

Medical management after endovascular stroke therapy

Alejandro A. Rabinstein, MD

Professor of Neurology

Mayo Clinic

USA

Rabinstein.alejandro@mayo.edu

Disclosures

- **None**

Learning Objectives

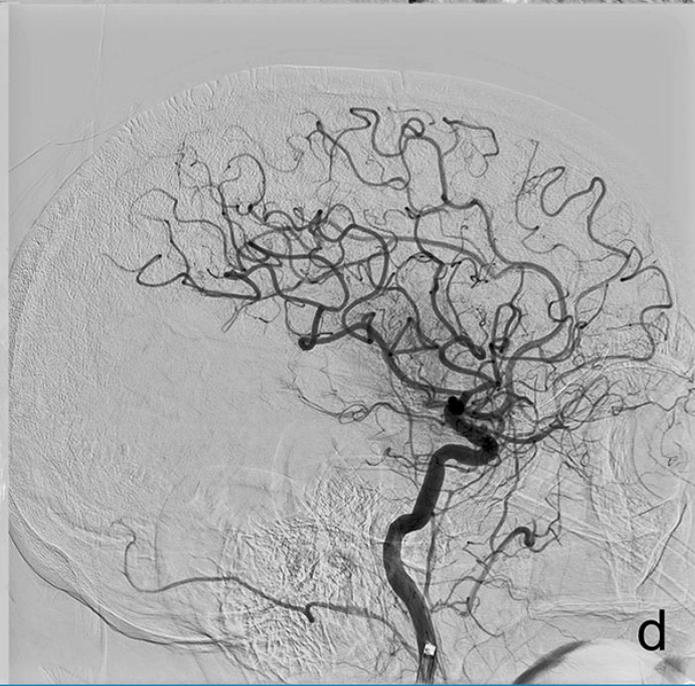
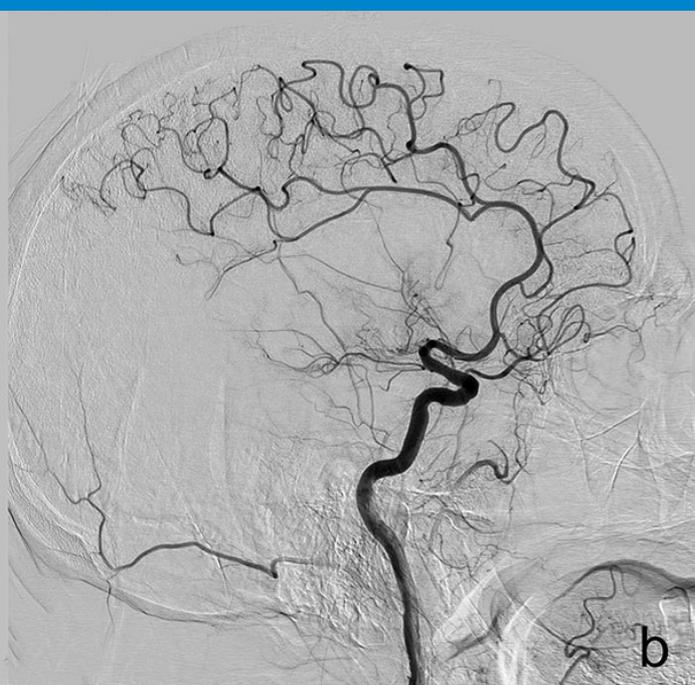
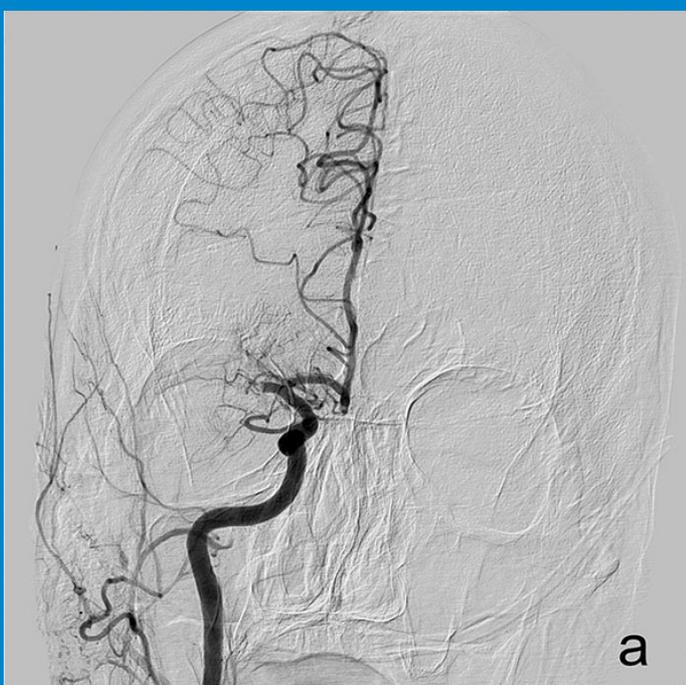
- **Appraise the factors that should be considered to optimize BP parameters after EVT**
- **Recognize the most common causes of neurological decline after EVT**
- **Diagnose the main site access complications after EVT**

