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Positive Response to Treatment of Reactive Attachment Disorder (RAD) Patient and Pediatric Post-Traumatic Stress Disorder (PTSD) by Utilizing Stellate Ganglion Block (SGB): A Case Series of Two Patients

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Abstract

Background: Reactive attachment disorder (RAD) is a psychiatric diagnosis usually made in childhood. It is commonly resistant to treatment, including pharmaceuticals and psychotherapy. A significant clinical feature of RAD is disturbance in affect regulation. This feature of affect regulation abnormality is similar to the over reactivity seen in post traumatic stress disorder (PTSD). A new treatment, called stellate ganglion block (SGB), has been shown to be effective in treating the over reactivity associated with PTSD in the adult population. It involves placing a local anesthetic near a cervical sympathetic ganglion. SGB is believed to reduce sympathetic over activity, which may last for months, leading to improvement in affect regulation. The commonality of abnormal affect regulation (in PTSD and RAD) lead the author to use SGB in a pediatric patient with RAD and in a pediatric patient with PTSD.

Methods: Both patients received a stellate ganglion block on the right side at C6 level utilizing fluoroscopic guidance and 0.5% bupivacaine. Both patients had consent provided for performing the SGB from their parents. The responses to SGB were per parents', teachers', and children's reports.

Results: Both patients experienced immediate, significant and durable relief of RAD and PTSD symptoms, respectively. The PTSD patient requested repeat treatment after three months following added trauma. Both patients markedly reduced antidepressant and antipsychotic medications while maintaining their functional improvements.

Conclusion: Selective blockade of the right stellate ganglion at C6 level is a safe and minimally invasive procedure that may provide durable relief from RAD and PTSD symptoms in a pediatric population, allowing the safe discontinuation of psychiatric medications.

Keywords: Reactive attachment disorder; RAD; Pediatric; Post-traumatic stress disorder; Stellate ganglion block; SGB

Introduction

Children need sensitive and responsive caregivers to develop secure attachments. Exposure to secure early attachment equips the relationship-dependent prefrontal cortex to regulate automatic responses [1]. Thus, when those attachments do not properly develop, reactive attachment disorder (RAD) may result. This condition often has severe symptoms and is characterized by markedly disturbed, developmentally inappropriate ways relating socially, as well as poor self-regulation. The neurobiologic interpretation of RAD is often focused on affective regulation disturbances [2]. These disturbances may be a manifestation of autonomic nervous system (ANS) dysfunction. The ANS offers a mechanism for so-called functional illnesses and illustrates the importance of recognizing that 'stress' takes many forms, including physical, psychological and environmental. Evidence of intrauterine and post-natal programming of ANS reactivity suggests that neonatal care and safeguarding practice may offer preventive opportunity [1]. Dr. Heller believed that "re-regulation" (modulation of emotional responses to within the normal range) may be possible [2]. Dr. Heller's "re-regulation" may be possible by modulation of the sympathetic nervous system, a division of the ANS activated during "stress". It may be possible to produce the "re-regulation" by utilizing an injection of a local anesthetic next to a cervical sympathetic ganglion.

Background

Stellate ganglion block (SGB) is a technique widely used for treating chronic pain in the upper extremities, head, face and neck by a local anesthetic blockade of the cervical sympathetic ganglion. SGB involves injecting a local anesthetic into the anterior lateral aspect of the cervical spine on the right side at C6 level with the intent to anesthetize the cervical sympathetic ganglion. A detailed description of the SGB procedure, as utilized for PTSD treatment, can be found in publications by Lipov [3]. The primary author of this paper was the first to publish a report detailing SGB use for PTSD in 2008 [3]. Since the first publication, over 2,500 SGB's have been performed for PTSD, with no long-term adverse reactions reported for any of the procedures. The published success rate of using SGB in treating PTSD is 75%, as reported in the literature, with n=12, 75% [4], n= 24, 75% [5], and n= 166, 70% [6]. Stellate ganglion blockade carries risks that are considered very small. Although rare, severe complications following SGB do include bleeding, seizures, pneumothorax and spinal cord trauma. A study of the incidence of severe complications was last undertaken in 1992 by German researchers Wulf and Maier, with a reported 1.7 complications per 1,000 blockades based on surveys completed by patients receiving a combined total of 45,000 blocks. Those complications were mostly CNS complications, such as convulsions (11 cases), and additionally

