Dextrose Injection in Stellate Ganglion Block: A Case Report

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ABSTRACT
Complex regional pain syndrome (CRPS) is a debilitating condition with severe chronic pain in the affected regions of the body. Stellate ganglion block is used as one of the treatment modalities for sympathetically mediated chronic pain like Complex regional pain syndrome (CRPS) and various peripheral vascular diseases. 5% dextrose injection as compared to steroid injections have various beneficial effects for stellate ganglion block. We report a case of Complex regional pain syndrome (CRPS) with various motor, sensory and autonomic changes in her right upper limb. Ultrasound guided diagnostic right stellate ganglion block with 5% dextrose was done with immediate pain relief. Patient reported significant reduction in her symptoms (>80%). Later after 1 week C-arm guided radiofrequency of T2-T3 sympathetic ganglion was performed. Use of 5% dextrose injection in pain medicine could be one of the promising methods for diagnosing and treating various painful conditions. Perineural dextrose injection in stellate ganglion seems to be more beneficial compared to steroid injections due to the close vicinity of the ganglion to various vascular structures in the neck.

INTRODUCTION
Complex Regional Pain Syndrome (CRPS) is a progressive, chronic condition associated with severe pain and various sensory, motor, autonomic and trophic changes. Presentation of CRPS varies but generally presents with an exaggerated deep burning pain, even provoked with light touch or something like an electric shock. Complex Regional pain syndrome has two subtypes: CRPS I and CRPS II. CRPS I is also known as reflex sympathetic dystrophy and CRPS II as causalgia. Causalgia precipitates as a result of some injury to a specific major peripheral nerve or one of its branches.

There is not a single diagnostic tests for CRPS. It can be done based on history taking and physical examinations. Exact pathophysiology of CRPS is not clearly understandable but it has been hypothesized the involvement of sympathetic nervous system in the pathophysiology of CRPS. The treatment plan is not fixed and varies widely. Treatment plan needs to be started early in the disease course with multidisciplinary approach. Various nerve blocks may be helpful in diagnosis and effective treatment for symptoms.

Stellate ganglion block has been used to diagnose and treat various chronic pain occurring in upper extremities, head and neck including CRPS. Stellate ganglion also known as cervicothoracic ganglion is a part of sympathetic ganglion of neck. It is formed by the inferior cervical ganglion and the first thoracic sympathetic ganglion.

The concept of using 5% dextrose to diagnose and treat neuropathic pain was advocated by Dr. John Lyftogt in 2007. There are many studies regarding the perineural injection therapy with 5% dextrose under ultrasound. But...
studies regarding its use in stellate ganglion block for CRPS is limited. Dextrose may indirectly downregulate the capsaicin-sensitive receptors (transient receptor potential vaniloid receptor-1, TRPV1), normally found in joints, tendons, ligaments and peripheral nerves. Upregulation of TRPV1 causes discharge of substance P and calcitonin gene related peptides causing neurogenic inflammation and neuropathic pain. Radiofrequency ablation of T2-T3 sympathetic ganglion can be done for long term good clinical results in CRPS of upper extremity.

CASE PRESENTATION

We present a case of a 42-year-old female (142 cm, 55 kg) who presented in our Out Patient Department (OPD) with chief complaints of right wrist pain for 8 months. Pain was insidious in onset and non-progressive. It was mainly on the ulnar side of the wrist, burning type. Pain was severe enough and even the slightest touch of bedsheet causes pain to the patient. NRS score was 8/10. It was associated with restricted movement of right wrist, tingling sensation was present on the affected wrist. She was unable to completely flex the little finger during the flexion of the fingers of the right hand. She also has swelling of the affected wrist. She gives history of injury to the right wrist 2 years back for which she underwent surgery. Surgery was done for chronic right distal radioulnar joint injury and TFCC (triangular fibrocartilage complex) injury 18 months back.

On examination of the right wrist: Visual inspection: mild swelling in right wrist region, scar mark present on lateral aspect of the dorsum of wrist, no skin changes. On palpation: warm, tenderness present, allodynia, hyperalgesia present, restricted range of motion of right wrist. Neurological examination: allodynia, hyperalgesia, motor normal.

Her blood parameters and Electromyography (EMG) report was normal. Magnetic Resonance Imaging (MRI) of right wrist done before surgery on December 2022 showed complete tear of ulnar side of TFCC, tear of ulno lunate and ulno triquetral ligament and mild intra and periarticular fluid. At present, MRI was not done.

CRPS right upper limb was made as a probable diagnosis. Informed written consent was taken and she was taken into the intervention room. Patient was kept in supine position. Using linear high frequency ultrasound probe, anterolateral part of right neck was scanned and searched for Chassaignac tubercle. Under all aseptic precaution, skin infiltration of 1% lignocaine 2 ml was given, 0.5% lignocaine (3 ml of 2% lignocaine) with 5% dextrose 7 ml, total 10 ml was given around right stellate ganglion.

Drug was injected under real-time imaging mode observing the target structure and spread of the drug. Post procedure, patient was observed for 30 minutes. There was significant decrease (>80%) in pain levels. NRS score was 2/10, during right wrist movement which was considered as one of the diagnostic tool. Tingling sensation was also decreased. Horner syndrome was seen after the block. Patient was discharged later once no complication was noted. Patient was reassured about the acceptable side effects. She was planned for right T2-T3 sympathetic Radiofrequency ablation in next visit as stellate ganglion block for given for diagnostic purpose and works just for short period of time.