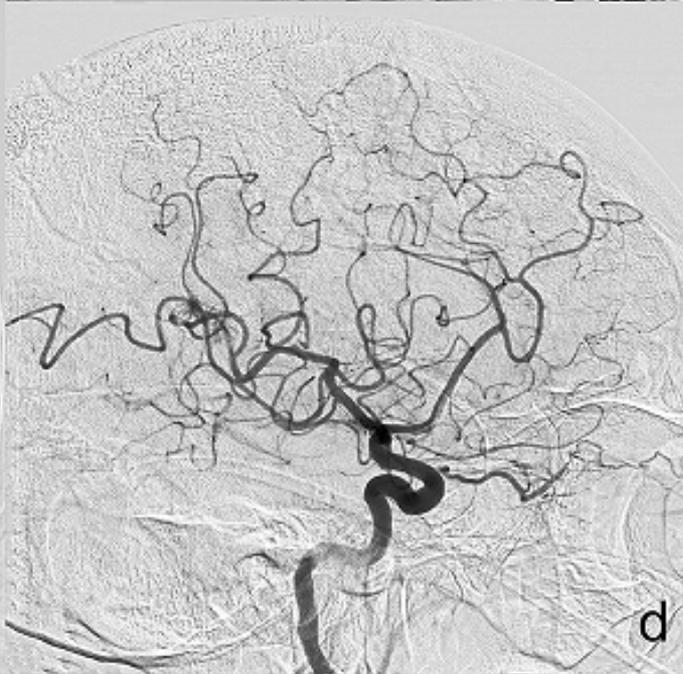
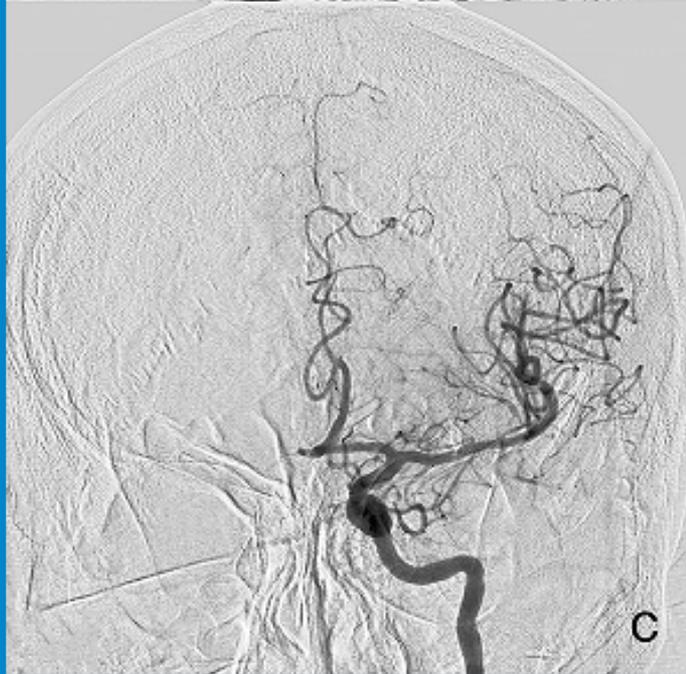
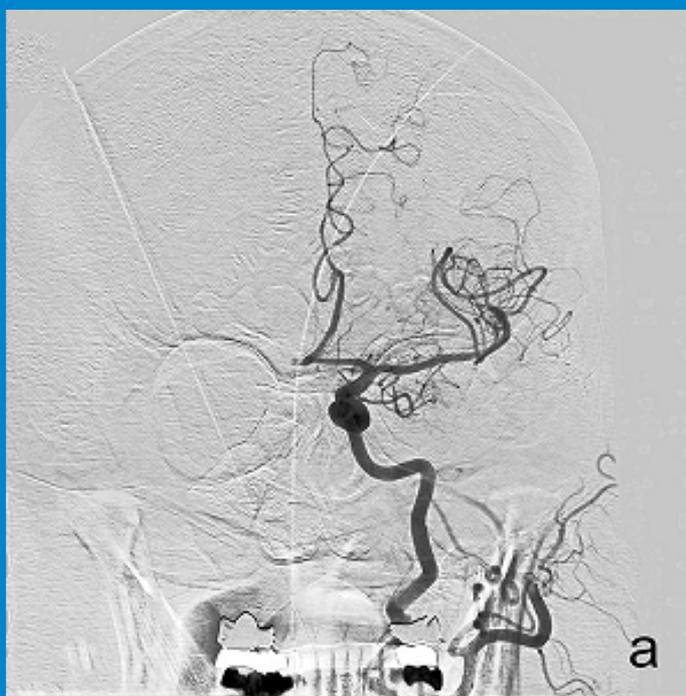
Outline

