

Stellate Ganglion Blocks With Low Volume Bupivacaine And Fentanyl In Complex Regional Pain Syndrome I: Our Experience In A Peripheral Healthcare Setup

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Citation

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Abstract

It is well-established that stellate ganglion block offers great benefit to the patients suffering from reflex sympathetic dystrophy of the upper limb in terms of pain relief and functional improvement. Using surface anatomical landmarks and Horner's syndrome as a clinical indicator of successful block, stellate ganglion block can be safely performed in the absence of advanced imaging modalities. This provides the indigenous local patients great convenience and benefit and at the same time improves the quality of life without the hassle and financial burden of repeatedly going to a big city for treatment. We report a case series of thirty patients of reflex sympathetic dystrophy of the upper extremity undergoing successful stellate ganglion block in a peripheral healthcare set up where none of the advanced imaging facilities were available for guidance. Injection of low volume of long acting local anaesthetic (bupivacaine) along with fentanyl in repeated sittings reduced pain at rest as well as during movement and swelling of the upper limb and improved overall patient satisfaction. This low volume technique along with fentanyl reduced the complications associated with use of larger volume of local anaesthetic alone. We took development of Horner's syndrome as indicator of successful sympathetic blockade.

INTRODUCTION

The International Association for the study of Pain (IASP) has classified Complex Regional Pain Syndrome (CRPS) into CRPS I (synonyms: reflex sympathetic dystrophy, sudeck's syndrome) that occurs after an injury to the skin, bone, joints or tissues and CRPS II (synonym: Causalgia) as occurring after injury to a major nerve. CRPS I, CRPS II (Causalgia) and Sympathetically maintained pain (SMP) are a complex group of disorders, with symptoms of spontaneous or stimulus-induced pain and vasomotor, sudomotor or skeletomotor dysfunction of the involved area. The Stellate Ganglion is part of the sympathetic network and is formed by the inferior cervical and first thoracic ganglia¹. Sympatholysis in the form of SGB has been recommended for diagnosis and/or classification and treatment of these patients. Various indicators have been described in the literature for detecting successful stellate ganglion block, such as an increase in temperature in the affected extremity of at least 30 F from the baseline, Horner's syndrome (development of ptosis, myosis, enophthalmos and anhydrosis on the affected side of the face), nasal stuffiness, negative sweat test etc. From a clinical standpoint, development of Horner's syndrome is a valuable sign of

successful sympathetic blockade². Delleijn et al reported that development of Horner's syndrome and nasal stuffiness was consistent with pain relief in their study population³.

Early diagnosis is critical in the management of RSD as early mobilization of the affected extremity (physiotherapy) and sympathetic nerve blocks can cure or mitigate the disease process. . If undiagnosed and untreated, RSD / CRPS can make the rehabilitation process a much more difficult one. Although there are no studies showing that RSD / CRPS affects the patient's life span, there are potential long-term financial consequences due to permanent deformities and chronic pain. At an advanced stage of the illness, patients may have significant psychosocial and psychiatric problems, narcotic dependency or tolerance and may be completely incapacitated by the disease⁴.

This series of SGB was done at Satish Sharma Memorial Hospital, which is situated in a remote area of Assam, India. Thirty adult patients of both sexes diagnosed to be suffering from reflex sympathetic dystrophy of the upper limb following a history of injury (mostly colle's fracture) or upper limb orthopedic surgery were selected for SGB. All patients reported within 45 days of the initial event of injury

or surgery (mostly referred by the orthopedic surgeon).

Inclusion criteria: ASA grade I and grade II patients, patients willing to undergo multiple sittings of stellate ganglion block.

Exclusion criteria: ASA grade III or more, patients with coagulopathy, allergy to local anaesthetic agents, uncontrolled blood sugar.

Median age of presentation was 55 years (range 45 to 72 years). Out of the total 30 patients, 24 were female.

