior or posterior circulation; 92% of 306 patients who underwent baseline CT angiography had large-artery occlusions</td>
<td>IV t-PA followed by endovascular therapy</td>
</tr>
<tr>
<td>SYNTHESIS Expansion8</td>
<td>362 Patients enrolled at 24 sites</td>
<td>2008–2012</td>
<td>No limit on NIHSS score; anterior or posterior circulation; no data on percentage of patients with large-artery occlusions‖</td>
<td>Endovascular therapy</td>
</tr>
<tr>
<td>MR RESCUE9</td>
<td>127 Patients enrolled at 22 sites but analysis restricted to 118 patients</td>
<td>2004–2011</td>
<td>NIHSS score, 6–29; large-vessel occlusion involving anterior circulation (ICA, M1, M2) required; 58% had favorable penumbral pattern</td>
<td>Endovascular therapy; 43.8% of patients in this group also initially received IV t-PA</td>
</tr>
</tbody>
</table>
A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

MR-CLEAN Investigators

Absolute difference 13.5%
mRS 0-2

**Ischemic Penumbra**

**DWI / PWI Mismatch**

- Diffusion Abnormality
- CBF < 10 ml/100g/min
- Cytotoxic edema
- Irreversible ischemia

**Penumbra**

- Perfusion Abnormality
- CBF = 10-18 ml/100g/min
- Neuronal paralysis
- Reversible ischemia
Who is appropriate for endovascular thrombectomy?

- 55 yo, stage IV metastatic disease, spontaneously resolving and then undergoing thrombectomy with TICI 3 reperfusion, a month more before hospice?

- 58 yo with no history, NIHSS 15 to 1, TICI 3 reperfusion and discharged to home with slight facial droop?
Take this home

Rapid assessment and treatment
Blood pressure = perfusion
Endovascular therapy is an option
Consider Goals of Care
We make a difference

Airway - fine tune it
Hyperventilation - don’t
Exam - repeat it
Blood pressure - manage it
Coagulopathy - reverse it
Osmotics - use them
Transfer - slow down to speed up
Seizure prophylaxis - consider it
Surgical/endovascular options - consider them

Goals of Care

Tuesday, May 10, 16
Thank you!

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