- **Blood pressure management**
- **Other general aspects of care**
- **Neurological decline**
 - **Reperfusion injury / hemorrhage**
 - **Delayed arterial reocclusion**
- **Access site complications**

Blood pressure

- **Not sufficiently studied**
- **2018 AHA Guidelines: <180/105 mmHg for the 24 hours following the procedure is reasonable**
- **Practices vary across centers**
- **Individualization of BP parameters based on degree of recanalization makes sense**





Decreases in Blood Pressure **During** Thrombectomy Are Associated With Larger Infarct Volumes and Worse Functional Outcome

Nils H. Petersen, MD*; Santiago Ortega-Gutierrez, MD*; Anson Wang, MD*; Sumita Strander, BA; Sreeja Kodali, BS; Andrew Silverman, ScB; Sudeepta Dandapat, MD; Lauren H. Sansing, MD; Joseph L. Saver, MD; Guido J. Falcone, MD; Emily J. Gilmore, MD; Hardik Amin, MD; Ryan M. Hebert, MD; Charles Matouk, MD†; Kevin N. Sheth, MD

If it matters during, it should matter later...

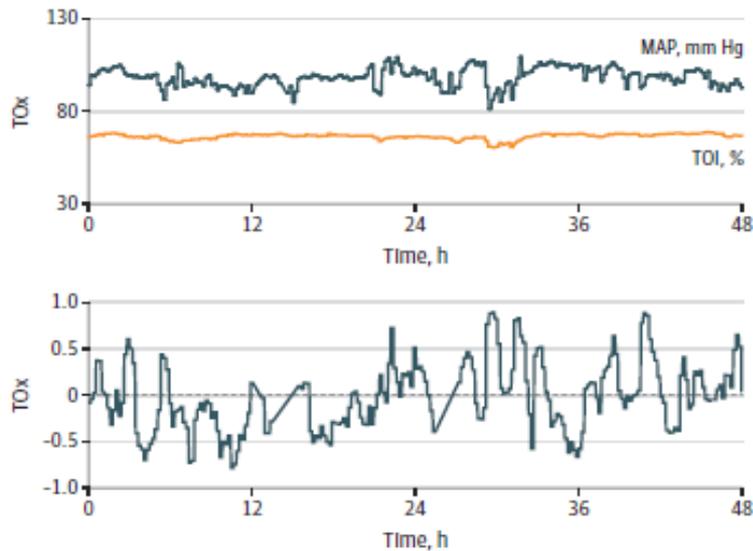
Background and Purpose—After large-vessel intracranial occlusion, the fate of the ischemic penumbra, and ultimately final infarct volume, largely depends on tissue perfusion. In this study, we evaluated whether blood pressure reduction and sustained relative hypotension during endovascular thrombectomy are associated with infarct progression and functional outcome.

