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# Stellate Ganglion Block as Adjunctive Therapy for Paroxysmal Sympathetic Hyperactivity after Severe Traumatic Brain Injury

**Scott Childs, BS[1,2];** Matthew N. Jaffa, DO[3]; Aseel Walker, MD[2]; Pranjali P Kainkaryam, MD[2]; Alice DiFrancesco, MD[2,4]; Kevin Finkel, MD[2]; Mikayla Zedek[2]; Yasser Al-Baghdadi, MD[2]

[1] Quinnipiac University School of Medicine, North Haven, CT - [2] Integrated Anesthesia Associates, Department of Anesthesiology, Hartford Hospital, Hartford, CT - [3] Division of Neurocritical Care, Department of Neurology, Ayer Neuroscience Institute, Hartford Hospital, Hartford, CT - [4] IAA Fellowship in Regional Anesthesia and Acute Pain Medicine at Bone and Joint Institute, Hartford

INTEGRATED ANESTHESIA ASSOCIATES
DEPARTMENT OF ANESTHESIA RESEARCH & DEVELOPMENT

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Frank H. Netter MD School of Medicine

## Background

- Paroxysmal Sympathetic Hyperactivity (PSH) is characterized by paroxysms of elevated heart rate, blood pressure, respiratory rate, temperature, sweating, and motor (posturing) often following severe traumatic brain injury (TBI) [1].
- PSH has been associated with increased ICU length of stay, ventilator days, and infection rates [1].
- Current available pharmacologic treatments aim to symptomatically minimize the frequency and severity of episodes.
- Stellate ganglion block (SGB) is a safe procedure known to inhibit the sympathetic chain and reduce sympathetic activity.
- This case series explores the use of SGB as a therapeutic adjunct to PSH after TBI.

## Methods

- An ultrasound-guided, single shot, right SGB was performed via a lateral para-carotid approach, at the C6 level, injecting 10 ml of short acting 1.5% mepivacaine. A successful block was confirmed by the onset of either ptosis, meiosis, or conjunctival engorgement.
- The purpose of performing these procedures was to evaluate the safety and feasibility of SGB for this new indication within this specific population. The right stellate ganglion has a greater impact on the sinoatrial (SA) node and heart rate; therefore, blocking this side often results in lower heart rates due to sympathetic inhibition. Additionally, a short-acting local anesthetic was selected to prevent a significant and abrupt decrease in heart rate and, consequently, blood pressure.
- SGB was performed in two patients with TBI and probable PSH, as assessed by the PSH Assessment Measure (PSH-AM) [2].
- Frequency and severity of episodes was assessed pre- and post-SGB through electronic chart review and physician/nursing notes using the Clinical Features Scale (CFS) component of PSH-AM. (Tab. 1&2)
- A single episode was defined as presence of ≥3 cardinal symptoms of PSH without other identifiable causes.

**Table 1: Clinical Features Scale (CFS) - Paroxysmal Sympathetic Hyperactivity-Assessment Measure (PSH-AM).**

| Score | +0 | +1 | +2 | +3 |
|---|---|---|---|---|
| Heart Rate (bpm) | <100 | 100-119 | 120-139 | ≥140 |
| Respiratory Rate (rpm) | <18 | 18-23 | 24-29 | ≥30 |
| Systolic Blood Pressure (mmHg) | <140 | 140-159 | 160-179 | ≥180 |
| Temperature (°C) | <37.0 | 37.0-37.9 | 38-38.9 | ≥39 |
| Sweating | Nil | Mild | Moderate | Severe |
| Posturing during Episode | Nil | Mild | Moderate | Severe |

A single episode of PSH was defined by ≥ 3 cardinal PSH symptoms.
Abbreviations: bpm, beats per minute; rpm, respirations per minute; mmHg, millimeters mercury; °C, Celsius.

**Table 2: PSH Episodes pre- and post-SGB.**

| | Case 1 | | Case 2 | |
|---|---|---|---|---|
| Day (pre-/post-SGB) | # of episodes | CFS | # of episodes | CFS |
| 2 (pre-SGB) | 1 | 4 | 1 | 6 |
| 1 (pre-SGB) | 3 | 7 | 1 | 6 |
| 0 (SGB) | 0 | n/a | 0 | n/a |
| 1 (post-SGB) | 0 | n/a | 0 | n/a |
| 2 (post-SGB) | 2 | 5 | 0 | n/a |
| 3 (post-SGB) | 2 | 8 | 0 | n/a |
| 4 (post-SGB) | 2 | 6 | 1 | 5 |
| 5 (post-SGB) | 3 | 6 | 1 | 6 |
| 6 (post-SGB) | 2 | 8 | 1 | 6 |
| 7 (post-SGB) | 3 | 6 | 2 | 5 |
| 8 (post-SGB) | 3 | 5 | 1 | 4 |
| 9 (post-SGB) | 4 | 5 | 3 | 5 |
| 10 (post-SGB) | 2 | 5 | 2 | 3 |

Abbreviations: SGB, stellate ganglion block; CFS, clinical features scale; n/a, not applicable

## Case 1

- 27 y/o male with intracerebral hemorrhage and Glasgow Coma Scale (GCS) of 3 having ≥1 PSH episodes per day.
- Uncomplicated SGB 15 days after admission.
- No PSH episodes were experienced through post-SGB day 1.
- Patient returned to baseline episode frequency by post-SGB day 2.
- Only one day through post-SGB day 10 had more severe episodes than episodes 1 day pre-SGB, as assessed by CFS scoring.
- On post-SGB day 6, buprenorphine infusion was weaned reportedly due to better control of PSH symptoms.

## Case 2

- 28 y/o male with hemorrhagic cerebral contusion and GCS of 8 having ≥1 PSH episodes per day.
- Uncomplicated SGB 19 days after admission.
- No PSH episodes were experienced through post-SGB day 5, then one episode was experienced daily until post SGB day 7.
- Majority of 10 days post-SGB were less severe than episodes pre-SGB, as assessed by CFS scoring
- Multiple PSH medications downgrades (e.g. propofol, bromocriptine, propanol) within 10 days post-SGB

## Discussion

- Both patients experienced a reduction in the severity of PSH symptom according to CFS scoring and medication management.
- Despite temporary nature of episode relief, these cases suggest SGB to be a safe and feasible adjunctive intervention for managing PSH.
- Further large-scale studies are necessary to evaluate the effectiveness of a single SGB with a longer acting local anesthetic or multiple/continuous SGB procedures for patients with PSH.

## References

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