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**Acute Intra-arterial Stroke Treatment**

**Purpose:** To provide guidance in the care of an Acute Intra-Arterial Stroke patient

**Application:** For all potential acute intra-arterial stroke patients

**Guideline: Acute Intra-arterial Stroke Guideline**

**Disclaimer**

This protocol was developed by the Stroke Service and members of the Stroke Taskforce at Boston Medical Center and outlines the major responsibilities for the urgent evaluation and treatment of acute stroke patients who present to the ED.

This information is intended to be used only as a medical and educational reference tool. It does not replace or overrule the treating physician's judgment or diagnosis. We tried to keep the information as accurate as possible and therefore disclaim any implied warranty or representation about its accuracy or appropriateness for a particular purpose. This stroke protocol is subject to change without notice.

**Guidelines for Acute Intra-arterial Stroke Treatment**

1. **A. Indications**
* Age ≥ 18 AND
* NIHSS ≥ 8 AND
* CT ASPECTS > 6 or DWI lesion < 70cm3 AND
* Anterior circulation stroke; Carotid T occlusion or M1/M2 MCA occlusion; in patients not receiving IV tPA) within 8 hours of stroke symptom onset (groin puncture by 6 - 7 hours from onset) or
* Posterior circulation stroke within 18 hours of stroke symptom onset or
* Wake-up strokes or anterior circulation strokes of beyond 8 hours or unknown time onset with clinical – CT/DWI mismatch (correlate with FLAIR sequences)
1. **B. Contraindications**
* Evidence of infarction > 70 cm3 DWI (calculation using abc/2) or CT ASPECTS < 5.
* Significant mass effect with midline shift
1. **C. Warnings (risks must be weighed against anticipated benefits)**
* Suspicion of aortic dissection
* Renal insufficiency (i.e. creatinine > 2) not on dialysis
* Minor neurological deficit or rapidly improving symptoms
* NIHSS 6 to 8: may consider patient; recommend CTA triage
* History of IVDA and/or suspicion for endocarditis
* Pregnancy (a lead shield may be placed over the abdomen)
* Significant impaired baseline functional status (mRS >4)
* Informed consent cannot be obtained. Two physician consent may be utilized on an emergent basis

**D. Not a contraindication**

* Current use of anti-platelets, oral anticoagulants with abnormal INR
* Post-surgery or cardiac catheterization (minimize lytics)
1. **E. For those patients presenting with suspected stroke and NIHSS ≥ 8 to the Emergency Room:**
2. EMT/Triage: alert EM-MD and stroke fellow (pager 1620 or call stroke fellow direct via Stroke Hotline 1 844 BMC 4CVA / 1 844 262-4282) and stroke resident (P1 page)
3. Patient is transferred to the Trauma Room on the Acute Side (Within 4.5 hours from symptom onset)
4. EM/MD: ORDER STAT HEAD-CT AND STAT Neuro Consult (“Code Stroke 1” via trauma line 8-6000). If NIHSS 6-12, order stat CTA to look for vessel clot burden. CTA NOT to delay IV tPA if patient is a candidate. If NIHSS is > 15 (new deficits) or patient presents with an MCA syndrome, notify Neuro-IR team (pager COIL/2645) to consider an emergent diagnostic cerebral angiography to identify target large vessel occlusion in place of CTA.
5. RN/MD
	1. Establish 2 IV sites, including stat 18 gauge right antecubital IV for CTA.
	2. Initiate fluid hydration in the ED with 500cc bolus of 0.9% NS (avoid hypo-tonic fluids) over the 1st hour, then NS at 100cc/h except in those patients who have a contraindication (pulmonary edema, renal failure, known CHF/LVEF<40%/mod-severe diastolic dysfunction)
	3. Consider Foley or condom catheter (this should NOT delay time to CT head)
6. STAT Labs: PTT, INR, CBC (without diff), electrolytes, BUN, creatinine, CK & troponin, glucose, type & hold, ESR, CRP
7. Order STAT CTA with initial CT head if concern for large vessel occlusion
8. If CT with ASPECTS > 6, STAT page Neurointerventional Attending (pager COIL/2645) who activates angio team. tPA is approved by stroke attending, 0.9mg/kg
9. Patient is considered for IA endovascular therapy

