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Stellate Ganglion Block Improves Refractory Post-Traumatic Stress Disorder and Associated Memory Dysfunction: A Case Report and Systematic Literature Review

Eugene G. Lipov, MD; Maryam Navaie, DrPH†; Peter R. Brown, PsyD, DAAPM‡; CAPT Anita H. Hickey, MC USN§; CDR Eric T. Stedje-Larsen, MC USN§; CDR Robert N. McLay, MC USNR‖*

ABSTRACT The prevalence of post-traumatic stress disorder (PTSD) has reached epidemic proportions among U.S. veterans, many of whom also have concurrent alcohol use disorder. This case report describes improvements in PTSD symptom severity and memory dysfunction in a combat-exposed veteran with persistent PTSD and alcohol use disorder following two treatments of stellate ganglion block (SGB). PTSD severity was measured using the PTSD Checklist, Military Version. Memory function was evaluated using the Rey Auditory Verbal Learning Test. One month after the first SGB, a 43.6% reduction in PTSD severity was observed along with increases in immediate memory (50%), recent memory (28%), and recognition memory (25%). Following a second SGB, PTSD severity decreased by 57.7% and memory function substantially improved, with pronounced changes in immediate memory (50%), recent memory (58%), and recognition memory (36%). One year after SGB treatments, the patient has stopped drinking alcohol, continues to have sustained relief from PTSD, has improved memory function, and has become gainfully employed. Future studies that employ robust epidemiologic methodologies are needed to generate confirmatory evidence that would substantiate SGB's clinical utility as an adjunctive treatment option for PTSD.

INTRODUCTION

The prevalence of post-traumatic stress disorder (PTSD), the complex pathological anxiety condition that substantially impairs mental and physical function, has reached epidemic proportions among the nearly 23 million U.S. veterans.[1] Another concerning trend is that 40% to 84% of veterans with PTSD also have concurrent alcohol or substance use disorders depending on the cohort and severity of combat exposure.[2,3] There are numerous adverse consequences of comorbid PTSD and alcohol use disorder,[4] the most alarming of which is that mortality is more than twice as high among patients with PTSD and comorbid alcohol dependence as compared to patients with PTSD alone.[5] One of the more limiting comorbidities that substantially reduces the patient's quality of life when PTSD and alcohol use disorder are jointly present is impairment of memory function. A plethora of studies have shown that as many as 80% of military veterans undergoing PTSD treatment with comorbid alcohol use disorder report difficulties with memory and concentration.[6–8]

Self-medication as a coping mechanism is often used to explain the strong association between PTSD and alcohol and substance use disorders.[9] In essence, alcohol is used to reduce the distress and heightened anxiety that accompany PTSD.[2,9,10] Although current gold standard treatments for PTSD utilized by the Military Health System and Veterans Administration (VA) are pharmacotherapy (e.g., selective serotonin reuptake inhibitors), psychotherapies (e.g., cognitive and exposure modalities), or both,[11,12] these therapeutic modalities have demonstrated little success in patients with chronic or refractory PTSD and comorbid alcohol use disorder.[13,14] The reasons for this lack of treatment success are multifactorial.

Interventions targeting patients with PTSD and co-occurring alcohol use disorder typically experience early and high attrition rates in excess of 50%, primarily because of the time demands of extended therapy.[15,16] In addition, insufficient patient motivation and other characteristics (e.g., male gender) that lead to differential access to care and nonadherence have been reported as influencers of treatment success among veterans with PTSD and comorbid alcohol use disorder.[17] Multiple studies have found that while more than 50% of those with PTSD access mental health services, fewer than 20% of those with comorbid PTSD and problem drinking do so.[2,11] Furthermore, there is no consensus on the most appropriate means of treating PTSD and comorbid alcohol or substance use disorders with pharmaco-

*Advanced Pain Centers, S.C., 2260 West Higgins Road, Suite 101, Hoffman Estates, IL 60169.

†Advance Health Solutions, LLC, 4370 La Jolla Village Drive, Suite 400, San Diego, CA 92122.

‡Brownstone and Associates, LLC, 9601 West 165th Street, Suite 6, Orland Park, IL 60467.

§Department of Anesthesiology, Naval Medical Center San Diego, 34800 Bob Wilson Drive, San Diego, CA 92134.

‖Department of Mental Health, Mental Health Directorate, Naval Medical Center San Diego, 34800 Bob Wilson Drive, San Diego, CA 92134.

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comorbid alcohol or substance use disorders with pharmacotherapies given their reduced efficacy in these patients.[1,12,13] With a few exceptions,[18,19] most large-scale trials of exposure

treatment modalities have excluded participants with comorbid alcohol and substance use disorders, leading to a significant gap in our knowledge base.

