Medical Management of Ischemic Stroke: An Update

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Objectives

• Diagnostic evaluation and management of acute ischemic stroke.
• Inpatient management of ischemic stroke.
• Summarize the recommendations for management of stroke risk factors for primary stroke prophylaxis.
• Principles of secondary stroke prophylaxis.
• Diagnostic evaluation of cryptogenic stroke.
ED Evaluation

- NIHSS
- Head CT/MRI
- Blood Glucose, BMP
- ECG
- CBC, PT/INR
- CxR: unclear utility
Diagnostic Evaluation

- Axial imaging
  - CT
  - MRI
- Vascular imaging
  - DSA
  - CTA
  - MRA
  - Carotid and transcranial doppler
- Cardiac imaging
  - Telemetry
- Laboratory evaluation
Acute Stroke Imaging

- CT or MRI to exclude ICH
- For Detection of vascular stenoses, CTA and DSA are recommended
  - MRA is less accurate but can be useful
  - DSA is the recommended imaging modality to determine the degree of stenosis prior to CEA/CAS
- Emergent treatment of acute stroke should not be delayed in order to obtain multimodal/advanced imaging
IV Thrombolysis

- IV thrombolysis with rt-PA: FDA approval in 1996
- 1995: NINDS IV rtPA 0-3h
- 2009: ECASS-3; 3-4.5 hrs
  - Additional exclusions
  - Not approved by the FDA
- DTN 60 minutes
- No upper age limit for tPA
NINDS tPA Trial

- Part 1: 291 patients
  - NIHSS at 24 hours
  - No difference compared to placebo
- Part 2: 333 patients
  - NIHSS, Barthel Index, mRS at 3 months
  - 30% more likely to have minimal or no disability at 3 months
  - 6.4% sICH
- Mortality 17% vs. 21%
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Antithrombotics

- Oral administration of aspirin (initial dose is 325 mg) within 24 to 48 hours after stroke onset is recommended.
- The usefulness of urgent anticoagulation in patients with severe stenosis of an internal carotid artery ipsilateral to an ischemic stroke is not well established.
- Urgent anticoagulation for the management of non cerebrovascular conditions is not recommended for patients with moderate-to-severe strokes because of an increased risk of serious intracranial hemorrhagic complications.
Inpatient Care

• The use of comprehensive specialized stroke care (stroke units) that incorporates rehabilitation is recommended.

• Assessment of swallowing before the patient begins eating, drinking, or receiving oral medications is recommended.

• Subcutaneous administration of anticoagulants is recommended for treatment of immobilized patients to prevent DVT.

• Cardiac monitoring is recommended for at least the first 24 hours: screen for atrial fibrillation and other potentially serious cardiac arrhythmias that would necessitate emergency cardiac interventions.
Cerebral Edema

- Decompressive surgical evacuation of a space-occupying cerebellar infarction is effective in preventing and treating herniation and brain stem compression.
- Decompressive surgery for malignant edema of the cerebral hemisphere is effective and potentially lifesaving.
- Corticosteroids are not recommended for treatment of cerebral edema and increased ICP complicating ischemic stroke.
- Prophylactic use of anticonvulsants is not recommended.
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Asymptomatic carotid stenosis

- Aspirin and statin
- Reasonable to consider CEA/CAS for >70%
  - Peri-operative risk <3%
  - Comparison with best medical therapy unknown
- May consider annual follow up with CDUS for >50%
  - Routine screening not recommended
Migraine

- Smoking cessation should be strongly recommended to women with migraine with aura
- Oral contraceptives (especially estrogen) should be avoided in women with migraine with aura
- Treatment to reduce migraine frequency
Antiplatelet Medications

- Low dose aspirin
  - Women with Diabetes
  - CKD with GFR 30-45
  - High risk individuals with 10 year risk >10%
- Cilostazol
  - Patients with PAD
- Not indicated for asymptomatic anti-phospholipid positive status
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Antiplatelets

- ASA 50-325mg/d
  - Increasing the dose of ASA has no proven benefit
- ASA 25mg+Dipyridamole 200mg BID
- Clopidogrel 75mg/d
- Combination therapy may be considered for minor stroke/TIA
  - Not recommended for long term prevention
Risk Factor Management

- **Hypertension**
  - Initiate therapy for patients with SBP>140, DBP>90
  - Target <130 for patients with a recent lacunar stroke
  - Diuretics and ACE-i are probably preferred medication classes

- **Diabetes**
  - All patients should be screened

- **Hyperlipidemia**
  - Statin for LDL>100
  - Atherosclerotic disease target <70
Carotid Stenosis

- Ipsilateral 70-99% stenosis with stroke within the last 6 months
  - CEA is recommended
  - Peri-operative M&M risk should be <6%
  - Selected high risk patients with 50-69% stenosis
- Carotid Stenting is an alternative
  - Non inferior to CEA
- Revascularization should be performed within 2 weeks of a TIA/non disabling stroke
- Aggressive medical therapy should be initiated for all patients with carotid stenosis
Intracranial Stenosis

