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Stellate Ganglion Block for Refractory Post-COVID Headache: Case Report

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Background: Long coronavirus disease (COVID) is a multitude of symptoms weeks to months after recovering from COVID 2019 (COVID-19) and involves a variety of symptoms, ranging from brain fog and fatigue to refractory headaches that may result in ongoing disability.

Case Report: A 49-year-old man presents for persistent headaches following COVID-19 infection months prior. The pain was frontal and bilateral but more prominent on the right, without sensitivity to light nor sound, and without identifiable triggers. He trialed numerous medications without relief. He rated his pain on average 8-10 on the Visual Analog Scale (VAS). After discussion of options, the patient elected to proceed with a stellate ganglion block (SGB). The patient underwent a right-sided SGB with 5 mL of 0.25% bupivacaine. Following the injection, the patient noted ~50% benefit immediately. On 6-week follow-up, he noted improvement of his headaches to 1-2 on the VAS. At 4 months, the headaches continued to be controlled (1-2 on the VAS).

Conclusions: Reports suggest that symptoms from long COVID are caused by dysregulation of the sympathetic nervous system. We report the use of the SGB for treating refractory headaches related to long COVID, suggesting that the SGB may relieve the dysautonomia.

Key words: Long COVID, stellate ganglion block, dysautonomia, refractory headache, case report

BACKGROUND

The severe acute respiratory syndrome coronavirus 2 is a single, positive-strand RNA virus that can cause respiratory, gastrointestinal, and central nervous system diseases in humans (1). The coronavirus disease 2019 (COVID-19) has emerged as a severe global pandemic, claiming more than 6 million lives, as of September 2022, according to the World Health Organization. Most individuals mount an adequate immune response that clears up the virus. In asymptomatic patients, inflammation is well-controlled, and cytokine levels remain within normal range. In symptomatic patients, inflammatory cytokines rise dramatically and correlate with disease severity (2). Time to resolution of symptoms usually correlates with severity of disease course. However, 10% to 30% of all individuals infected with the virus may develop "long COVID," formerly known as postacute sequelae of COVID-19 (PASC). Preexisting comorbidities, like obesity, cardiovascular disease, respiratory disease, and hypertension, increase the risk of developing long COVID (3).

There is a multitude of symptoms from several weeks to months after recovering from acute illness and presumably months after viral clearance. Symptoms may include headache, brain fog, fatigue, orthostatic intolerance, elevated resting heart rate, joint pain, muscle aches, and depression, among others (4). Dysautonomia or excessive sympathetic activity has been implicated

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and may be a contributing mechanism to some of the symptoms of long COVID (5).

Sympathetic innervation to the head, neck, upper limbs, and upper thoracic region is provided by the cervical sympathetic chain. The cervical sympathetic chain consists of the superior cervical ganglion, middle cervical ganglion, inferior cervical ganglion, and first thoracic ganglion. The stellate ganglion (SG) is a collection of sympathetic nerves found anterior to the neck of the first rib and forms from the fusion of the inferior cervical and first thoracic sympathetic ganglions (6).

Injection of a local anesthetic at the SG can block the activity of the cervical sympathetic chain. An SG block (SGB) thereby can decrease sympathetic tone and improve blood supply (7). The SGB has shown promising results for a wide variety of conditions, including vascular headaches, cardiac arrhythmia, posttraumatic stress disorder (PTSD), and complex regional pain syndrome (CRPS), among others (6).

In this case report, we describe a patient with refractory, debilitating headaches from long COVID that was successfully treated with the SGB.

CASE PRESENTATION

As the case report is devoid of patient identifiable information, it is exempt from Institutional Review Board review requirements and informed consent as per MetroHealth Institutional policy.

A 49-year-old man with a past medical history of obesity, obstructive sleep apnea, and tobacco use presented to the clinic for persistent headaches after getting over COVID infection 18 months prior. The patient did not require hospitalization for the initial symptoms of shortness of breath. He was seen in the emergency room, but did not require oxygen and was treated with supportive outpatient care.

Shortly after the initial symptoms, he began to also experience headaches, along with other symptoms. After recovering from the acute illness, the patient continued to experience debilitating headaches, shortness of breath, fatigue, vertigo, and hoarseness. Given his constellation of symptoms, the patient was seen by multiple specialists, including the post-COVID clinic, ears, nose, and throat, rheumatology, pulmonology, cardiology, and neurology. The patient had imaging of his chest, heart, neck, and brain, which were all unremarkable. Although some of his symptoms improved with appropriate follow-up and time, the patient continued to have his headaches. The headaches were frontal on both sides of his forehead, but more prominent on the right, without sensitivity to light nor sound, and without any identifiable triggers. On average, the patient rated his pain 8-10 out of 10 on the Visual Analog Scale (VAS). The headaches were constant and dull with periodic sharp pain. He was trialed on acetaminophen, nonsteroidal anti-inflammatory drugs, rizatriptan, topiramate, magnesium, and a short course of oxycodone, all without long-term relief. Due to limited efficacy, he had stopped using all medications. After failed conservative management and discussion of options, the patient was elected to proceed with the SGB.