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included nine cases of pneumothorax, six cases of high subarachnoid block, three cases of high epidural block, and two cases of allergic reaction. No fatalities or persistent complications were reported [7,8]. This survey was conducted prior to the use of fluoroscopic guidance, and when the stellate ganglion blocks were performed at the C7 level, rather than the C6 level currently used. With current improvements in guidance technology and performing the procedure at C6, complication rates should be even lower. The following report is the first of its kind in the literature. It may help pave the way to reduce the misery associated with RAD and pediatric PTSD, just as SGB has in the adult PTSD population.

Methods

Both patients had consent provided for performing the SGB from their parents. The needle was placed at the anterolateral aspect of right-sided C6 vertebral body, the iodine-based radio-opaque dye was injected, followed by injection of 7 cc of 0.5% bupivacaine utilizing fluoroscopic guidance. Both patients had a Horner's response (signifying sympathetic blockade). Details of SGB technique have been reported in past publications and are available [8]. The responses to SGB were per parents', teachers', and children's reports.

Case Reports

Patient #1

The focus of this report is a 15 year-old (at time of presentation) Caucasian male patient who was diagnosed with RAD by a local psychiatrist. Prior to presentation, the patient had undergone over five years of conventional treatments that included pharmaceutical and psychotherapy. At presentation, the family reported inadequate response to the totality of therapies utilized for their son, as well as great difficulties for the patient at home, in school, and in day-to-day life. The patient and his parents reported the following symptoms: hypervigilance, difficulty sleeping, over reactivity, severe anxiety and intrusive thoughts of dying. The patient 's pharmaceutical regimen included: divalproex delayed release tablets 500 MG, trazodone 100 MG, risperidone 0.1 MG, and sertraline 100 MG.

The patient received a single SGB, utilizing 0.5% bupivacaine 5 cc at right-sided C6 with x-ray guidance. One week after the procedure, the family reported a marked reduction in over reactivity, hypervigilance and intrusive thoughts. At the time of last follow up, 11 months status-post SGB, the patient's parents reported persistent improvement in these same symptoms. The parents also reported a "75% reduction in medications use". His medication regimen was now limited to Vyvanse (lisdexamfetamine dimesylate) 20 mg and Sertraline 20 mg. His mood and school performance were reported as "markedly improved" as well.

Patient #2

The focus of this report is a 12 year-old female with PTSD. She initially presented on a medication regimen consisting of lithium 1200 mg, Abilify 5 mg, and Tenex 3 mg. The patient received a single SGB. Following the block, she reported significant relief of her symptoms and was able to reduce her medications by 80%. Two months following the initial SGB, the patient was sexually attacked at a shopping mall. She was able to successfully push the perpetrator away and run for safety, but the event triggered a return of her PTSD symptoms. Therefore, a second SGB was performed four months after the initial block. The second SGB not only provided her marked relief of her PTSD symptoms, but lead to the termination of any psychotropic medications.

The mother of the patient reported the following regarding the patient's change of function after SGB: The year prior to SGB, the patient was on a modified day of school, leaving at 12:30 pm every day. She also had a history of using profanity, fleeing the school grounds, destroying property, and fighting. Five months following SGB #1 and one month following SGB #2, the patient is in full day school, off all medications, and has had only minor incidents at school. She also made the volleyball team.

Discussion

The commonality of symptoms and underling psychopathogenesis of PTSD and reactive attachment disorder (RAD) has been reported [9]. Common symptoms of both conditions include: hypervigilance, severe anxiety, difficulty sleeping and others. The similarity of adult PTSD and RAD lead the author to perform SGB for a pediatric RAD and pediatric PTSD.

