

Educational Case Report

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Stellate ganglion block in disparate treatment-resistant mental health disorders: A case series

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Abstract

Objectives – A significant subset of patients with mental health disorders (MHDs) fail to respond to standard management and are termed as treatment-resistant. This cohort has limited options for managing their condition. Autonomic dysfunction has been reported in the neurobiology of MHDs including anxiety, depression, obsessive-compulsive disorder (OCD), panic disorder, and bipolar disorder (BD). Stellate ganglion block (SGB) is an emerging treatment that dampens sympathetic activity and has been shown to be of benefit in the management of post-traumatic stress disorder.

Methods – Patients with treatment-resistant disparate MHDs were reviewed by a multidisciplinary team comprising a psychiatrist, a clinical psychologist, and a pain medicine physician. Patients were offered SGB as a novel strategy in the management of treatment-resistant conditions. Validated outcome measures were completed at baseline, 4 weeks, and 16 weeks post-intervention.

Results – Four patients with heterogenous treatment-resistant MHDs who received SGB are presented in this report. SGB resulted in an improvement in BD, OCD with alcohol addiction, opioid addiction, and health anxiety.

Conclusion – SGB could have a role in the management of treatment-resistant MHDs.

Keywords: stellate ganglion block, treatment-resistance, anxiety, mental health disorder, bipolar disorder, substance abuse disorder

1 Introduction

Current management of mental health disorders (MHD), which relies primarily on medications and psychotherapy, can be ineffective in a significant subset [1]. Patients either fail to respond or are unable to tolerate the side effects of pharmacological agents. This phenomenon, termed treatment resistance, can affect 20–60% of patients with MHD [1]. However, there are very few consensual definitions for treatment resistance in MHD. For example, treatment-resistant anxiety disorder is diagnosed when patients fail to respond to an 8-week trial of at least one first-line medication and psychotherapy [2]. Treatment-resistant MHDs often lead to decreased productivity, loss of quality of life, and recurrent hospitalizations. These patients often have limited options in managing their condition, leaving them feeling hopeless [3].

A common thread linking the neurobiology of various MHDs is autonomic dysregulation with sympathetic hyperactivity [4–7]. Stellate ganglion block (SGB) is a nerve block that inhibits the sympathetic nervous system. SGB has been reported to reduce anxiety in patients with post-traumatic stress disorder (PTSD) [8–10]. The therapeutic effect of SGB could probably be due to the downregulation of the sympathetic nervous system resulting in a reduction of norepinephrine release [11]. We present four patients with disparate treatment-resistant MHD who were successfully managed with ultrasound-guided SGB.

2 Report

Department of Pain Medicine, Sri Madhusudan Sai Institute of Medical Sciences and Research approval was obtained for performing the service evaluation. Patients were provided an information sheet in the local language detailing the technique and the rationale for offering it. Informed written consent was obtained. Patients also provided separate written consent for their de-identified data to be used for publication in a peer-reviewed journal.

Patients presenting with treatment-resistant MHD and reporting moderate to severe dysfunction were offered a

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trial of ultrasound-guided SGB. This cohort of patients was assessed by a multidisciplinary team (MDT) comprising of a psychiatrist, a clinical psychologist, and a pain medicine physician from October 2023 onwards. Patients completed validated outcome measures specific to the presenting MHD. The rationale for offering SGB was based on two factors: evidence of effectiveness in patients with PTSD and evidence of autonomic dysfunction in MHD [4–10]. At the time of writing this report, a total of 36 heterogenous treatment-resistant MHD patients were assessed in the MDT clinic and all received SGB. At the post-intervention review, SGB was effective in 30 patients (30/36, 83%). The cases form a convenience sample drawn from the cohort reviewed in the MDT clinic.

Two SGBs were performed with an interval of 1–14 days between the blocks. Validated outcome measures were completed at baseline, 4-, 12-, and 16-week review post-intervention (Table 1). The intervention was performed as an outpatient procedure under cardiovascular monitoring.

2.1 SGB

The patient was positioned supine with the head turned to the contralateral side. The skin over the anterolateral aspect of the neck was prepped. At the level of cervical C6 vertebrae on the right side, the skin and the subcutaneous tissue were injected with 2% lignocaine. An anterolateral approach was used after scanning the neck anatomy with Doppler imaging to identify common structures and vascular anomalies. Then, a 5 cm 22-gauge sonogenic needle was inserted in the long axis to the ultrasound transducer

just ventral to the tip of the anterior tubercle of C6 until the needle tip penetrates the ventral fascia of longus coli, dorsal to the common carotid artery. Slowly, the mixture (9 mL of 0.2% ropivacaine and 20 mg of depot methylprednisolone) was injected. After 10 min, the subject was examined in a seated position for the presence of Horner's syndrome to confirm a successful sympathetic block. The procedure was repeated on the left side of the neck after 24 h and within 14 days.