PREPARATIONS

In the first visit, thorough medical history, including history of allergy was elicited and examination of the effected extremity was carried out. The degree of pain was recorded on a Visual Analog Scale (VAS score) both at rest and on movement. The range of movement of the extremity (metacarpophalangeal & interphalangeal joints), presence of swelling, skin changes in the form of shininess and loss of hair were noted in the history sheet (Fig. 1)

Figure 1

Figure 1: Presentation of CRPS I in a patient showing tissue edema and restriction of movement.



As a routine, hemoglobin percentage, fasting blood sugar, bleeding time and clotting time were done. Five patients needed optimization of their blood pressure and 3 patients needed insulin treatment prior to the block. Patients were explained about the nature of his/her illness and the various treatment modalities available. They were also educated about stellate ganglion block and its advantages, limitations and side effects. A written consent was taken. They were kept nil by mouth 6 hours prior to the block and admitted on the morning as a day care. Tablet alprazolam 0.5 mg was

given orally two hours prior to the procedure.

MATERIAL AND METHOD

Patient is taken to the operation theatre. Basic monitoring devices used were electrocardiogram, blood pressure and pulse oxymetry (both attached to the unaffected limb). An 18 G intravenous cannula was secured on the normal side and maintenance fluid started. Emergency drugs were kept ready along with instruments to secure the airway in case of an emergency. The patient is placed in the supine position with the neck slightly extended and the head rotated slightly to the opposite side. Skin preparation was done with providone iodine and spirit. One ml of lignocaine 2% was used for local skin infiltration to raise a wheal using a 26G hypodermic needle. A 10 cc non-luer lock syringe was charged with 5 ml of bupivacaine 0.25% and 0.5 µ/kg fentanyl. Another 2 cc syringe was loaded with 1 cc of lignocaine 2% with adrenaline 1 in 2 lac solution to be used as test dose. Two fingers are used to palpate the cricoid cartilage and then swept laterally and dorsally while displacing the carotid sheath laterally. After identifying the C6 tubercle, the two fingers are spread apart in a cranial and caudal direction. The needle is placed between the two spread fingers and advanced to contact the transverse process of C6. The needle is then withdrawn 1-2 mm and held immobile. The test dose is injected after negative aspiration. Any significant change in heart rate and blood pressure was noted to rule out intravascular injection into the vertebral artery. This test dose was followed by injection of 5 ml of bupivacaine and fentanyl 0.5 µ/kg solutions. Immediately after the block, the patient is placed in the sitting position to facilitate the spread of local anaesthetic inferiorly to the stellate ganglion. The onset of Horner's syndrome was taken to be the indicator of a successful block. Horner syndrome was noted as early as 3 minutes after the block and in case it does not appear till 10 minutes, another attempt was made using the same drug. In total 3 patients required 2nd attempt at SGB to attain Horner syndrome.

Patient was observed for 3 hr after the block and VAS score noted after half hour and 2 hrs of the procedure. Before discharge the patient took water and then a glass of juice with the help of a straw. The standard discharge advices were:

- A responsible adult must drive the patient home.
- Not to drive or operate machinery for at least 24

hours after the procedure.

- Home physiotherapy and warm water bath of the effected limb.
- To immediately come to the hospital in case of development of difficulty in breathing, such as shortness of breath or pain when breathing or severe swelling of the neck.

Blocks were performed every second or third day for first 7 blocks depending upon the response.

RESULT

Parameters noted on subsequent visits and after each block were:

1. Change in VAS score both at rest and on movement.
2. Decrease in edema
3. Increase in range of movement
4. Overall patient satisfaction
5. Any untoward side effect.

We observed significant improvement in pain score (as assessed by VAS) and range of movement of the affected extremity. Full range of movement could be achieved in 22 patients. The remaining eight patients could achieve almost 70% to 80% of the full range of movement, which was quite encouraging for us. There was greater than 70% reduction in edema of the extremity at the end of three weeks (Fig. 2)

Figure 2

Figure 2: The same patient of figure 1 one month after multiple sittings of stellate ganglion block.