>4.5 hours from symptom onset, wake-up stroke or unknown symptom on-set

* If CT head does not show obvious hypodensity ASPECTS <6, or CT head difficult to interpret ASPECTS, order STAT CTA (intra/extra-cranial CTA) or consider STAT MRI (DWI) if readily available

STAT CTA to be performed prior to available Creatinine in patients presenting with suspected emergent large vessel occlusion. In patients with prior history of CKD consider delay until serum creatinine is available prior to performing CTA

*Note: Lima et al. reported 575 consecutive acute stroke patients who received contrast, only 5% developed CIN (vs.10% in the non-exposed cohort of 343 patients)*

*Please see Appendix A for a brief literature review regarding CTA in acute stroke and the incidence of contrast induced nephropathy.*

**F. Decision triaged for IA:**

* Neurointerventional confirms case with angio team. A rapid response is critical.
* Anesthesia team activated by Neurointerventional Attending. The procedure will proceed as first intention under conscious sedation with initial monitoring by Radiology nursing to bridge any potential delay in Anesthesia team arrival. A rapid response is critical.
* Stroke Fellow activates Critical Care Resource Nurse (Pager 4771) to help mobilize patient to angio suite.
* In parallel, Stroke Fellow, Stroke Resident or Stroke Attending obtains procedure consent with patient/patient family. Probability of opening blood vessel 50-80%. Opening blood vessel does not necessarily improve exam if tissue is infarcted. Risks include: stroke, intracranial hemorrhage (up to 10%), death, failure of intervention, blood vessel injury, groin hematoma, contrast nephropathy, need to convert to general anesthesia, radial artery injury, pseudoaneurysm, need for additional procedures, myocardial injury.

*Note: CT-to-groin times in EXTEND-IA 93 mins SWIFT PRIME 58 mins and ESCAPE 51 mins.*

*Note: Only 9% of endovascular treatment patients received general anesthesia in ESCAPE*.

* Blood pressure goal: if s/p IV rt-PA, SBP goal 150-180, DBP goal < 105. Otherwise, SBP goal 140-200 mm Hg pre-recanalization.
1. **G. Procedure**
* Sheath (5-8F) inserted in femoral artery, sheath side-arm connected to a-line monitoring or continuous heparinized saline flush (2000 units/liter NS, 30cc/hour).
* Heparin bolus will be at the discretion of the interventionalist. (Ex: IMS III 2000 units of heparin bolus, then 450 units/hour heparin, to d/c at end of procedure)
* Symptomatic artery cannulated and imaged. If carotid artery occlusion suspected or confirmed, contralateral carotid or vertebral artery can be interrogated for collateral flow.
* If no occlusion identified in the symptomatic vascular territory, no device nor IA tPA will be administered. If thrombus is present, the device will be selected at the discretion of the neurointerventionalist. Some preferred devices may include:
	+ M1 occlusions – BCG + Stent retriever or Aspiration
	+ M2 occlusions (left hemispheric) – BCG + Stent retriever
	+ Carotid terminus occlusions – BCG + Stent retriever or Aspiration
	+ ICA bifurcation occlusion – Angioplasty +/- stent

*Note: Innovation of neurointerventional tools in acute stroke therapy is on-going. As such, new and novel tools not explicitly named in this document may be considered for use at the neurointerventionalist’s discretion.*

* If the vessel cannot be recanalized after a reasonable trial, then the procedure may terminate at the discretion of the neurointerventionalist.

*Note: M2 occlusions were included in recent trials, 14% of treatment group in SWIFT PRIME, 11% in EXTEND-IA.*

If tPA is chosen:

* The rt-PA concentration for IA administration will be 1 mg/5 ml or 10 ml solution; maximum dose is 22 mg over 2 hours infusion
* After microcatheter placement:
	+ 1 mg of tPA will be hand injected at low pressure over 2 minutes distal to the thrombus
	+ A microcatheter contrast injection may be performed if the position is not clear
	+ The microcatheter will be retracted just proximal into the proximal thrombus
	+ A guide catheter angiogram or road map image should be obtained with microcatheter in place in proximal thrombus to confirm arterial occlusion and appropriate microcatheter placement
	+ An additional 1 mg of rt-PA will be slowly hand injected at low pressure over 2 minutes, followed by infusion rate 10 mg/hour low pressure hand infusion or syringe pump
* Control angiogram to be conducted every 15 minutes via guide catheter
* Microcatheter contrast injections should be minimized
* If complete lysis has not occurred, the microcatheter may be advanced further into the thrombus. Microguidewire and microcatheter may be passed to and from through the thrombus as well for mechanical disruption

