Stroke Reperfusion Therapy: Intra-arterial/Catheter-based therapy

Mechanical and/or chemical thrombolysis is offered for eligible patients. Decisions about treatment selection in these patients are made in conjunction with the Neuroendovascular team.

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Comments in brackets denote activities specific to MGH, or additional commentary regarding national standards or guidelines. Activate the Stroke Team:

Prior to making any medical decisions, please view our disclaimer.

- Patient selection is key for successful and safe endovascular stroke therapy. Clinical and radiological criteria are assessed. Criteria are formulated based on current evidence for patient selection strategies in endovascular treatment in AIS, including institutional data and peer-reviewed publications.
- The following criteria are assessed for each patient by the treating teams:
  1. Clinical
     a. Stroke severity (NIHSS)
     b. Stroke duration (time of last known well to time of neuroimaging)
     c. Determinants of poor outcome (age, premorbid status)
  2. Radiological
     a. Infarct size (DWI/CT infarction core)
     b. Proximal vessel occlusion (site/accessibility)
- Using these components, patients are stratified into three groups, based on their expected outcomes from endovascular therapy:
  1. Likely to benefit
  2. Uncertain to benefit
  3. Unlikely to benefit
- Patients deemed likely to benefit will be offered an emergent endovascular procedure unless they are enrolled in a clinical trial.
- Patients uncertain to benefit will have candidacy for endovascular treatment determined following discussion between the Acute Stroke and Neuroendovascular services.
- Patients unlikely to benefit will only be offered an endovascular procedure in exceptional circumstances, with the agreement of both Acute Stroke and Neuroendovascular services

Likely to benefit

All of the below must be met

- Clinical
  - NIHSS ≥ 8
  - Time ≤ 6 hours anterior circulation/≤ 12 hours posterior circulation
  - Age < 80
  - Premorbid condition- Normal baseline functional status (mRS ≤1), life expectancy >12 months, reperfusion reasonably expected to prevent infarction of tissue at risk
- Radiological
Anterior Circulation

- Infarct core < 70 cc (DWI), or ASPECTS > 7 (NCCT) if MRI is not available
- Proximal arterial occlusion (ICA, M1 or proximal M2)

Posterior Circulation

- Minimal brainstem or thalamic infarct core (cerebellar stroke volume is not considered)
- Proximal arterial occlusion (basilar artery or distal dominant vertebral artery)

Unlikely to benefit

One of the below needs to be met

- **Clinical**
  - NIHSS < 4
  - Age > 90
  - Time > 8 hours Anterior circulation/> 24 hours Posterior circulation
  - Premorbid condition Moderate-severe dementia, significantly impaired baseline functional status (mRS ≥4), life expectancy of < 6 months

- **Radiological**
  - **Anterior**
    - Infarct core > 100 cc (DWI), or ASPECTS ≤ 4 (NCCT) if MRI is not available
    - Distal arterial occlusion (Mid M2, A2 or distal)
  - **Posterior**
    - Pontine, midbrain or thalamic infarcts > 50% of the territory
    - Proximal vertebral arterial occlusion
    - Distal arterial occlusion (isolated PCA)

Uncertain to benefit

- All other patients

Warnings

There are few absolute contraindications to an endovascular procedure. Patients with acute intracranial hemorrhage are not considered for endovascular arterial procedures. Large territory infarcts with mass effect are also not candidates. IAT is performed safely on patients after full dose IV t-PA. For patients with extracranial hemorrhage or a hemorrhagic tendency (e.g. recent surgery, anticoagulant use, etc) mechanical treatment alone is considered. Consideration for use of intra-arterial lytic therapy carries similar precautions to use of IV t-PA. All women of childbearing age should have a pregnancy test. Patients with a history of contrast reaction will require either premedication, or if the reaction was anaphylactic may not be candidates for intervention at all.

