2015 AHA/ASA Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

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Outline and Objectives

• Review the new recommendations
  • Focus on recommendations applicable to rural hospitals
• Discuss our approach to endovascular stroke treatment
• Case correlation
Introduction

• In 2013, the American Stroke Association published “Guidelines of the Early Management of Patients With Acute Ischemic Stroke”

• Why the update in 2015?
  • 8 randomized clinical trials of endovascular treatment have been published since 2013 demonstrating the efficacy of endovascular stroke treatments
  • “Pivotal new evidence that justifies changes in current recommendations.”
Case

• 72 year old left handed man with dense aphasia and left hemiplegia
• NIH stroke score of 17
• Approximately 7.5 hours from onset of symptoms
CT perfusion

Time to peak  Mean transit time  Cerebral blood flow  Delay

Cerebral blood volume
CT perfusion

Time to peak  Mean transit time  Cerebral blood flow  Delay

Cerebral blood volume
Cerebral Angiogram
Post Embolectomy
Before and After
Follow up MRI
Follow up

• The patient began speaking in complete sentences and moving his left upper and lower extremities while still on the table.
• By the next morning he was nearly back to baseline with only a mild hemianopsia.
• Discharged home with NIH stroke score of 1.
American Stroke Association Recommendations

- Endovascular Interventions
- Imaging
- Systems of Stroke Care
Endovascular Interventions

1. Patients eligible for intravenous r-tPA should receive intravenous r-tPA even if endovascular treatments are being considered (Class I; Level of Evidence A). (Unchanged from the 2013 guideline)
Endovascular Interventions

2. Patients should receive endovascular therapy with a stent retriever if they meet all the following criteria (Class I; Level of Evidence A).

(New recommendation):

• (a) prestroke modified Rankin Scale (mRS) score 0 to 1
• (b) acute ischemic stroke receiving intravenous r-tPA within 4.5 hours of onset according to guidelines from professional medical societies
• (c) causative occlusion of the internal carotid artery or proximal MCA (M1)
• (d) age ≥18 years
• (e) NIHSS score of ≥6
• (f) ASPECTS of ≥6
• (g) treatment can be initiated (groin puncture) within 6 hours of symptom onset
Endovascular Interventions

• 3. As with intravenous r-tPA, reduced time from symptom onset to reperfusion with endovascular therapies is highly associated with better clinical outcomes. To ensure benefit, reperfusion to TICI grade 2b/3 should be achieved as early as possible and within 6 hours of stroke onset (Class I; Level of Evidence B-R). (Revised from the 2013 guideline)
Endovascular Interventions

• 4. When treatment is initiated beyond 6 hours from symptom onset, the effectiveness of endovascular therapy is uncertain for patients with acute ischemic stroke who have causative occlusion of the internal carotid artery or proximal MCA (M1) (Class IIb; Level of Evidence C). Additional randomized trial data are needed. (New recommendation)
Endovascular Interventions

• 5. In carefully selected patients with anterior circulation occlusion who have contraindications to intravenous r-tPA, endovascular therapy with stent retrievers completed within 6 hours of stroke onset is reasonable (Class IIa; Level of Evidence C). There are inadequate data available at this time to determine the clinical efficacy of endovascular therapy with stent retrievers for those patients whose contraindications are time-based or nontime based (eg, prior stroke, serious head trauma, hemorrhagic coagulopathy, or receiving anticoagulant medications). (New recommendation)
Endovascular Interventions

• 6. Although the benefits are uncertain, use of endovascular therapy with stent retrievers may be reasonable for carefully selected patients with acute ischemic stroke in whom treatment can be initiated (groin puncture) within 6 hours of symptom onset and who have causative occlusion of the M2 or M3 portion of the MCAs, anterior cerebral arteries, vertebral arteries, basilar artery, or posterior cerebral arteries (Class IIb; Level of Evidence C). (New recommendation)
Endovascular Interventions

7. Endovascular therapy with stent retrievers may be reasonable for some patients <18 years of age with acute ischemic stroke who have demonstrated large vessel occlusion in whom treatment can be initiated (groin puncture) within 6 hours of symptom onset, but the benefits are not established in this age group (Class IIb; Level of Evidence C). (New recommendation)
Endovascular Interventions

8. Although the benefits are uncertain, use of endovascular therapy with stent retrievers may be reasonable for patients with acute ischemic stroke in whom treatment can be initiated (groin puncture) within 6 hours of symptom onset and who have prestroke mRS score of >1, ASPECTS <6, or NIHSS score <6 and causative occlusion of the internal carotid artery or proximal MCA (M1) (Class IIb; Level of Evidence B-R). Additional randomized trial data are needed. (New recommendation)
Endovascular Interventions

