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Cervical Sympathetic Blockade Produces a Significant Reduction in Suicidal Ideation in a PTSD Cohort: A Case Series of 254 Patients

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ABSTRACT

Background: *Suicide is estimated to account for 1.4% of deaths worldwide, making it among one the leading causes of premature death. Stellate ganglion block (SGB) has been shown to reduce suicidal ideation in a single case report of a patient with comorbid post-traumatic stress disorder (PTSD) and suicidal ideation.*

Aims: *To report a significant reduction of suicidal ideation using cervical sympathetic block (CSB), a more advanced version of SGB, in a cohort of patients with PTSD.*

Methods: *254 patients were evaluated for suicidal ideation via pre- and post-suicide risk assessments by using the Depressive Symptom Index - Suicidality Subscale (DSI-SS) as part of a pre- and post-treatment clinical interview. Further included were other psychiatric measures. Patients received CSB as per clinic protocol.*

Results: *Overall, the patients had an average DSI-SS reduction of 43.8%, PCL-5 reduction of 31.7%, GAD-7 reduction of 22.5%, and PHQ-9 reduction of 35.5%, following CSB.*

Limitations: *Lack of control, given this is an open-labeled, case series study.*

Conclusion: *Cervical sympathetic block is a safe and minimally invasive procedure that may provide significant reduction in suicidal ideation as well as symptoms of PTSD.*

Keywords

Suicide, PTSD, SGB, Sympathetic block, Cervical sympathetic block.

Background

Suicide is among the leading causes of death worldwide with an estimated 700,000 people dying by suicide each year [1]. In the United States military, 45 die by suicide per day of 2023 as reported by Operation Deep Dive [2]. There has been a global call for an effective public health approach to suicide prevention that target not only individuals at known risk for suicide but also the environments in which at-risk individuals live [3,4]. Soldiers with PTSD were at increased risk for suicidality [5].)In a study of 2,616 National Guard soldiers, Calabrese et al. found that soldiers diagnosed with PTSD were 5.4 times more likely to report suicidal ideation than their peers without PTSD [5].

SGB is a common pain procedure that has recently gained acceptance for treating PTSD. In 2013, SGB was reported to successfully treat a suicidal patient with PTSD [6]. “The patient was a 35-year-old male with 8 years’ time in service (Army) as a truck driver. He had two deployments to Iraq from 2004 to 2005 and 2007 to 2008. The patient also has a significant history of childhood physical abuse. During his first deployment to Iraq, the patient was involved in 4 separate convoys hit by improvised explosive devices and was involved in 8 firefights… He was

admitted to the inpatient psychiatric ward 4 times between March 22, 2009, and November 15, 2010 for suicidality in the context of ETOH intoxication and PTSD symptoms.…The patient had been tried on the following psychotropics with little improvement during the course of his treatment: trazodone, Remeron, Celexa, Zoloft, risperidone, naltrexone (ETOH), disulfiram (ETOH), and lithium. During the patient's final say on the TAMC psychiatric inpatient ward, he scored 80 or 85 on his PCL-M. Two days after the procedure, he was discharged from the ward, his PCL-M having dropped to 18, and his suicidal ideation having completely resolved…'(6).

CSB and SGB in the treatment of PTSD

SGB involves the injection of a local anesthetic into the area surrounding the stellate ganglion, a sympathetic ganglion located in the neck. A 2017 systematic review including 32 publications found that SGB has significant potential benefit in PTSD patients [7]. More recently, in 2020, multisite, sham-controlled, randomized trial was conducted in 113 active-duty service members with PTSD symptoms. The findings revealed that two SGB treatments, two weeks apart, were effective in reducing PTSD total symptom severity over 8 weeks, with an adjusted mean symptom change two times greater in the SGB group compared to the sham group [8].

Optimization of CSB: Although it has shown to be safe and effective for the treatment of PTSD, a C6-level right-sided SGB is not always sufficient in clinical practice. As a result, a left-sided SGB may be used as a rescue procedure, if the right-sided SGB does not work. This was shown in a retrospective study with 205 patients treated with a right-sided SGB, 20 patients did not respond to a right-sided SGB with clinical significance. Ten of these patients subsequently received a left-sided SGB, and 90% responded favorably with a PCL-5 mean improvement of 28.3 points [9]. In addition to the laterality consideration, the targeting of additional levels has also been suggested to increase the impact of CSB. A retrospective analysis of 147 patients with PTSD compared C6 SGB versus dual CSB at C6 and C4, with ultrasound guidance, on the right and left sides. Not only did both single and two-level CSB show safety and efficacy, but the dual CSB showed greater improvement than the standard SGB in the treatment of PTSD [10].

The objective of this case series is to describe the efficacy of CSB in treating suicidal ideation as well as symptoms of PTSD, anxiety, and depression.

Materials and Methods

Patients and Setting

The setting of this case series was various Stella Centers across the US. 325 patients were included after meeting criteria for being diagnosed for PTSD with suicidal ideation.

Cervical Sympathetic Block

The patient was given information concerning the risk/benefits of the procedure and a consent form was completed. Patients received local anesthetic or sedation as desired by the patient. The patient was positioned comfortably in the supine position, with the head rotated slightly contralaterally, routine monitoring was applied as per clinic protocol.

