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

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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 stay, ventilator requirements, 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.
- SGB was performed in two patients with TBI and probable PSH, as assessed by the PSH Assessment Measure (PSH-AM) Scoring [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.

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-SBG 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.

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 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-SBG day 5, then one episode was experienced daily until post SBG 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)

Discussion

- 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.
- The results showing that neither patient experienced PSH episode the day following adjunctive SGB, and Case 2 remained episode-free 4 days post-SGB
- 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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