2.2 Case 1: Bipolar disorder (BD)

A 43-year-old female, diagnosed with bipolar affective disorder Type 2 since 24 years, presented to the psychiatry clinic with a 2-month history of pervasive low mood, hopelessness, and loss of interest. She had become socially withdrawn with a poor sleep pattern and appetite. She reported suicidal ideation with a history of attempts in the past. Her partner, a medical doctor, reported several hypomanic episodes characterized by over-productivity, disturbed sleep, and wasteful investments. Medications previously trialed included phenytoin, lamotrigine, olanzapine, escitalopram, risperidone, quetiapine, and pregabalin. Following hospital admission, she was assessed in the MDT clinic. Following SGB, the patient reported a marked reduction in fear, low mood, and anxiety with significant improvement in sleep patterns (Table 1). She was discharged home after 48 h. At 16-week review, the patient had discontinued medications and reported substantial benefits.

Patient perspective: At the 16-week review, she reported that it was the first time in her adult life she was feeling at peace.

Table 1: Baseline and post interventional outcome scores

	Baseline	4-week	12-week	16-week
Case 1 BD	YMRS = 19 PHQ-9 = 27 GAD-7 = 18	YMRS = 1 PHQ-9 = 6 GAD-7 = 3	YMRS = 2 PHQ-9 = 3 GAD-7 = 1	YMRS = 1 PHQ-9 = 1 GAD-7 = 1
Case 2 Opioid misuse	BSCS = 20 GAD-7 = 12	BSCS = 1 GAD-7 = 3	BSCS = 0 GAD-7 = 2	BSCS = 0 GAD-7 = 3
Case 3 OCD	OCDS = 48 GAD-7 = 21	OCDS = 16 GAD-7 = 9	OCDS = 1 GAD-7 = 1	OCDS = 3 GAD-7 = 1
Case 4 Health anxiety	GAD 7 = 21	GAD-7 = 1	GAD-7 = 1	GAD-7 = 1

YMRS: Young Mania Rating Scale, PHQ-9: Patient Health Questionnaire, BSCS: Brief Substance Craving Scale, OCDS: Obsessive Compulsive Drinking Scale, GAD-7: Generalized Anxiety Disorder-7, OCD: Obsessive Compulsive Disorder.

2.3 Case 2: Opioid addiction and withdrawal

A 47-year-old male presented to the MDT clinic with a 5-year history of tramadol addiction and a 3-day history of abrupt discontinuation. His addiction commenced following a prescription for lower limb diabetic neuropathy. He reported daily use of 1,000–1,200 mg tramadol via intramuscular route. The patient reported significant opioid withdrawal symptoms including insomnia, sweating, tremor, loss of appetite, photophobia, phonophobia, headache, severe anxiety, cold sensitivity, palpitations, and restlessness. Additionally, he confessed to an intense craving to reuse tramadol. He had previously trialed buprenorphine as a part of a weaning program at another center. However, he

was unable to tolerate buprenorphine and continued tramadol misuse. We were unable to trial methadone as our recently established medical college hospital was yet to acquire the license for the use of methadone. He was treated with benzodiazepines to manage sympathetic overactivity, and the treatment was ineffective. The patient exhibited significant distress. He also reported being unable to maintain gainful employment. As the withdrawal symptoms were severe, he was offered SGB. After the first SGB, he reported a 50% improvement. Immediately following the second SGB, he reported a complete absence of withdrawal symptoms. He was able to resume gainful employment within 48 h. At the 16-week review, he had not reused tramadol and reported no cravings.

2.4 Case 3: Obsessive-compulsive disorder (OCD) and alcohol addiction

A 45-year-old male presented to the psychiatry department with a history of alcohol misuse for 25 years. He reported intrusive thoughts, urges, severe anxiety, and intense craving for 8 years. He had failed detoxification on multiple occasions with recurrent hospital admissions. Medications trialed included fluoxetine, baclofen, and lorazepam. Following an emergency admission for an upper gastrointestinal bleed, he was reviewed in the MDT clinic. He was offered SGB in an attempt to reduce cravings. He underwent right-sided SGB. When he arrived for the left-sided SGB 11 days later, he reported a complete absence of craving and was alcohol abstinent. Within 2 weeks of left SGB, he was readmitted with alcohol intoxication. He reported no benefit from left SGB. Given the initial albeit transient response to right SGB, he underwent two-level (cervical C4 and C6) right-sided SGB. At the 4-week follow-up, he reported 50% improvement in craving and significantly reduced alcohol consumption. At the 16-week review, he reported 90% improvement in craving, anxiety, anger, and OCD symptoms.

