Disclosures

- I do not have any relevant commercial relationships, and my presentation will not include discussion of off-label usage.

Introduction

- Reperfusion therapy remains the mainstay in the treatment of acute ischemic stroke
- Good critical care can make a difference
Outline

- Airway and ventilatory support
- Hemorrhagic transformation
  - Risk factors
  - Practical guide to treatment
- Worsening neurological symptoms
  - Role of induced hypertension

Admission Criteria

<table>
<thead>
<tr>
<th>Neurologic</th>
<th>Non-Neurologic</th>
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<tbody>
<tr>
<td>• Post-reperfusion therapy by thrombolysis or endovascular treatment</td>
<td>• Respiratory failure and mechanical ventilation</td>
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<tr>
<td>• Massive cerebral infarction</td>
<td>• Persistent hypotension</td>
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<td>• Cerebellar and brainstem infarctions</td>
<td>• Severe hypertension requiring intravenous therapy</td>
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<tr>
<td>• Hemorrhagic conversion</td>
<td>• Cardiac infarction or arrhythmias</td>
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<tr>
<td>• Worsening neurological symptoms</td>
<td>• Severe systemic bleeding</td>
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Airway and ventilatory support

- Prevent hypoxia and hypotension
- Posterior circulation strokes are at higher risk
- Partial airway obstruction
- Hypoventilation
- Abnormal respiratory patterns
- Aspiration pneumonia
Airway and ventilatory support

Need for endotracheal intubation indicates a poor prognosis
Mortality of approximately of 50% at 30 days

Case # 2

- 67 year old arrives to the ED two hours after acute onset of right homonymous hemianopsia. IV Tpa is given and the patient is transferred to the NeuroICU. During the initial evaluation a new right sided hemiparesis is found. ED records indicate sustained BP 210/110 despite repeated doses of IV Labetalol

Hemorrhagic Transformation

- Asymptomatic hemorrhagic conversion occurs in about one third of all treated ischemic strokes.
- The risk is higher on strokes cause by large vessel occlusion and cardioembolic etiology.
- The presence of asymptomatic hemorrhagic conversion had no influence on outcomes at 3 and 6 months as measure by the MRs and the Barthel Index.
Hemorrhagic Transformation

- Biologic half-life of IV TPa at the site of the thrombus is 45 minutes
- Bleeding usually occurs in the first 12-24 hours after Tpa
- Hypertension usually implicated
- Risk higher after heparin, thrombolytics or clot retrieval
- Hyperglycemia increases the risk

Clinical signs include:
- Decreased level of consciousness
- Headache
- Vomiting
- Increased BP, bradycardia, apnea
- Worsening Neurological symptoms

Stop ongoing thrombolytic infusion
Stat head CT w/o contrast (ABC)
Send for HH, PT, PTT, INR, platelet count, fibrinogen and type and cross-match

Reversal of coagulopathy should be attempted:
- 4 units Fresh Frozen Plasma
- 10 units of Cryoprecipitate
- Consider recombinant Factor VIIa or Prothrombin complex concentrate (PCC)
- Consult Neurosurgery for evacuation of hematoma once the coagulopathy is corrected
Case # 3

- 72 year old woman comes to the ED with complaints of dysarthria and gait instability for last 4 hours. Pt is alert follows commands and has 5/5 strength in all 4 extremities. The next morning the patient is found obtunded and quadriplegic with a BP is 85/43 Upon further inquiry she has been re-started her home oral metoprolol early that morning for “rate control” of her A fib. However her symptoms improved after administration of 1 L of NS and repeated doses of Neosynephrine.

Worsening Neurological Symptoms

- Hypotension
- Fever
- Hypoglycemia
- Seizures
- Hydrocephalus
- Hemorrhage

Blood Pressure: Hypotension

- Arterial Hypotension should be avoided
- Systolic BP < 100 mmHg or Diastolic BP < 70 mmHg associated with poor outcome
- Investigate underlying cause

Raising BP improves Outcome?


Blood Pressure: Induced Hypertension

Mismatch Collaterals

Blood Pressure: Induced Hypertension

Safety of Induced Hypertension Therapy in Patients With Acute Ischemic Stroke
Matthew R. Karg** Keneng G. E. Gencali, Megan de Gouy, Jonne F. S. Jang, M. L. Female, L. Male
Neurointensive Care Unit, Johns Hopkins Hospital, Baltimore, MD Department of Neurology, Johns Hopkins Hospital, Baltimore, MD

Blood Pressure: Induced Hypertension

Adverse Events in the Study Groups

<table>
<thead>
<tr>
<th>Adverse Events</th>
<th>Top</th>
<th>Bottom</th>
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<tbody>
<tr>
<td>Abortion</td>
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<td>Arterial ischemia</td>
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<tr>
<td>Hemorrhagic stroke</td>
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<td>2</td>
</tr>
<tr>
<td>Hemorrhagic ischemia</td>
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<td>Prognosis worse</td>
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<tr>
<td>Prognosis worse (N)</td>
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<tr>
<td>Other</td>
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<tr>
<td>40% survival rate</td>
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*40\% survival rate
Blood Pressure: Induced Hypertension

- Good preliminary results in retrospective and small prospective clinical trials

- Onset <12 hours
- NIHSS score 11.7
- Phenylephrine to target SBP 160 mmHg (or 20% above baseline)
- 7/13 clinically improved

Blood Pressure: Induced Hypertension

- Who qualifies?
  - Early acute ischemic stroke < 12hr
  - Mismatch on functional imaging (CTP or MR perfusion diffusion)
  - Flow limiting vessel stenosis
  - Patients with fluctuating symptoms that are flow related

Blood Pressure: Induced Hypertension

- What target?
  - Clinical exam
  - Physiology (CPP, CBF)
  - Empirical target (SBP 160-180 mmHg or 10-20% above baseline)
Blood Pressure: Induced Hypertension

- How?
- Head of bed flat
- Volume
- Vasopressors


Conclusions

- Patients undergoing chemical or mechanical reperfusion therapy are at higher risk for hemorrhagic conversion
- Hypotension should be avoided after acute ischemic stroke
- Induced hypertension may be consider in a selected group of patients
Thank you