• 9. Observing patients after intravenous r-tPA to assess for clinical response before pursuing endovascular therapy is not required to achieve beneficial outcomes and is not recommended. (Class III; Level of Evidence B-R). (New recommendation)
Endovascular Interventions

• 10-16. Technical recommendations.
Imaging

1. Emergency imaging of the brain is recommended before initiating any specific treatment for acute stroke (Class I; Level of Evidence A). In most instances, nonenhanced CT will provide the necessary information to make decisions about emergency management. (Unchanged from the 2013 guideline)
Imaging

2. If endovascular therapy is contemplated, a noninvasive intracranial vascular study is strongly recommended during the initial imaging evaluation of the acute stroke patient but should not delay intravenous r-tPA if indicated. For patients who qualify for intravenous r-tPA according to guidelines from professional medical societies, initiating intravenous rtPA before noninvasive vascular imaging is recommended for patients who have not had noninvasive vascular imaging as part of their initial imaging assessment for stroke. Noninvasive intracranial vascular imaging should then be obtained as quickly as possible (Class I; Level of Evidence A). (New recommendation)
Imaging

3. Summary - The benefits of additional imaging such as CT perfusion or MR diffusion- and perfusion-weighted imaging, for selecting patients for endovascular therapy are unknown. Further randomized, controlled trials may be helpful to determine whether advanced imaging paradigms are beneficial for selecting patients for acute reperfusion. (New recommendation)
Systems of Stroke Care

• 1. **Patients should be transported rapidly to the closest available certified primary stroke center or comprehensive stroke center or, if no such centers exist, the most appropriate institution that provides emergency stroke care as described in the 2013 guidelines (Class I; Level of Evidence A). In some instances, this may involve air medical transport and hospital bypass. (Unchanged from the 2013 guideline)**
Systems of Stroke Care

• 2. Regional systems of stroke care should be developed. These should consist of consisting of:
  • (a) Healthcare facilities that provide initial emergency care including administration of intravenous r-tPA, including primary stroke centers, comprehensive stroke centers, and other facilities.
  • (b) Centers capable of performing endovascular stroke treatment with comprehensive periprocedural care, including comprehensive stroke centers and other healthcare facilities, to which rapid transport can be arranged when appropriate (Class I; Level of Evidence A). (Revised from the 2013 guideline)
Systems of Stroke Care

• 3. It may be useful for facilities that provide initial emergency care including administration of intravenous r-tPA to develop the capability of performing emergency noninvasive intracranial vascular imaging to most appropriately select patients for transfer for endovascular intervention and reduce time to endovascular treatment (Class IIb; Level of Evidence C). (Revised from the 2013 guideline)
Systems of Stroke Care

• 4. Summary - Endovascular therapy requires an experienced stroke center with rapid access to cerebral angiography and qualified neurointerventionalists. Expeditious assessment and treatment should be emphasized and outcomes on all patients should be tracked. (Class I; Level of Evidence E). (Revised from the 2013 guideline)
Stroke Process at HSHS Sacred Heart Hospital

• System of Stroke Care
• Imaging
• Endovascular Interventions
System of Stroke Care

- Transfer process
- Streamlined stroke protocol
  - Clearly defined jobs for each member of the stroke team
  - Diagnostic evaluation
  - Imaging evaluation
HSHS Sacred Heart Hospital

Stroke Transfer Protocol Check List

<table>
<thead>
<tr>
<th>TIME (Minutes)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Patient presentation to Hospital</td>
</tr>
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</table>

< 25 min.

- Suggested Stroke Protocol Orders
  - Initiate Stroke Protocol labs: CBC, with diff, chem 12, PT/PT, INR, Troponin-1, BMP, Type A Screen, Sed rate
  - Initiate CT head \text{**STK**}
  - Accu-check target range Bi-440
  - urs amin Dpa (glucose < 100) or insulin drip if glucose 250 or greater
  - SMRT EKG
  - Supplemental oxygen (O2 saturation > 95%)
  - Normal saline TKD
  - Establish 2 large-bore IV sites, antecubital site needed
  - NPO
  - Blood pressure control: keep BP 135 systolic and < 80 diastolic
  - Use ONE of the following:
    - Lidocaine: 20 mg/kg push over 1-5 min.
      - Infuse 6 mg/min for 20 min, then total of 125 mg, for SBP-120 or SBP-240, give Lidocaine every 10 min. Patient to remain supine for at least 30 min. after OSD.
      - Check blood pressure every 5 min. x 2, after injection.
    - OI
      - Nicardipine 50 mg push IV over 1-2 min.