Pre-IAT Management

- Parallel processing is essential to reduce time delays. Times will be recorded as part of quality improvement efforts.
- IAT patients follow the same triage and evaluation pathways as those who are to receive IV t-PA
- On suspicion of proximal vessel occlusion (any patient with NIHSS> 8) within 8 hours of LSW the Neuroendovascular team should be activated by paging the fellow at 33722 to provide case details and allow for early preparation. The Endovascular fellow will activate the relevant components of the endovascular team.
- Do not place foley, nasogastric tube, arterial line or central venous line unless it is immediately necessary for patient safety.
- Unless patient is status post IV t-PA administration (see BP management guidelines above), do not lower blood pressure prior to consulting with the Acute Stroke Team. Use labetolol IV (5-20 mg IV q 10-20 mins) or, if necessary, nicaripine infusion 5-15 mg/hr. Monitor with non-invasive cuff pressures q 15 mins or continuous arterial pressure monitoring.
- Check for MRI exclusions (e.g. implanted pacemaker, metal fragments, shrapnel, etc) by contacting family immediately in the ED or while patient en-route, if a Telestroke case.
- ED radiology will be aware of the patient and will have prepared the scanners. ED team will focus on arranging for rapid transport to the scanner.
- All patients will have CT/CTA followed by MRI DWI. Treatment decisions will be made on this basis. As with evaluation for IV t-PA candidacy, treating teams and the Neuroradiologist will be present in the scanner to review images in real time.
• Upon determination that the patient is a candidate for endovascular therapy the patient will be transported directly from the MRI scanner to the angiographic suite. The patient will not return to the ED bay.

Peri-IAT Management

• The stroke service will be responsible for patient transport to the OR for IAT. Components of the endovascular team will already be in the angiographic suite, and will meet patient in the OR.
• On arrival to the room the Stroke fellow will provide a detailed summary of patient history and events to the Anesthesia team and the OR nursing team. This will occur in parallel with patient evaluation and transfer onto the angiography table.
• Procedures will be conducted under monitored anesthesia care (MAC), per the IAT MAC guidelines on Anesthesia sharepoint. The preferred agent for sedation is dexmedetomidine, given the preservation of respiratory drive despite sedation with this agent. Should the patient decompensate from a cardio-respiratory standpoint, or become excessively combative, the procedure will be halted and endotracheal intubation and general anesthesia pursued.
• Foley and A-line are not required unless special circumstances dictate.
• Blood pressure will be maintained at levels directed by the stroke service, typically elevated given the know proximal occlusion
• While the patient is being positioned and prepped the endovascular team will target groin access as rapidly as possible, per the time targets outlined in the IAT process diagram (see Appendix)
• The approach to the occlusion and the means of recanalization will be at the discretion of the endovascular team, within FDA guidelines for use of the available approved mechanical options.
• Use of intra-arterial lytic agents will be a joint decision between the Stroke and Endovascular service. Similarly, the role of antiplatelet therapy will be jointly determined in the event that cervical or intracranial stenting is indicated. The Stroke service will remain present throughout the procedure to provide procedural input.
• ICU placement will be arranged during the procedure by the stroke team, to ensure a ready location for the patient following the treatment.

Post-IAT Management

• The patient’s sheath will be managed on the basis of t-PA exposure and available closure devices, by the Neuroendovascular service.
• The patient will have sedation lightened immediately upon procedure completion and will be transported to the Neurological Critical Care unit.
• Blood pressure parameters will be adjusted based on the angiographic result. In the event of recanalization parameters will be decreased from their procedural levels.
• A post-procedure NIHSS will be obtained, where possible.
• Repeat head CT within 24 hours of IV or IA thrombolysis/thromborrhexis, as per routine, unless a STAT indication arises peri-/post-procedurally.

Management of IAT Complications

• Intracerebral hemorrhage: The procedure is terminated immediately, unless endovascular measures are instituted to stop the hemorrhage. If the patient received t-PA then reversal is initiated as soon as post-t-PA labs are drawn (see Bleeding after t-PA). Blood pressure is reduced to <160 systolic. The patient is transported to the CT scanner prior to admission to the ICU. A scan is repeated at 4 hours to evaluate for continued expansion of the hematoma (ideally a dual energy CT to distinguish hemorrhage from CT contrast). Neurosurgery is consulted for all large bleeds for consideration of EVD or hematoma evacuation as indicated.
• Failure to recanalize: Once the procedure is deemed unsuccessful, the goal is to continue collateral augmentation with BP and volume support. SBP is allowed to regulate to 220mmHg (if no t-PA exposure) or 185mmHg (if patient received t-PA). The patient is admitted to the NeuroICU for continued care. Immediate post-op CT is only obtained, if concern for injury from attempted recanalization, otherwise plan for 24 hour scan as per usual protocol.
• Groin complications: Access site complications can be serious, and represent the commonest site of extracranial hemorrhage in patients treated with endovascular means after t-PA exposure. If the right groin access is not possible then left groin access is attempted. Rarely brachial access may be considered. Vessel injury may result in hemodynamic instability if severe. Patient’s should be typed and screened, with a low threshold for transfusion if significant blood loss. Vascular surgery consultation will be determined by the Neuroendovascular team.

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