- Antiplatelet medication
  - ASA 325+Clopidogrel 75 * 3 months if >70%
- Intensive lipid lowering therapy
- SBP<130
- Angioplasty and stenting is not recommended
  - Investigational use if medical therapy fails
Cardioembolic Stroke

- Atrial fibrillation
  - Warfarin- INR 2.5
  - NOACs (NVAF only)
- Cardiomyopathy with low EF
  - ASA vs. Warfarin?
- Aortic arch atheroma
  - Antiplatelets
Hypercoagulable States

- For patients with ischemic stroke or TIA who meet the criteria for the APS, anticoagulant therapy might be considered
  - Antiplatelet therapy if APS criteria not met
- The usefulness of screening for thrombophilic states in patients with ischemic stroke or TIA is unknown
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Cryptogenic Stroke

- 20-25% of all ischemic strokes
- Most are embolic

**TABLE 1. TOAST Classification of Subtypes of Acute Ischemic Stroke**

<table>
<thead>
<tr>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-artery atherosclerosis (embolus/thrombosis)*</td>
</tr>
<tr>
<td>Cardioembolism (high-risk/medium-risk)*</td>
</tr>
<tr>
<td>Small-vessel occlusion (lacune)*</td>
</tr>
<tr>
<td>Stroke of other determined etiology*</td>
</tr>
<tr>
<td>Stroke of undetermined etiology</td>
</tr>
<tr>
<td>a. Two or more causes identified</td>
</tr>
<tr>
<td>b. Negative evaluation</td>
</tr>
<tr>
<td>c. Incomplete evaluation</td>
</tr>
</tbody>
</table>
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- **High Prevalence**
  - 10-25% prevalence in non stroke population
  - 40-50% prevalence in Cryptogenic stroke population
- **Cryptogenic Stroke +PFO ≠ Paradoxical embolism**
  - PFO may be incidental
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Points</th>
<th>RoPE score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No history of hypertension</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No history of diabetes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No history of stroke or TIA</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Nonsmoker</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cortical infarct on imaging</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Age, y**

<table>
<thead>
<tr>
<th>Age</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–29</td>
<td>5</td>
</tr>
<tr>
<td>30–39</td>
<td>4</td>
</tr>
<tr>
<td>40–49</td>
<td>3</td>
</tr>
<tr>
<td>50–59</td>
<td>2</td>
</tr>
<tr>
<td>60–69</td>
<td>1</td>
</tr>
<tr>
<td>≥70</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total score (sum of individual points)**

<table>
<thead>
<tr>
<th>Total score</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum score (a patient &lt;30 y with no hypertension, no diabetes, no history of stroke or TIA, nonsmoker, and cortical infarct)</td>
<td>10</td>
</tr>
<tr>
<td>Minimum score (a patient ≥70 y with hypertension, diabetes, prior stroke, current smoker, and no cortical infarct)</td>
<td>0</td>
</tr>
</tbody>
</table>

Abbreviation: RoPE = Risk of Paradoxical Embolism.
Patent Foramen Ovale

- High RoPE score
  - Higher prevalence of PFO
  - PFO more likely to be pathogenic
  - Lower stroke recurrence risk
- Highest stroke recurrence rate
  - Low RoPE score
  - Least likely to have a PFO attributable CS
- CLOSURE data
  - $\leq 5$: 14.5% recurrence rate
  - $>5$: 4.2%, $p<0.0001$
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- Aspirin
  - Warfarin
  - NOACs?
- Percutaneous closure
  - Disk occluder devices in selected patients
Occult Atrial Fibrillation

- 10-20% of cryptogenic strokes
- Most patients monitored for 24-48 hours

### Graph

**Patients with Atrial Fibrillation Detected (%)**

<table>
<thead>
<tr>
<th>Duration of ECG Monitoring</th>
<th>Patients Detected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Hr</td>
<td>2.2</td>
</tr>
<tr>
<td>1 Wk</td>
<td>7.4</td>
</tr>
<tr>
<td>2 Wk</td>
<td>11.6</td>
</tr>
<tr>
<td>3 Wk</td>
<td>12.3</td>
</tr>
<tr>
<td>4 Wk</td>
<td>14.8</td>
</tr>
</tbody>
</table>
CRYSTAL-AF

- Implantable loop recorder compared to conventional monitoring
  - 8.9% vs. 1.4% at 6 months
  - 12.4% vs. 2.0% at 12 months
- Median time-41 days
- >70 % episodes were asymptomatic
- Look hard and keep looking
Cryptogenic Stroke

• Genetic causes
  • Fabry’s disease
  • CADASIL
• Autoimmune disease
  • Vasculitis
• Occult malignancy
References

Thank You