Patient visited our OPD 3 days later as she was planned for radiofrequency ablation for long-term pain relief.
(3-4 years). She was painfree during her visit even after 3 days which also suggest that 5% dextrose injection can be used in stellate ganglion for decreasing pain. As per ASA guidelines, NPO for 2-3 hours was kept. Informed written consent and all necessary preparation were done. Patient was kept in prone position and C-arm was placed in true AP vie. Then vertebra and ribs were counted. A scale was placed and 4 cm distance from the midline was marked with a forcep. C-arm was then rotated on same side till the forcep comes close to vertebral body. Needle entry point was marked at the junction of vertebral body and rib at T2 and T3. Local anesthetic was infiltrated at needle entry points. Radiofrequency needle (or cannula) was then introduced in tunnel vision at both T2 and T3. Needle was touching vertebral body. C-arm was then taken in lateral view. Needles were further advanced touching the vertebral body till the junction of anterior 2/3 and posterior 1/3 of vertebral body. Sensory testing were done at 50 Hz and motor testing was done at 2 Hz and no sensory or motor stimulation was noted. Iohexol dye (2ml at each level) was then injected under continuous fluoroscopy. Dye spread was heterogenous with prominent vertical spread along the anterior part of vertebral body. There was no washing out of dye in continuous fluoro image. C-arm was then taken in AP view and  typical spread of dye along lateral part of vertebral body was seen. 3 ml of local anaesthetic were injected at each RF cannula. C-arm was again taken in lateral view to confirm location of needle tip before RF lesion. Multichannel Radiofrequency lesion was then started at 80 degree temperature for 90 sec. A second cycle was done with 180 degree rotation of RF needle. Steroid was injected after lesion was completed to prevent neuritis. RF needles were taken out and the procedure was completed. Patient was observed for 30 min and discharged after no complication was seen.

**DISCUSSION**

Among all treatment plans for nerve entrapments, perineural injection with various drugs have been used since long. There are studies that used local anaesthetic for stellate ganglion block but studies using 5% dextrose for perineural injections are just handful in our study, lignocaine and dextrose both were given but they act individually and showed no synergistic effect.

Use of 5% dextrose injection for hydrodissection has beneficial effect in treating neuropathic pain. Hydrodissection with 5% dextrose release pressure on the nervi nervorum or vaso nervorum. The function and discharge of motor, sensory and mixed nerves are regulated by these nerves. The major nerves are innervated by the nervi nervorum located outside the epineurium. Small blood vessels, vaso nervorum are also situated outside the epineurium. Peripheral nerves receive nourishment from these arteries and their metabolites are removed by the veins. Venous outflow would be first impacted by mild compression of these vaso nervorum, perhaps causing stasis and toxic build up at the affected area of nerve. Compression would also affect lymphatic outflow which is possible beyond the epineurium. Thus the main goal of hydrodissection is to hydrodissect the peripheral nerves in order to free them from entrapment.

In a case report by Martin G Ferrillo, liposomal bupivacaine was used for stellate ganglion block for the treatment of CRPS. There was three to four fold longer pain relief with liposomal bupivacaine than bupivacaine hydrochloride, which gave up to 1 week pain relief. Here in our study, use of 5% dextrose in stellate ganglion caused significant decrease (>80%) in pain and clinical symptoms. In compared to bupivacaine dextrose injection provides prolonged pain relief for chronic pain and dextrose is safer than local anaesthetic like bupivacaine.

Chang K. V. et al, in their study mentioned that USG guided hydrodissection of 2 sessions of 2ml 5% dextrose injection performed near right distal superficial radial nerve improved the paresthesia over the right radial wrist which was not improved with the use of corticosteroid injection. In our study also, use of 5% dextrose injection around right stellate...
ganglion caused significant (>80%) decrease in tingling sensation over right ulnar wrist over the dorsal area.

Study by Chen L.C. et al. showed significant reduction in symptom severity and cross sectional area of ulnar nerve from third month onward in patients who were given perineural 5% dextrose injection in comparison to those given corticosteroid. Our case also had significant reduction (>80%) in pain and tingling sensation over right wrist thus highlighting the effectiveness of dextrose injection in their as well as our study.

Chen CK et al. in their study mentioned that percutaneous T2-T3 radiofrequency sympathectomy led to >75% pain relief after diagnostic block at T2 and even after 6 month follow up, pain relief was >50% in the patients of CRPS. In our study diagnostic stellate ganglion block was given with 5% dextrose injection along with 0.5% lignocaine. Reduction in pain and tingling sensation was >80% which was similar to their study. Pain relief was >50% when patient came for radiofrequency T2-T3 sympathectomy.

Thus all these studies showed how 5% dextrose injection work in peripheral nerve entrapment as well as can be equally effective for diagnosing chronic pain like CRPS.

**CONCLUSION**

Use of 5% dextrose injection with lignocaine for stellate ganglion block is safe and diagnostic for sympathetically mediated chronic pain syndromes. Further studies should be conducted to support the effectiveness of dextrose injection for the management of chronic pain.

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