The role of sympathetic system in both disorders

Reactive attachment disorder (RAD): Data exists that suggest that traumatic attachments, expressed in episodes of hyperarousal and dissociation, are imprinted into the developing limbic and autonomic nervous systems of the early maturing right brain. These enduring structural changes lead to the inefficient stress coping mechanisms that lie at the core of infant, child, and adult posttraumatic stress disorders [10]. More specifically, magnetic resonance imaging (MRI) shows that late adoption was associated with larger corrected amygdala volumes, poorer emotion regulation, and increased anxiety [11]. In a study reported by Richard Bryant and Lilian Chan, participants (N=61) provided baseline salivary samples, underwent a cold pressor test, then imagined an attachment or non-attachment figure, and then provided subsequent saliva samples. Participants who imagined a non-attachment figure had greater noradrenergic response following the stressor than those who imagined an attachment figure. These findings highlight that activating attachment representations can ameliorate the immediate noradrenergic stress response [11].

Pediatric post traumatic stress disorder (PTSD): The neurodevelopment of childhood anxiety disorders is not well understood. Basic research has implicated the amygdala and circuits related to these nuclei as being central to several aspects of fear and fear-related behaviors in animals. Stellate ganglion block (SGB) has been described as having a psychiatric effect by modulating the limbic and autonomic nervous systems [12]. The stellate ganglion has been shown to be connected to the amygdala via second or third generation sympathetic neurons [13]. Another approach to evaluation of SGB effect has been positron emission tomography (PET) scanning. PET scanning utilizes a positron-emitting radionucleotide to produce computer-constructed three-dimensional images displaying the function of tissues. In a study lead by Dr. Alkire, PET scans were performed before and after SGB for PTSD. The results showed that SGB dramatically reduced PTSD symptoms in three of five (60%) subjects. Importantly, brain regions that correlated with the individual Clinician Administered PTSD Scale (CAPS) scores and their functional improvement following SGB, centered on the amygdala and hippocampus, primarily in the right hemisphere. This is consistent with previous reports of the right amygdala/hippocampal areas being relatively overactive when PTSD symptoms are prominent [14]. Additionally, the right and total amygdala volumes have been found to be significantly larger in generalized anxiety disorder subjects [15]. The role of norepinephrine (NE) in the brain is that of a neurotransmitter leading to arousal, selective attention, and vigilance, which has been demonstrated in preclinical studies [16]. Specifically, elevated urinary norepinephrine has been identified among patients with PTSD [17].

Similarly, norepinephrine concentrations in cerebrospinal fluid (CSF) are significantly higher in subjects with PTSD than among healthy controls and have been correlated with the severity of PTSD symptoms [18]. Stellate ganglion block (SGB) has been proposed to work by reduction of CSF NE levels. Reports consistent with this view have been published where EEG deactivation was noted in rat and human models. Dr. Jeong reported significant reduction in EEG activity in a rat model after administration of SGB with 0.2 ml 0.25% bupivacaine [9]. A member of the same team, Dr. Yeo, performed a similar experiment in a placebo controlled human trial. The findings were that, in the SGB group, bispectral index (BIS) values (a simplified EEG) significantly decreased after the intervention as compared to baseline ($P<0.05$). The values were also significantly decreased in the SGB group when compared to the values in sham group after the intervention ($P<0.05$) [19,20]. Both researchers remarked that the reduction in the EEG activity was connected to a reduction in intracerebral NE.

Conclusion

Selective blockade of the right stellate ganglion at C6 level is a safe and minimally invasive procedure that may provide durable relief from RAD and PTSD symptoms in the pediatric population, allowing the safe discontinuation of psychiatric medications. To the best of the author's knowledge, this is the first medical literature report of the successful treatment of RAD and pediatric PTSD by utilizing SGB. In the future, children diagnosed with RAD and PTSD may benefit significantly if formal studies validate cervical sympathetic blockade as an effective tool in treatment of RAD and pediatric PTSD.

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