Anesthetic Management of Thrombectomy for Acute Ischemic Stroke

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Introduction

Each year in the US, approximately 795,000 adults experience a new or recurrent stroke, and 140,000 die as a result.[1] Stroke ranks 5th among all causes of death and is the leading cause of serious long-term disability.[1]

The **first-line treatment for ischemic stroke is IV tPa (alteplase) within the first 3 to 4.5 hours of symptom onset.**[2] However, its effectiveness is limited in patients with large vessel occlusions or those presenting outside this time window. **For these cases, mechanical thrombectomy is performed by neurointerventional radiologists,** using endovascular techniques (most commonly via either the radial or femoral artery) under fluoroscopic guidance to deploy a stent retriever or suction catheter into the cerebral vasculature to capture and extract the clot in order to restore blood flow to the ischemic brain region.[2]

Each hour of delay in reperfusion during an acute ischemic stroke can cost approximately 120 million neurons, 830 billion synapses, and 714 km of myelinated fibers, **equating to the brain aging 3.6 years per hour in terms of lost neuronal function.**[3] Thus, time efficient anesthetic induction, along with tight hemodynamic management with the goal of maximizing cerebral perfusion, is paramount to the long-term prognosis of these patients.

Case Report

Patient History

86 y/o M, NKDA, with PMHx of **atrial fibrillation and hypertension**. Patient was at home when his wife noticed him falling on the floor. BIBA **with R sided weakness. CT/CTA revealed an L M1 occlusion**. He was **not treated with IV tPA** as he was on apixaban**.** However, he was **deemed a candidate for thrombectomy and thus flown to WHC.** Per Medstar transport, patient was **hypertensive en route and also had one episode of emesis,** but they did not think that he aspirated. On arrival to MWHC, patient had **L gaze deviation, R visual field cut, RUE flaccid, mute.**

Anesthetic Summary

The patient was brought into the neuro IR suite by EMS with limited PMH. **Standard ASA monitors** were placed. Due to concerns for emesis, patient was induced via **RSI with standard IV drugs** (100 mcg fentanyl, 100 mg lidocaine, 150 mg propofol, 100 mg rocuronium), thus mask ventilation was not attempted, and intubation was performed with a video laryngoscope. The patient was **maintained with sevoflurane (0.6-0.8 MAC)** and 60% FiO2. **Blood pressure was supported with a phenylephrine infusion ranging from 30-50 mcg/min, and SBP was maintained in the 130-140 mmHg range.** The patient was transported to the neuro ICU intubated, without infusions for transport, and neuromuscular blockade was reversed with glycopyrrolate/neostigmine.

Discussion

Anesthetic Technique: Sedation or General?

A 2019 survey in showed an almost equal split between the use of general anesthesia and conscious sedation (51% vs. 49%) in the USA.[4] GA provides better airway control and prevents patient movement, though it **takes longer, delaying intervention, can cause more hemodynamic instability, and is associated with a higher risk of pneumonia.**[4] Sedation allows for real-time neurological monitoring and faster procedural onset but **risks respiratory depression, aspiration, and patient movement, all possibly requiring conversion to GA.**[4] While retrospective studies have favored sedation, recent randomized trials suggest no significant difference in long-term outcomes between GA and sedation when protocols are adhered to regarding SBP control.[4]

Blood Pressure Management

Systematic review of observational studies of blood pressure and ischemic stroke outcomes suggests that **during the revascularization procedure, SBP should be tightly controlled between 140–180 mmHg**, with a MAP above 70 mmHg to maintain collateral perfusion and prevent further ischemic injury.[5] Sudden drops in blood pressure should be avoided, as they can reduce perfusion to the penumbral tissue, exacerbating infarction.[5] Post-revascularization, SBP targets depend on the degree of reperfusion: **following successful reperfusion, SBP should be kept ≤160 mmHg to prevent reperfusion injury,** while for cases with intracerebral hemorrhage, stricter control to ≤140 mmHg is essential to minimize the risk of hematoma expansion.[5] If reperfusion is incomplete, BP should remain below 180/105 mmHg to reduce the risk of further ischemic damage or hemorrhagic conversion.[5]

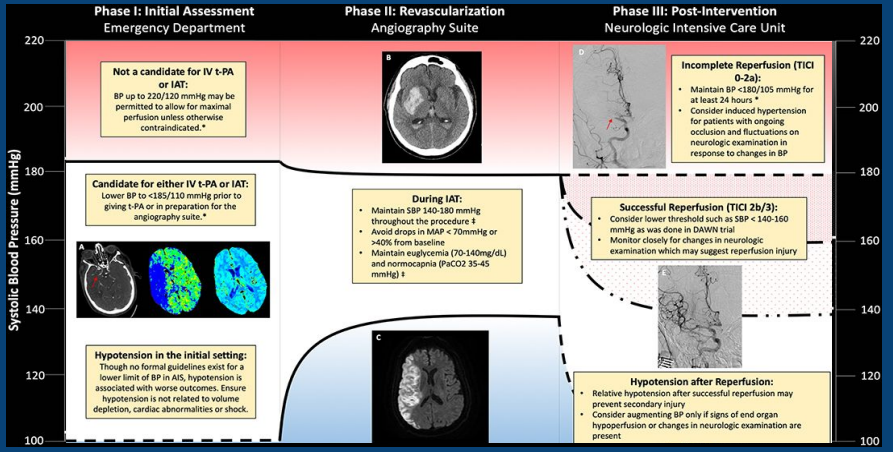

Figure 1 *(Above)*: Perioperative Blood Pressure Management Goals for Stroke Revascularization.[5] IAT = Intra-arterial treatment (mechanical thrombectomy).

Reflection/Conclusion

Should we have put in an A-line?

Society of NeuroInterventional Surgery target times are **from diagnostic imaging to arterial puncture in <60 minutes** and **arterial puncture to first thrombectomy attempt in <30 minutes.**[6] While we considered placing an A-line prior to the procedure given the need for tight BP control, it ultimately would have cost too much time. In hindsight, it may have been prudent to place one after the procedure before taking the patient back up to the ICU.

Did we choose the correct anesthetic technique?

Given the risk for aspiration knowing the patient had already vomited during transport, it was necessary to **intubate in order to secure the airway**. Furthermore, we needed to ensure the patient would tolerate the procedure, and **due to altered mental status,** we were not confident he could follow commands and remain still. We ultimately felt that a **time-efficient induction performed with video laryngoscopy to minimize intubation delays** would alleviate any concerns about delaying the procedure, and ultimately our induction time was <10 mins from room arrival to procedure start.

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