Methods—We identified consecutive patients with large-vessel intracranial occlusion ischemic stroke who underwent mechanical thrombectomy at 2 comprehensive stroke centers. Intraprocedural mean arterial pressure (MAP) was monitored throughout the procedure. Δ MAP was calculated as the difference between admission MAP and lowest MAP during endovascular thrombectomy until recanalization. Sustained hypotension was measured as the area between admission MAP and continuous measurements of intraprocedural MAP (aMAP). Final infarct volume was measured using magnetic resonance imaging at 24 hours, and functional outcome was assessed using the modified Rankin Scale at discharge and 90 days. Associations with outcome were analyzed using linear and ordinal multivariable logistic regression.

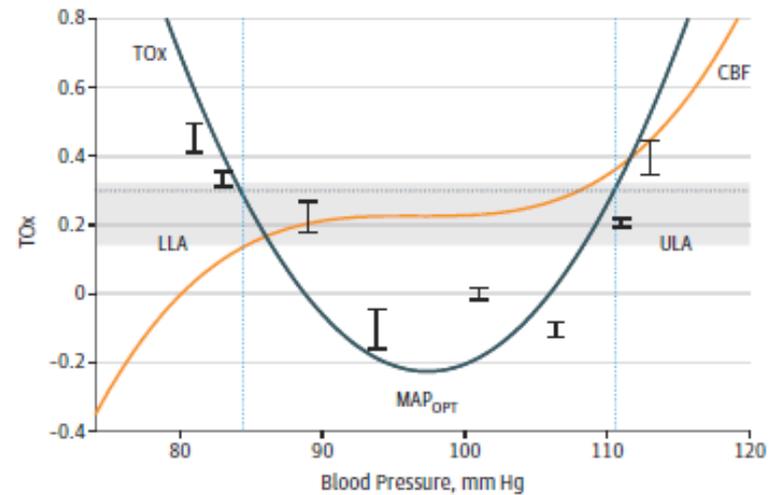
Results—Three hundred ninety patients (mean age 71 ± 14 years, mean National Institutes of Health Stroke Scale score of 17) were included in the study; of these, 280 (72%) achieved Thrombolysis in Cerebral Infarction 2B/3 reperfusion. Eighty-seven percent of patients experienced MAP reductions during endovascular thrombectomy (mean 31 ± 20 mm Hg). Δ MAP was associated with greater infarct growth ($P=0.036$) and final infarct volume ($P=0.035$). Mean Δ MAP among patients with favorable outcomes (modified Rankin Scale score, 0–2) was 20 ± 21 mm Hg compared with 30 ± 24 mm Hg among patients with poor outcome ($P=0.002$). In the multivariable analysis, Δ MAP was independently associated with higher (worse) modified Rankin Scale scores at discharge (adjusted odds ratio per 10 mm Hg, 1.17; 95% CI, 1.04–1.32; $P=0.009$) and at 90 days (adjusted odds ratio per 10 mm Hg, 1.22; 95% CI, 1.07–1.38; $P=0.003$). The association between aMAP and outcome was also significant at discharge ($P=0.002$) and 90 days ($P=0.001$).

Conclusions—Blood pressure reduction before recanalization is associated with larger infarct volumes and worse functional outcomes for patients affected by large-vessel intracranial occlusion stroke. These results underscore the importance of BP management during endovascular thrombectomy and highlight the need for further investigation of blood pressure management after large-vessel intracranial occlusion stroke. (*Stroke*. 2019;50:1797-1804. DOI: 10.1161/STROKEAHA.118.024286.)