The patient underwent a right-sided SGB at C6 with 5 mL of 0.25% bupivacaine under fluoroscopic guidance (Fig. 1). Following the injection, the patient noted about a 50% benefit immediately prior to discharge. On 6-week follow-up, he noted improvement of his headaches to 1-2 on the VAS from 8-10 before. He also noted improvement of his balance and vertigo. At 4-month follow-up, the headaches continued to be controlled at 1-2 on the VAS. Unfortunately, there was no improvement of the hoarseness, fatigue, or shortness of breath.

DISCUSSION

This case report describes improvement of refractory headaches related to long COVID after a successful right SGB. In Liu et al's case series (2), they report 2 patients that were successfully treated with bilateral SGBs. The 2 reported patients had a myriad of symptoms, including fatigue, anosmia, mental fog, sleep disturbances, headaches, and dyspnea (2). Our case is unique in that the other long COVID symptoms our patient presented with resolved asides from the headaches.

However, our case further supports Liu et al's study (2) in that our patient's primary long COVID symptoms resolved with the SGB.

Given that our patient's headaches were more prominent on the right side, we elected to do just a right-sided SGB. Had his left side been as affected as his right, we would have elected to do both a right and left SGB. If the patient did not have as much improvement from the right SBG, we would have proceeded with the left SBG, given there have been reports of successful relief of COVID-related symptoms with bilateral SBG. Given the relief seen in our patient, this supports the theory that dysautonomia and impaired cerebral blood flow contribute to the pathophysiology seen in long COVID patients (5).

The autonomic nervous system has a complex

bidirectional communication system with the immune system and the nervous system, balancing rapid response to infection and damaging levels of inflammation (2). Chronic medical conditions, like diabetes and obesity, tip off the balance between the 2, resulting in damaging cytokine levels seen in severe COVID-19 patients (1).

An ongoing inflammatory state drives the vagus nerve to send signals to the dorsal brain stem, which are then integrated into behavioral responses, including sickness behavior, seen in COVID-19 patients (8). Part of the mechanism of long COVID is thought to be due to prolonged changes in the autonomic signaling and exaggerated response to these signals, similar to that seen in CRPS and PTSD, conditions for which the SGB has been implicated (8,9). We believe the SGB provides its benefits not only by attenuating the dysautonomia, but also by improving cerebral blood flow.

Cerebral perfusion in humans primarily depends on blood pressure and carbon dioxide, which are affected by a variety of inputs, including sympathetic fibers, originating from the cervical chain (2). Consequently, dysautonomia syndromes, like postural tachycardia syndrome (POTS), have been associated with impaired cerebral blood flow, and newer studies (5,10) have made that association with long COVID patients. Compared to healthy controls, patients with long COVID were more likely to display cerebral hypoperfusion. Orthostatic cerebral blood flow velocity as monitored in the middle cerebral artery declined significantly more in both long COVID/PASC and POTS patients compared to controls (10). This cerebrovascular dysregulation may contribute to the symptoms of headaches and brain fog seen in a subset of long COVID patients.

Blockade of the SG has been shown to not only alleviate dysautonomia, but also increase cerebral blood flow (11). This should therefore improve symptoms related to impaired cerebral perfusion. Our patient had more than just the short-term relief expected from the transient sympathetic blockade, suggesting that the SGB may recalibrate the autonomic nervous system toward pre-COVID homeostasis (2). Investigation of this mechanism is beyond the scope of this report, but deserves further study.

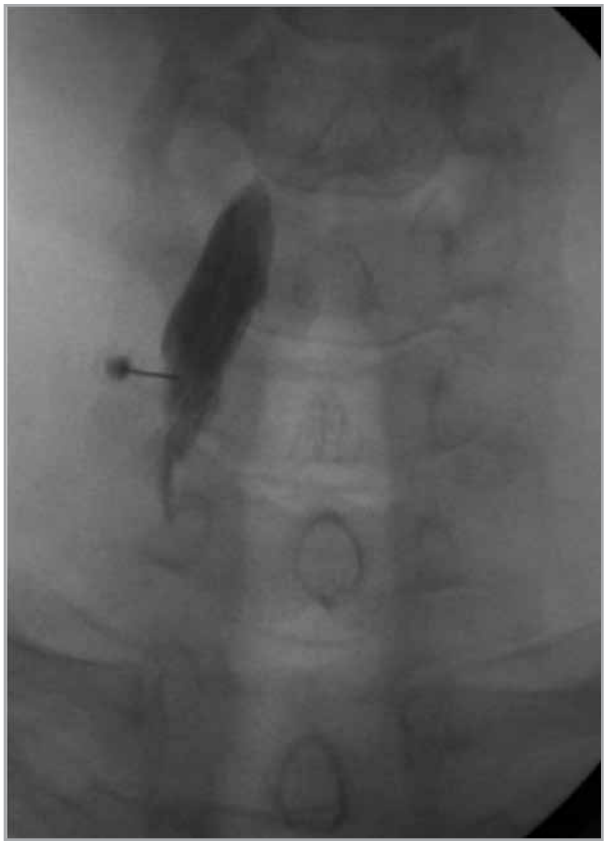

Fig. 1. Fluoroscopic image of right-sided SGB.
SGB, stellate ganglion block.

CONCLUSIONS

The global pandemic of COVID-19 has caused a huge public health burden. Patients with long COVID are suffering from this disease years after its inception. The SGB has been used for many sympathetically related conditions. Its application in treating some symptoms related to COVID-19 has shown promising results and warrants further research.

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