2.5 Case 4: Health anxiety

A 34-year-old male was reviewed in the MDT clinic with treatment-resistant health anxiety disorder. He presented to the psychiatry clinic with a 3-year history of palpitations, fear, apprehension about health, and impending doom of death. These were triggered following the death of a close relative from coronavirus infection. He had to give up work as a photographer due to severe health anxiety. Medications (propranolol, clonazepam, and paroxetine) and psychoeducation failed. He required hospital admission for

severe anxiety. He was reviewed by the MDT and offered SGB. Pre and post interventional patient reported outcomes are shown in Table 1.

Patient perspective: This treatment has helped to resume gainful employment, improve quality of life and am grateful to the medical team.

3 Discussion

We present the successful management of four heterogeneous treatment-resistant MHDs with ultrasound-guided SGB. A recent review of the literature reveals the study of SGB in patients with PTSD, borderline personality disorder, schizophrenia, and major depressive disorder [9]. To the best of our knowledge, this is the first report that details benefits in patients with BD, OCD with alcohol addiction, substance abuse disorder, and health anxiety following SGB. We observed substantial improvement in primary symptoms of BD, OCD, and substance abuse disorder in addition to secondary anxiety symptoms.

The stellate ganglion has extensive neuronal connections with various parts of the brain including the hypothalamus, amygdala, infralimbic, insular, and ventromedial regions [11]. Dysregulation of the autonomic nervous system with sympathetic dominance has been reported in the neurobiology of MHD including BD and substance abuse disorder [4–7]. There is recent evidence on the effect of increased sympathetic tone on illness burden in BD [5]. Patient 1 reported suicidal ideation with multiple past attempts. In BD, a history of suicidal attempts is associated with autonomic dysregulation and increased sympathetic tone [12].

Heart rate variability (HRV) is a marker for autonomic function. Reduced HRV signals autonomic dysfunction as a result of increased sympathetic tone. Significantly decreased resting HRV has been reported in patients with substance abuse disorder. Lower resting HRV has been shown to be associated with stress and craving in substance abuse disorder [6]. Patient 2 with a history of opioid misuse and severe withdrawal symptoms reported a substantial reduction in craving and anxiety post-SGB.

Hypersensitivity of amygdala, which has extensive connections to the sympathetic system, is reported to be linked to negative emotional responses in OCD [13]. By downregulating the sympathetic system, SGB may allow for resetting of the autonomic nervous system [14]. SGB also enhances parasympathetic activity, which has been shown to provide benefits in MHD [15].

In the present report, bilateral SGB was performed after the patients underwent a thorough assessment in a

multi-disciplinary clinic. In addition, the mixture used contained a depot corticosteroid, which may have played a role in providing a durable effect. We performed two SGB with a gap of at least 24 h to mitigate the effect of inadvertent recurrent laryngeal nerve palsy. In addition, the use of low concentration of ropivacaine (0.2%) has shown to be of benefit. Patient 3 reported a transient response to bilateral SGB. He received an additional two-level cervical sympathetic ganglion block that appeared to provide enhanced and durable benefit [10].

The authors are aware of the major limitations inherent in this type of report in a small cohort. However, there is an urgent need for novel strategies in managing treatment-resistant MHD. The impact of poorly controlled MHD on both the patient and the society is immense.

In BD, the risk of premature death due to coronary artery disease is reported to be twice that of the general population [16].

In conclusion, SGB could have a role in the management of patients with disparate MHDs who fail standard treatment. Definitive studies are warranted to confirm these initial observations. We are conducting a randomized clinical trial on the effectiveness of SGB in treatment-resistant anxiety disorder (CTRI/2024/02/063259).

Research ethics: Not applicable. Ethical review was not required according to [regional/national law] as this was a performance review.

Informed consent: Informed written consent was taken from all the patients included in this report.

Author contributions: The authors have accepted responsibility for the entire content of this manuscript and approved its submission. G. Niraj: helped in the concept, design, performed intervention, and drafting of the manuscript. V. Karanth: helped in concept, design, data collection and drafting the manuscript. S. Niraj: helped in the concept, design, data collection, and drafting of the manuscript. N. Charan: helped in data collection and drafting of the manuscript.

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