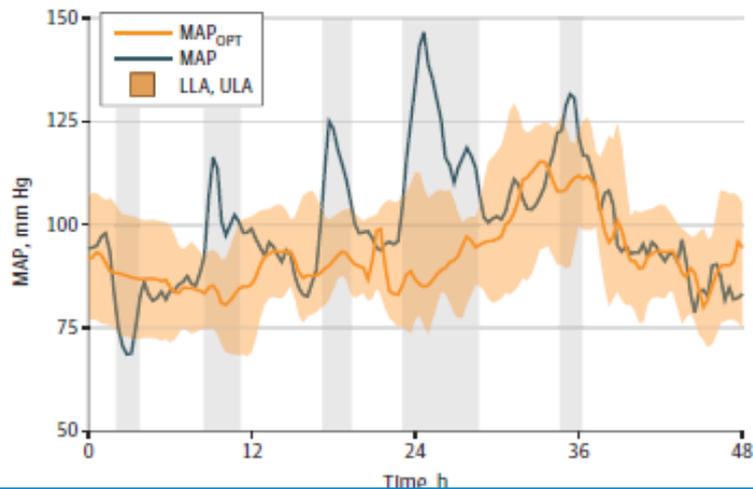
A Recording of MAP



B Limits of autoregulation



C Optimal MAP, LLA, and ULA



Study of 65 pts post-EVT

Time of MAP exceeding ULA was associated with HT and worse outcomes

Other aspects of care

- **Ensure adequate ventilation and oxygenation**
- **Blood sugar control (100-180 mg/dL)**
- **Treat fever**
- **Close neurological assessments (especially the first 12 hours)**

Reperfusion injury

- **Most commonly manifested with edema and hemorrhage**
- **Main risk factors**
 - **Higher baseline NIHSS**
 - **Lower baseline ASPECTS**
 - **Better reperfusion**
 - **Older age, high glucose, IV rtPA, low platelets, high INR**
- **Avoid severe HTN and major BP fluctuations**



a



b

Dual energy CT after stroke thrombectomy alters assessment of hemorrhagic complications

Håkan Almqvist, MD, Staffan Holmin, MD, PhD, and Michael V. Mazya, MD, PhD

Neurology® 2019;93:e1068-e1075. doi:10.1212/WNL.0000000000008093

Correspondence

Dr. Almqvist

hakan.almqvist@ki.se

Abstract

Objective

To determine whether dual energy CT with a combined approach (cDECT) using a plain noncontrast monochromatic CT (pCT), a water-weighted image after iodine removal, and an iodine-weighted image changes the diagnosis and classification of intracranial hemorrhage (ICH) after endovascular thrombectomy (EVT) in acute ischemic stroke compared to a pCT image alone without separate water and iodine weighting.

Method

During 2012 to 2016, 372 patients at our comprehensive stroke center underwent DECT scan within 36 hours after EVT. Two readers evaluated pCT compared to a second reading with cDECT, establishing the diagnosis of ICH and grading it per the Heidelberg and SITS-MOST classification.

Result

Using cDECT changed the ICH diagnosis to contrast staining only in 34% (52 of 152), modified the ICH grade in 10% (15 of 152), and diagnosed initially undetected ICH in 2% (5 of 220). pCT alone had 95% sensitivity, 80% specificity, 66% positive predictive value, 98% negative predictive value, and 85% accuracy for ICH compared to cDECT. Interreader agreement on the presence of ICH increased with cDECT compared to pCT (Cohen κ = 0.77 [95% confidence interval 0.69–0.84] vs 0.68 [0.61–0.76]).

Conclusion

cDECT within 36 hours after EVT changes the radiologic report regarding posttreatment ICH in a considerable proportion of patients undergoing EVT compared to pCT alone. This could affect decision-making regarding monitoring, secondary prevention, and prognostication. The cDECT scan could improve the interpretation consistency of high-attenuating changes on post-EVT images.