- Stroke Diagnosis by MD

- Initiate Stroke Protocol
- Referral baseline

- Call SHH 715-723-4546
- Call SHH 715-723-5495
- Talk to ER physician
- Activate EMS transfer to SHH

- Fax this sheet to 715-723-4022 ASAP or 800-723-4023 with the following:
  - EKG with patient demographics
  - Labs, CT report if results available prior to transfer
  - Transfer copy of CT, if done
  - Nursing & physician notes, other supporting documents
  - If patient transfers prior to lab results, please fax ASAP

< 30 min.

- Transport Team Arrives
- Assist Transport Team
- Transport Team Leaves

Family/Witness who called
- Home phone
- Cell phone

PARTNER INFO
- Name: ____________________________
- Age: ____________________________
- Allergies: ____________________________
- Sender info
- Contact person: ____________________________
- Phone: ____________________________

Sacred Heart Hospital

Stroke Transfer Protocol

tPA Contraindications

Do not administer tPA to treat acute ischemic stroke in the following situations in which the risk of bleeding exceeds the potential benefit.

- Significant head trauma, intracranial or intraspinal surgery in the past 3 months.
- Current Subarachnoid or Intracerebral Hemorrhage.
- Intracranial neoplasms, AVMs, or Intracranial aneurysms that are at high risk for bleeds.
- Elevated blood pressure (systolic > 185 mmHg or diastolic > 110 mmHg).
- Active internal bleeding.
- Platelet count < 100,000/mL.
- Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (such as PT, INR, plating count, and ECT [heparin clotting time]; TT [thrombin time]; or appropriate factor Xa assays).
- Heparin received within 48 hours, resulting in abnormally elevated aPTT.
- Greater than the upper limit of normal.
- Absolute contraindications for the 4.5 hour window
  - History of both Diabetes and prior ischemic stroke.

- Severe stroke (NIHSS > 25)
  - Taking an oral anticoagulant regardless of INR.

Relative Contraindications

Do not administer tPA to treat acute ischemic stroke in the following situations in which the risk of bleeding exceeds the potential benefit.

- Symptoms cleared spontaneously.
- Pregnancy.
- Recent significant stroke.
- Major surgery or serious trauma within previous 14 days.
- Recent gastrointestinal or urinary tract hemorrhage (within previous 3 months).

Other

- Family or patient refusal.
- Hospice care.
- Palliative care.
- Outside treatment window.
- Given at outside facility.
- Unknown time of onset.
STROKE CODE

PATIENT ARRIVES BY EMS

PROVIDER ASSESSES FOR STROKE PROTOCOL ELIGIBILITY (5 min goal) and/or SCANNING

READINESS

NO ← Scanning readiness/appropriate → YES

ROOM PATIENT
NIH DONE
EKG (if not done by EMS)
ACCUCHECK (IF NOT DONE BY EMS)
MONITOR PLACED
MOVE PATIENT TO ER CART & OBTAIN WEIGHT
IV START WITH LAB DRAW
(IF IV NOT DONE BY EMS)

NO ← STABLE → YES

CONTINUE STABILIZATION MEASURES

TO SCANNING

STABLE

YES

NIH DONE IN HALL (5 min goal)
BLOOD SUGAR (if not done by EMS)
TO SCANNING ON EMS CART
PATIENT TRANSFERRED TO ER CART FOR WEIGHT
PATIENT TRANSFERRED TO CT TABLE AND SHH MONITOR PLACEMENT
INITIAL SCAN (10 min goal)
LABS DRAWN (if not done by EMS, goal 15 min)
FINISH SCANNING SERIES
PT BACK TO ER
EKG

NOTIFY CT IF IMAGING NOT APPROPRIATE
Starting February 1st, 2016

Work flow for Stroke Direct Admissions Going to Imaging First for Potential Clot Retrieval

Transfer center receives notification of transfer

Patient information entered into bed tracking

Transfer center responsibilities:
1. Ask transferring facility to remind EMS to give ETA time when roughly 10 minutes out
2. Notify ER, 6th floor charge, and CT of pending transfer

ER responsibilities:
1. Obtain ETA from ambulance at time of radio report
2. ER RN to notify ER physician of transfer upon ambulance radio report
3. Notify the operator of patient’s predicted arrival time
4. Assess stability upon patient arrival (perform ABC assessment)
   a. Stable: patient will continue on to CT per EMS cart
   b. Unstable: patient changed to ED status, initiate care, and notify neurologist

Operator responsibilities:
1. Once ER calls with pending arrival time, notify on-call stroke protocol neurologist, CT, CCU, 6th floor charge, and registration of patient’s predicted arrival time.