The skin over the anterior and right-side neck was widely cleaned with chlorhexidine-isopropyl alcohol preparation. Sterile ultrasound gel was applied. The right-side anterior neck was scanned using a linear transducer (Mindray Ultrasound, China) from the level of the 7th to the 4th cervical vertebrae in transverse view. Power Doppler was utilized to identify vasculature in the planned needle track. The skin on the lateral neck was anesthetized with 1 mL of 1% lidocaine. Utilizing an in-plane approach, under real-time ultrasound guidance, a 22 Gauge echogenic needle was placed just dorsal to the ventral fascia of the longus coli, medial to the longus capitus, and approximated to the cervical sympathetic chain. After attempting aspiration, while monitoring the patient, 0.5 mL of 0.5% bupivacaine was injected, and after observing the patient for 30 seconds, 7.5 cc of injectate was injected over 1 minute for a total injection volume at C6 level. The same procedure was performed at C4 level; the total volume use was 4 cc at this level. Due to the risk of serious airway compromise with inadvertent bilateral blockade of the recurrent laryngeal nerves, the left-sided SGB was performed 24 hours after the right-sided SGB to allow adequate time for local anesthetic effects to subside.

Both before and after the procedure, the patient was specifically informed as to the potential for and signs of life-threatening adverse events, including worsening neck pain which may indicate hematoma formation, and shortness of breath. All procedures were well tolerated. All patients exhibited Horner's syndrome (ptosis, miosis and anhidrosis) within 10 minutes of the injection. The patient was then returned to the supine position and monitored for an additional 30 minutes before discharge. No hospital admissions occurred, or persistent complications were observed.

Psychometric Testing

The PTSD Checklist Version 5 (PCL-5)

The PTSD Checklist Version 5 is a 20-item self-reported questionnaire designed to assess PTSD symptomatology including symptoms of re-experiencing, avoidance, and hyperarousal. The PCL-5 has demonstrated excellent reliability and validity in primary care settings [11]. Nonresponse to the treatment was defined in patients who had obvious Horner's syndrome findings but failed to improve by at least 10 points on a PTSD Checklist Version 5 (PCL-5) [11].

Depressive Symptom Index - Suicidality Subscale (DSI-SS)

The DSI-SS is widely used to detect and prevent suicidal ideation. In all samples, we found excellent item-total correlations and internal consistencies for the DSI-SS. The DSI-SS differentiated well between patients with and without suicide attempts in the population-based sample [12].

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is 9-item self-reported questionnaire designed to assess widely used to screen and diagnose depression. The PHQ-

9 has demonstrated excellent high specificity and sensitivity for major depression disorder [13].

Generalized Anxiety Disorder-7 (GAD-7)

The GAD-7 is 7-item self-reported questionnaire designed for screening, diagnosis, and severity of anxiety. The GAD-7 has demonstrated excellent reliability with a sensitivity of 89% and specificity of 82% for generalized anxiety disorder [14].

Results

A total of 254 patients were assessed with DSI-SS, PCL-5, GAD-7, and PHQ-9 scores prior to and post-CSB. Consecutive cohort data collection January 2023 to December 22, 2023.

The findings were as follows:

In a cohort of DSI-SS with 4 or above (n=122), Pre-procedure PCL-5=58.7, GAD-7=14.9, PHQ-9=20. Average reduction of DSI-SS was 43.6%, PCL-5 reduction =30.6%, GAD-7=23.8%, PHQ-9= -35.1%.

In a cohort of DSI-SS with less than 4 (n=132), Pre-procedure PCL-5=53.7, GAD-7=13.7, PHQ-9=18.8. Average reduction of DSI-SS was 44.2%, PCL-5 reduction =32.8%, GAD-7= 21.1%, PHQ-9= -35.8 %.

In summary of results DSI-SS severity did not predict higher PCL-5, GAD-7, or PHQ-9 scores. Significant reduction in DSI-SS scores were noted to be similar in both lower and higher DSI-SS cohorts. Significant reduction in PCL-5, GAD-7, and PHQ-9 scores were noted to be similar in both lower and higher DSI-SS cohorts.

Discussion

At first glance, it is hard to envision the possible mechanism of marked reduction of suicidal ideation by CSB. Yet, consider the fact of experimental evidence that sympathetic nervous system (SNS) activation may promote emotion-related impulsivity (Peters). It has been suggested that alterations in NE, E, and 5-HT may have relevance for symptoms commonly seen in survivors with PTSD, including hypervigilance, exaggerated startle, irritability, impulsivity, aggression, intrusive memories, depressed mood, and suicidality [15]. Further, impulsive behavior with or without violence increases suicide risk [16,17]. CSB is a highly selective therapeutic approach to modulate SNS and is believed to have an impact on symptoms of PTSD by reducing NE as well as pruning sympathetic fibers that were "sprouted" by trauma, providing a prolonged reduction of NE levels and PTSD symptoms [18]. Dr. Schneider reported PTSD association with SNS dysfunction [19]. Considering all the above, it is not a surprise that persons with PTSD commonly associated with impulsivity are at higher risk for suicide [20] and an effective treatment of SNS over activation, impulsivity and PTSD can reduce the suicide rate.

The rationale of targeting two levels of the cervical spine, C4 and C6, involves the recognition of differing sympathetic supply to different regions of the brain. All sympathetic afferent fibers supplying the brain originate from the spinal cord (primarily T-2 to T-4) and pass through the stellate ganglion following the arterial supply, before ascending to the superior cervical ganglion [21]. The stellate ganglion sympathetic fibers typically follow the vertebral artery to the brain, unlike the superior cervical sympathetic ganglion which follows the internal carotid artery [21]. This would explain how dual blockade of the sympathetic system may produce a more intense "rebooting" of the brain, thereby leading to increased pruning and clinically greater reduction of PTSD symptomatology [10].

Conclusion

In a summary of results, DSI-SS severity did not predict higher PCL-5, GAD-7, or PHQ-9 scores. As described in prior case studies, CSB appears to be both safe and efficacious in the treatment of PTSD symptoms, this is the first report of a large cohort where CSB lead to a significant reduction of suicidal ideation in patients with PTSD.

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