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Medically Challenging Cases

# Making a Case for Use of Stellate Ganglion Blocks in the treatment of refractory Cerebral Vasospasm.

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## Introduction

Recovery following Subarachnoid Hemorrhage (SAH) from a ruptured cerebral aneurysm is often complicated by Cerebral Vasospasm (CV) which typically occurs 3-14 days after the initial neurological event. 30% of these patients are left with a residual neurological deficit due to delayed cerebral ischemia precipitated by vasospasm despite aggressive medical treatment, making it the most significant risk factor for morbidity and mortality.

Cerebral Vasospasm has been traditionally treated with Triple-H therapy and direct vasodilator instillation which are not always effective and often lead to further morbidity and mortality. Stellate Ganglion blockade (SGB) has recently emerged as a viable alternative to combat vasospasm, improve cerebral blood flow and decrease blood flow velocity by decreasing sympathetic tone. Optimizing blood flow and consequently cerebral oxygenation can help improve neurological outcomes.

This Case Report highlights the use of Ultrasound guided SGB in a patient with Aneurysmal SAH and worsening neurological status due to documented Cerebral Vasospasm confirmed by Transcranial doppler (TCD). The subsequent improvement in patient's neurological status makes a case for inclusion of SGB in the management of refractory CV.

## Materials and Methods

For a medically challenging case IRB approval is not mandatory in absence of PHI per UMMC . Patient informed consent was obtained for submission of a case report.

All patient protected health information has been de-identified.

## Results/Case Report

A 55 year old female with past medical history of Hypertension (HTN), Coronary artery disease was admitted to the Neurosurgical ICU after transcatheter embolization of a ruptured Right Posterior communicating aneurysm and placement of External ventricular drain by the Interventional Neuroradiologist. Preoperative CT head showed hydrocephalus secondary to SAH in the sylvian fissures, basal cisterns, and ventricles. The patient was left intubated and placed on ventilatory support under

sedation. Antiepileptics were initiated for prevention of seizures and HHH therapy (Nimodipine, Intravenous fluids, permissive HTN) for vasospasm prophylaxis. Intracranial pressure, transcranial doppler and Cerebral Oximetry were monitored daily. ICU course was protracted, complicated by symptomatic vasospasm, requiring IV pressors, intra-arterial verapamil with minimal improvement.

Anesthesiology was consulted to consider a Stellate Ganglion Block. After discussion with the family, a bedside Ultrasound guided Left sided SGB was performed with the patient in a semi-recumbent position under strict aseptic precautions with standard ICU monitors. At the level of the cricoid cartilage a high frequency linear probe was placed over the sternocleidomastoid muscle, identifying the Chassaignac's tubercle on the transverse process of the 6th cervical vertebra, moved medially to identify the major vessels (carotid and IJ vein) as well as the Longus coli muscle and Vertebral artery. Color Doppler was used to further confirm the position of the vascular structures. A 22-gauge, 3.5" nerve block needle was inserted under ultrasound guidance using an in-plane approach avoiding the vasculature to reach the anterior lateral border of the longus coli muscle. After confirming negative aspiration, 10 mL of 0.25% Ropivacaine was incrementally injected in the facial plane between the Carotid and longus coli muscle engulfing the cervical sympathetic chain. The patient tolerated the procedure well without any evidence of complications.

Within 15 minutes of the procedure, patient developed a left sided Horner's syndrome with a 1.5 degrees rise in temperature of the Left upper extremity. Transcranial Doppler was repeated showing about 70 % decrease in velocity that persisted for the next 16 hrs suggesting vasodilation. Cerebral Oximetry revealed a rise in saturation from 64% pre-procedure to 73% following SGB. Patient had a repeat SGB 30 hours later with similar results. She continued to improve thereafter, EVD was weaned to removal and patient was extubated and transferred to a regular hospital floor. Remainder of the hospital course was uneventful. With Physical, Occupational, and Speech therapy, the patient was clinically ready for transfer to a long-term rehabilitation facility.

## Discussion

Prompt management of Cerebral Vasospasm and optimization of hemodynamics is vital to reducing morbidity and mortality after coiling or clipping of an aneurysm following aneurysmal SAH. Management of Cerebral Vasospasm, Cerebral edema, delayed cerebral ischemia, hydrocephalus and complications from excess catecholamines are all important treatment goals to prevent further adverse neurological sequelae. While "Triple H" therapy ( Hypertension, Hypervolemia, Hemodilution) and IV Nimodipine are still commonly used to combat Cerebral Vasospasm, they remain controversial. Balloon angioplasty and intra-arterial administration of Vasodilators- Papaverine and Milrinone are much more invasive, leading to further morbidity in an already critically ill patient. Bedside Transcranial Doppler (TCD) is used to detect Cerebral Vasospasm by measuring an increase in Cerebral Blood Flow Velocity on the affected side and Cerebral Oximetry can detect a fall in oxygen supply.

Several studies have documented the benefits of SGB in improving blood flow in patients with Cerebral Vasospasm lasting about 24 hours[1,2,3]. The indications for SGB has recently expanded beyond the treatment of sympathetically maintained pain in Complex Regional Pain Syndrome (CRPS) of the upper extremity, Atypical facial pain and Upper extremity Peripheral vascular disorders to include refractory Cardiac Arrhythmias (ventricular fibrillation) as well as Cerebral Vasospasm. Ultrasound guidance offers several advantages over the traditional fluoroscopic technique and is rapidly becoming the preferred approach to block the Stellate Ganglion, avoiding vital vascular and other structures and allowing for a more precise sympathetic blockade using a smaller volume of local anesthetic. The ability to perform this

at the bedside with a portable ultrasound machine makes it even more attractive particularly while dealing with a critically ill patient as in this case. Further studies are required before Stellate Ganglion blocks can be routinely used in the treatment of Cerebral Vasospasm as an alternative to conventional treatment options in the Neurosurgical ICU. As Anesthesiologists with expertise in this procedure, this could further expand our role as "Perioperative Physicians" caring for this critically ill population.

## References

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## Disclosures

No

## Tables / Images