Neurologist responsibilities:
1. Place order for CT, CTA, CTP once patient is assigned a bed
2. Meet patient in CT
3. Discuss with radiologist the option of clot retrieval

NIH and CCU RN’s responsibilities:
1. Meet patient in ER hallway by ambulance entrance
2. CCU RN to bring monitor from the patients assigned CCU room
Imaging

• Noncontrast head CT
• CTA head and neck
• CT cerebral perfusion

• MRI
Noncontrast head CT

- Hemorrhage
- Visible stroke
- Normal

STOP
CT perfusion

• Core infarct
  • Tissue that has already or will go on to infarction

• Penumbra
  • Ischemic tissue that is at risk for progressing to infarction but may be salvageable with reperfusion
CTA head and neck

- Intracranial occlusions
  - Ischemic strokes can affect vessels of any size
    - Microscopic – not visible by CTA
    - Large vessel occlusions

- Carotid stenosis or occlusion
Large Vessel Occlusions

- High mortality rate
- High rates of disability in survivors
- Account for the majority of patients with long term disability
Large Vessel Occlusions

• Internal Carotid Artery
• Middle Cerebral Artery
• Basilar Artery
Treatment Options

• IV tPA
• Endovascular treatment
  • IA tPA
  • Embolectomy
Intravenous tPA

• Tissue Plasminogen Activator (tPA)
• Can be administered within 3-4.5 hours of onset of symptoms
• Powerful clot dissolving medicine
• Limited ability to recanalize large vessel occlusions
  • 6% for ICA occlusion
  • 20.3% for distal ICA and M1 occlusion
  • 29% for M1 occlusion
• IV tPA should be administered to those who meet eligibility criteria even if endovascular therapy is planned
Endovascular Treatment

- Intraarterial tPA
- Embolectomy
Intraarterial tPA

- Better than IV tPA for large vessel occlusions but overall suboptimal recanalization rates
- Primarily used as an adjunct to embolectomy
- Also can be used in patients with unfavorable anatomy for embolectomy
Embolectomy

• Mechanical removal of the embolus/thrombus causing the stroke
• Indicated for large vessel occlusions
• Can be performed up to 6-8 hours after onset of symptoms
  • Up to 24 hours for posterior circulation strokes
• Recent clinical trials have demonstrated superior clinical outcomes of embolectomy over IV tPA alone
  • MR CLEAN
  • ESCAPE
  • EXTEND IA
  • SWIFT-PRIME
  • REVASCAT
Embolectomy

• Devices
  • Merci
  • Solitaire
  • Penumbra
Embolectomy

• Eligibility criteria
  • Good baseline functional status
  • NIH stroke score > 5
  • < 6-8 hours from onset of symptoms
  • No intracranial hemorrhage

• Large vessel occlusion
• Penumbra on perfusion imaging and small or no core infarct
Case 1

• 66 year old man with acute dense hemiparesis and aphasia
• NIH stroke score of 26
• Presented 5 hours after onset of symptoms
CT perfusion

Time to Peak

Delay

Cerebral blood volume
Cerebral Angiogram
Status Post Embolectomy
Before and After
Follow up

• Discharged home with NIH stroke score of 2
Case 2

• 63 year old man with acute onset of aphasia and right hemiplegia
• NIH stroke score of 26
• Presented less than 2 hours from onset of symptoms
• Received IV tPA
CT Perfusion

- Cerebral blood flow
- Mean transit time
- Time to peak
- Cerebral blood volume
CT Angiogram
Cerebral Angiogram
Post Embolectomy
Before and After

6/13/2015, 6:58:52 PM

6/13/2015, 7:17:09 PM
Follow up

• Discharged home with NIH stroke score of 1
Case 3

• 64 year old man with acute onset aphasia and right sided deficit
• NIH stroke score of 15
CT Perfusion

Cerebral blood flow
Time to Peak
Mean Time to Transit
Delay

Cerebral blood volume
CTA Head and Neck
Carotid Angiogram
Post Embolectomy
Carotid Stent and Angioplasty
Post Embolectomy
Follow up

• Discharged to rehab with NIH stroke score of 10
Conclusion

- Ischemic strokes are a leading cause of death and disability
- Large vessel occlusions in particular are associated with high mortality and disability rates
- ASA updated their recommendations in 2015 due to overwhelming evidence that endovascular treatment is safe and effective for treatment of large vessel occlusions
- Embolectomy should be offered to all patients who meet eligibility criteria (even if they also receive IV tPA)
  - NIH stroke score ≥6
  - < 6-8 hours from onset of symptoms
  - No intracranial hemorrhage
  - Large vessel occlusion
  - Penumbra on perfusion imaging and small or no core infarct