As far as the side effects are concerned, we observed hoarseness of voice in 12 patients and cough in 11 patients. These symptoms subsided automatically after a few hours.

DISCUSSION

Pathogenesis of CRPS has been variously attributed to injury to central or peripheral neural tissue⁵, tonic activity in myelinated mechanoreceptor afferents⁶, abnormality in the peripheral nervous system and elevated levels of soluble tumor necrosis factor- alpha activity in patients with polyneuropathy with allodynia⁷. The upper extremities are more likely to be involved than the lower with a predilection to the female population (60-80% of cases)⁸. Approximately 20 percent of the patients who present with the diagnosis of CRPS have a history of prior surgical procedures, primarily orthopedic, in the affected region⁹. As per the guidelines of the International Association for the study of Pain (IASP) the diagnosis of CRPS I (RSDS) can be made in the following context: a history of trauma to the affected area associated with pain that is disproportionate to the inciting event plus one or more of the following:

- Abnormal function of the sympathetic nervous system
- Swelling (edema)
- Movement disorder
- Changes in tissue growth (dystrophy and atrophy).

If there is an identifiable nerve injury than the diagnosis falls

into CRPS II (Causalgia). Lankford has suggested some secondary characteristics of CRPS such as demineralization and osteoporosis, sudomotor changes (hyperhidrosis, dryness), temperature difference between affected and unaffected extremities, vasomotor instability, erythema, glossy shiny appearance of skin etc¹⁰. Many patients with CRPSI/RSDS will exhibit some type of movement disorder ranging from strength reduction (78%) to tremor (25-60%) to myoclonus and dystonia. Initially, RSD/CRPS symptoms are generally localized to the site of injury. As time progresses, the pain and symptoms tend to become more diffuse. Three patterns of spreading symptoms in RSD/CRPS has been described: A “continuity type” of spread where the symptoms spread upward from the initial site, e.g. from the hand to the shoulder; a “mirror-image type” where the spread was to the opposite limb and an “independent type” where symptoms spread to a separate, distant region of the body¹¹. This type of spread may be spontaneous or related to a second trauma.

The stellate ganglion receives afferent signals from the paravertebral sympathetic chain and provides sympathetic efferents to the upper extremities, head, neck and the heart. SGB is indicated in RSD and Raynaud syndrome of the upper extremities, herpes zoster of the face or neck, hyperhidrosis of the neck and upper extremity pain due to arterial insufficiency. The volume of local anaesthetic used during SGB varies from 5-20 ml as per the literature. Feigl GC et al in 2007 demonstrated by computed tomography in cadavers that the use of 5 ml of local anaesthetic solution results in an almost ideal vertical distribution. He observed that high volume of local anaesthetic (10 ml and 20 ml) might lead to extensive and uncontrollable spread to various regions of the neck¹². Image guided (fluoroscopic, computed tomography) SGB have the advantages of increased safety and accuracy compared to blind injections and the ability to use smaller volume of local anesthetics.

Ganglionic local opioid application (GLOA) has been utilized as a treatment of neuropathic and sympathetically-mediated pain syndromes. Although there are various reports of the beneficial use of fentanyl in SGB^{13, 14}, nothing could be found in the literature about the dose of fentanyl.

CONCLUSION

Type I CRPS remains largely a clinical diagnosis and depends very much on the exclusion of correctable causes. Early recognition and aggressive physiotherapy with adequate pain relief is important for a better outcome. So, it

is of paramount importance that effected patients get the necessary treatment as early as possible. Orthopedicians and primary physicians should refer these patients to the pain specialist as early as possible. We have found that if adequate knowledge of the block and technical skill along with resuscitation facilities are available, SGB can be successfully performed using clinical parameters at remote areas also. We realized that there is a high probability of these patients not going to a far away place where high-end pain set-ups are available because of psychosocial, financial and various other issues. As a result they may suffer from permanent disability.

It's just a matter of bringing supportive health care to the doorstep.

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