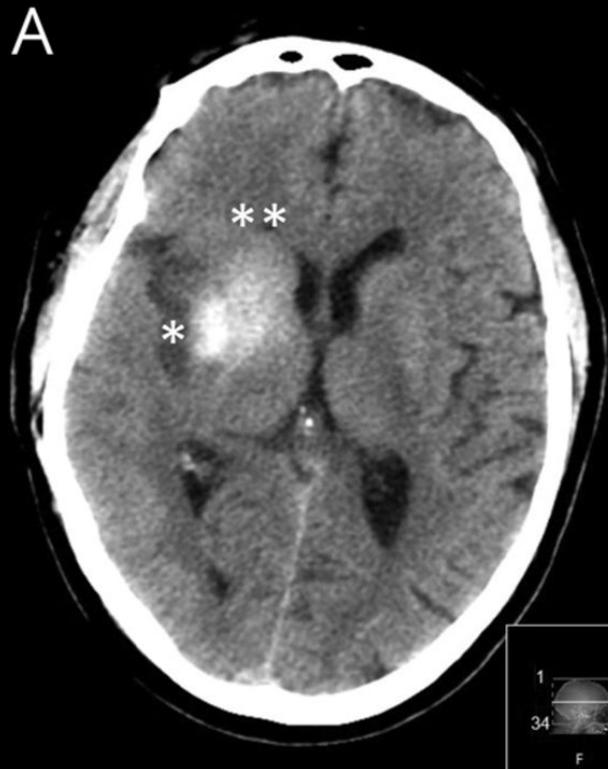
MORE ONLINE

CME Course

NPub.org/cmelist

DECT changed the diagnosis to contrast only in 34% of cases

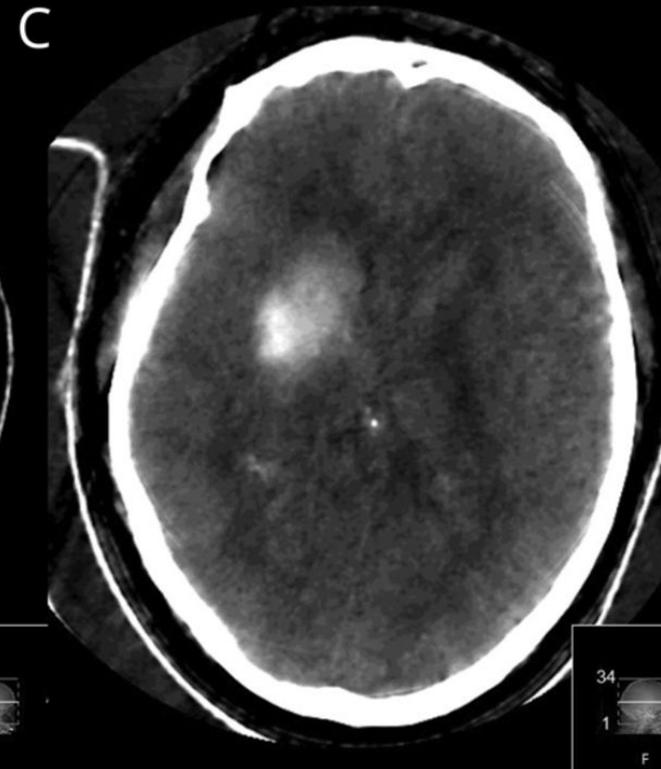
Dual-energy CT scan



Plain CT



Water-weighted CT



Iodine-weighted CT

Management of reperfusion hemorrhage

- **Strict BP control (SBP 140 mmHg or lower)**
- **If recent IV rtPA: TXA, cryoprecipitate**
- **If mass effect: HTS or mannitol**
- **Consider surgery for evacuation and decompression**
- **Greater risk for seizures: consider AED**

Delayed arterial reocclusion

- **Insufficiently studied**
- **Estimated to occur in around 3.5% of cases after mechanical thrombectomy**
- **Possible mechanisms: endothelial damage, plaque disruption, focal dissection**
- **Treatment may include drugs (e.g. IA IIb/IIIa agents) and repeat mechanical thrombectomy**

Access site complications

- **Most prevalent problem after EVT (reported in 1.2% to 7% of cases)**
- **Most are minor but some can be severe and even life-threatening**
- **Possible complications:**
 - **Groin hematoma**
 - **Femoral artery pseudoaneurysm**
 - **Arterial occlusion → leg ischemia**
 - **Retroperitoneal hematoma**
 - **Femoral neuropathy**

Key Messages

- **Optimal BP after EVT not well studied but individualizing is most reasonable**
- **Neurological decline post-EVT are usually due to reperfusion injury or delayed arterial reocclusion**
- **If suspected hemorrhage after EVT, best to get dual-energy CT scan**
- **Always check for access site complications**

Thank You