In light of the dilemmas clinicians face in treating refractory PTSD and co-occurring alcohol use, some have employed a novel therapeutic approach. Since 2008, the application of a commonly used pain management procedure for the face and upper extremities known as a stellate ganglion block (SGB) has been published in a series of case reports across multiple health care settings as a promising adjunctive treatment option for PTSD.[20–23] These studies have mostly focused on active duty military service members or veterans suffering from persistent PTSD. Collectively, the results from these preliminary reports provide evidence suggesting that SGB has the potential to significantly and rapidly improve PTSD symptoms.

The purpose of our case report is to add to the growing body of literature on the potential benefits of SGB in reducing PTSD symptom severity. To the best of our knowledge, our case report is the first to provide evidence of improvements in memory dysfunction as a secondary outcome following SGB treatment for refractory PTSD in a combat-exposed veteran with comorbid alcohol use disorder.

METHODS

SGB Treatment Procedure

Once informed consent was obtained from the patient, an intravenous line was started with a 22G IV in the left hand. The patient was positioned supine on a fluoroscopy table, placed into cervical extension with a shoulder roll, and hemodynamically monitored (e.g., pulse oximetry and electrocardiogram). After radiographic confirmation of the right-sided C6 vertebral body, the skin was anesthetized with 2 cc of 1% lidocaine. Using an anterior paratracheal approach, a 22-gauge Quincke needle was passed under fluoroscopic guidance until contact with the anterolateral vertebral body of the C6 was made, at which time the needle was pulled back 1 mm. Appropriate needle position was then confirmed by the injection of 2 cc of iohexol (180 mg/mL) radio-opaque dye to monitor spread. After negative aspiration, a 0.5 cc test dose of 0.5% bupivacaine was injected. No side effects were noted after the test dose, thus sympathetic blockade was achieved by the slow injection of 6.5cc of 0.5% bupivacaine. The patient was observed for facial anhidrosis and Horner's signs (i.e., enophthalmos, ptosis, miosis, and anhidrosis) to confirm successful blockade of the cervical sympathetic ganglia. In addition, the patient's right hand temperature was monitored for 15 minutes following the anesthetic administration as evidenced by an increase of at least 1.5°C for further confirmation of sympathetic blockade.

ment composed of 17 items with Likert-type response scales (ranging from1 = not at all to 5 = extremely) that capture anxiety symptom clusters related to re-experiencing, avoidance, and hyperarousal.[24] Auditory learning and episodic declarative memory were measured by the Rey Auditory Verbal Learning Test (RAVLT), a standardized instrument that consists of five presentations of a 15-item word list (list A) with recall, one presentation of a 15-item Interference List (list B) with recall, and a Short Delay Free Recall of list A (Trial VI).[25] The RAVLT provides scores based on the total number of words remembered correctly for each trial to assess immediate memory, new verbal learning, susceptibility to interference (proactive and retroactive), retention of information after a period of time, and memory recognition.

CASE REPORT

A 41-year-old Naval chief who had experienced multiple combat-related traumatic events while deployed in Afghanistan and Iraq presented with symptoms associated with persistent PTSD including nightmares, night sweats and shaking, daytime flashbacks, heart palpitations, apathy, self-isolation, avoiding situations that reminded him of his trauma, shortness of breath, feeling constantly guarded and easily startled, severe mood swings, irritability, and anger outbursts. The patient reported persistence of these symptoms for multiple years.

Additionally, the patient reported problems with insomnia spanning 5 to 8 years. At presentation, he stated he was sleeping between 4 to 6 hours nightly only after lying in bed for 3 to 4 hours before he could fall asleep with 4 to 5 nightly arousal episodes. The patient also reported having poor memory function. No formal records of baseline memory function were available but the patient reported no difficulties with memory during schooling or Naval training. He had no history of traumatic brain injury, a condition that is known to adversely affect sleep patterns and memory function.[26]

The patient had a history of heavy alcohol use which included drinking 10 to 12 or more beers daily, a habit that had been sustained for multiple years but which had been reduced to three to four daily alcohol drinks after rehabilitation. He was considered medically disabled by his VA physicians. Moreover, the patient believed himself to be "unemployable" because of his persistent PTSD and memory dysfunction. His treatment history included group and individual psychotherapy spanning several years and citalopram at a daily dose of 20 mg.

The patient underwent neuropsychologic testing (NPT) 2 weeks following his initial clinic visit for the purposes of obtaining baseline measures of PTSD symptom severity and memory function (Table I). Thereafter, the patient underwent his first SGB treatment. Approximately 30 minutes after

confirmation of sympathetic blockade.

Clinical Measurements and Analysis

Data were extracted retrospectively from the patient's medical records. PTSD symptom severity was measured using the PTSD Checklist, Military Version (PCL-M), a validated instru-

completion of SGB injection, his skin temperature had risen 2°C indicating an appropriate sympathetic block with Horner's signs noted. At follow-up, 43 days after the initial SGB treatment, the patient reported marked improvements in PTSD symptoms as evidenced by a 43.6% reduction in his PCL-M score. He also reported an improvement in memory