Post-procedure

* At 24 hours: All patients will receive NIHSS
* At discharge: All patients will receive NIHSS
* 1 month: telephone or stroke clinic visit survey for modified Rankin Scale and NIHSS
* 3 months: telephone or stroke clinic visit survey for modified Rankin Scale and NIHSS
* 12 month: mRS
* NIHSS and mRS recommended at every stroke clinic visit follow-up for first 3 months

**APPENDIX A**

Brief summary of selected trials addressing the risk of CIN in acute ischemic stroke patients who underwent CTA.

1. **Krol AL, Dzialowski I, Roy J. Incidence of Radiocontrast Nephropathy in Pa-tients Undergoing Acute Stroke Computed Tomography Angiography. Stroke 2007;38:2364-2366.**

Incidence of CIN, defined as > 25% elevation in serum Cr within 72 hrs of administration

Contrast used: nonionic, low-osmolar Optiray 320

Patients with a positive history renal disease, CTA was delayed until available serum Cr

Results

224 patients (2 with h/o CKD)

3% developed CIN acutely\* and 13% in late follow-up (none required HD)

\*93 patients underwent CTA without available Cr, 2% developed CIN; 131 patients underwent CT after available Cr, 4% developed CIN

1. **Hopyan JJ, Gladstone DJ Mallia G et al. Renal Safety of CT Angiography and Perfusion Imaging in the Emergency Evaluation of Acute Stroke. AJNR Nov 2008. 29:1826-1830**

Incidence of CIN, defined as > 25% elevation in serum Cr within 72 hrs of administration

Incidence of CKD, regardless of available Cr within 72 hrs

Contrast used: nonionic; low-osmolar Omnipaque, iso-osmolar Visipaque\*

\*Visipaque preferentially used in patients with GFR 30-60mL/min, and those without baseline Cr

Results

198 patients (10 patients with known h/o CKD)

0 patients developed CKD

2.9% developed CIN\* (none required HD or developed CKD)

\*2% in patients scanned before available baseline Cr

Most patients received IVF after contrast CT (75-125 mL/h)

1. **Dittrich R, Akdeniz S, Kloska SP et al. Low rate of contrast-induced Nephropathy after CT perfusion and CT angiography in acute stroke patients. J Neurol. 2007 Nov; 254(11):149-7.**

Contrast used: nonionic, low osmolar Ultravist 300

Results

162 patients (25% with known h/o CKD)

3% developed CIN (none required HD)\*

\*Cr clearance did not decrease significantly in patients with h/o CKD

Most patients received IVF within 48 hours after administration of contrast

1. **Lima FO, lev MH, Levy RA et al. Functional contrast-induced CT for evaluation of acute ischemic stroke does not increase the risk of contrast-induced nephropa-thy. AJNR 2010 31:817-821**

CIN defined as > 25% elevation in post-contrast serum Cr

Contrast used: nonionic, low osmolar Isovue

Results

575 patients received contrast

5% developed CIN (vs. 10% in non-exposed cohort of 343 patients)

1. **Sharma J, Nanda A, Jung RS et al. Risk of contrast-induced nephropathy in patients undergoing endovascular treatment of acute ischemic stroke. JNIS 2013 Nov;5(6):543-4.**

CIN defined as > 50% elevation of serum Cr above baseline.

Contrast used: Optiray 320

Results

191 patients with baseline Cr

1.5% developed CIN within 48 hours

Additional CTA was obtained in 44 patients, none of which developed CIN.

**Responsibility:** MD, RN, Radiologist, radiology tech, Lab, Pharmacy

**Forms:** tPA consent, tPA information sheet, IR consent

**Other Related Policies:** IA Stroke Protocol,

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#### Section:

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