



# Ultrasound Guided Cluneal Nerve Block in Management of Low Back Pain

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## Abstract

**Objectives:** To ascertain the effectiveness of ultrasound guided cluneal nerve block in management of low back pain and its complications.

**Methods:** We present the results of our first 24 patients, who underwent ultrasound guided cluneal nerve injection, for low back pain due to possible cluneal nerve entrapment neuropathy. All patients selected for the injection had clinical examination suggestive of cluneal nerve entrapment and had normal MRI scan of the lumbar spine. High resolution ultrasound scan was performed to confirm clinical findings. Written informed consent was obtained on standard consent form. A mixture of 4ml Levobupivacaine and 40mg dexamethasone was injected around the nerve and under the fascia. Pain score was recorded before and 10 minutes after the procedure on visual analogue scale. Patients were followed up in clinic at 6 weeks, 3, 6 and 9 months after injection to record their pain score and any relevant complication.

**Results:** Complete relief of pain and tenderness was reported by 96% of our patients 10 minutes after injection. 88% remain pain free at 3 months and excellent pain relief continued in 83% patients for 6 months. Fifty percent patients stated recurrence of pain and discomfort at 9 months however, symptoms were not as severe as before injection. No procedure related complication was recorded.

**Conclusion:** Cluneal nerve block can be safely performed as clinic procedure. It is very effective in a selective group of patients, and provides excellent pain relief for over 6 months.



## Introduction

Low back pain is one of the most common symptoms in patients presenting to the spine clinic [1]. As spinal surgeons, we come across a group of patients suffering from chronic low back pain radiating to the superior gluteal region and posterior upper thigh, mimicking radiculopathy. They are usually tender around posterior superior iliac spine area, and an MRI scan of the lumbar spine usually does not show significant pathology. Their pain does not respond to conservative management, including physiotherapy and analgesics. This group of patients present a dilemma to the treating surgeon as they are in pain, affecting their daily living and no underlying pathology can be attributed as the cause of their sufferings. The Superior cluneal nerve's inflammation or entrapment has been identified as the source of pain in these patient [2-4]. We present a novel technique of ultrasound guided Cluneal Nerve block, and its outcomes in pain management of these patients.

The Superior Cluneal Nerve (SCN) and Middle Cluneal Nerve (MCN) are purely sensory nerves, comprised of 3-6 branches which supply sensations predominantly in the lumbar and gluteal region [2]. They are formed by the dorsal rami of lower thoracic and lumbar nerve roots, and travel from superior-medial to inferior-lateral in the erector spine muscle [5]. Once they have reached the level of iliac crest, it penetrates the thoraco-lumbar fascia, about 3-8 cm lateral from the midline [5]. Here the SCN passes through the osteofibrous tunnel formed by the thoraco-lumbar fascia and the iliac crest. The nerve fibers of SCN can be compressed or entrapped in this tunnel, causing pain which is mainly felt at lower lumbar and gluteal region, and occasionally can mimic radiculopathy [6]. The middle cluneal nerve passes below the long posterior sacroiliac ligament between the posterior superior iliac spine and posterior inferior iliac spine and passes over the iliac crest to enter the gluteal region [6].

A variety of treatment options, from non-operative to surgical decompression, are available to help these patients with variable outcomes. Nerve block is one of the most common treatment modality used, however its efficacy is yet to be proven [7]. We present a novel technique of ultrasound guided cluneal nerve block and it's short to medium term efficacy in our first 24 patients.

## Materials and methods

Ultrasound guided cluneal nerve block was started in August 2019 as clinic procedure in our unit for the patients suffering from low back pain due to cluneal nerve entrapment. The findings about presentation, clinical examination, investigations and outcome following the treatment was recorded prospectively on hospital's electronic patient record system (CERNER). The approval to perform this study was obtained from Medical Research and Ethics Committee.

All 24 patients, who underwent this procedure from August 2019 to Feb 2020, were included in the study. These are the patients presented to the spine clinic, with back pain radiating to gluteal region and upper thigh mimicking radiculopathy. Clinical examination revealed point tenderness just over the iliac crest, area 3-8 cm lateral from midline corresponding to the cluneal nerve anatomical position. Straight leg raise test was positive in about 60 % of patients. However, nerve stretch sign was rarely present. An MRI scan of the lumbar spine was performed in all these patients to rule out any disc pathology causing nerve root compression. Having a normal MRI scan was a pre-requisite for

the injection. All patients had at least 6 months of non-operative management, including 2 weeks of anti-inflammatory medication and 4 months of physiotherapy.

A high resolution ultrasound scan was performed by an experienced musculoskeletal radiologist and if the nerve showed signs of inflammation or entrapment (thickness and point tenderness) the patient was offered nerve block. Informed consent was taken on standard surgical consent form by the surgeon, after explaining the risks and benefits. The procedure was performed jointly by spine consultant and radiologist, under ultrasound guidance. Pain score was recorded in patient's clinic notes on the CERNER before the injection.

## Ultrasound and injection Technique

Superior cluneal nerve is a mono-oligo fascicular cutaneous nerve with thicker preineurium and is hyperechoic on short axis, therefore difficult to differentiate from overlying fascia. We use 10 megahertz linear musculoskeletal Ultrasound (US) transducer starting in transverse orientation. Guided by the trigger point area on clinical examination, we begin our scan near Posterior Superior Iliac Spine (PSIS) with the transducer placed distal and parallel to the iliac crest, and move the transducer back and forth to find hyper-echoic ovoid structure. With medial and lateral movements, one can see the fascia, and the nerve can be seen as a small ovoid structure under the fascia just medial to the PSIS. By moving the US scan more proximal over the paraspinous muscles, one can see the branches as small ovoid structures under the fascia. By pivoting the transducer in longitudinal direction the nerve can be seen in long axis. Furthermore, by moving the transducer more cranially, the nerve is seen coursing underneath the thoracolumbar fascia and top of the iliac crest.

We use out of plain approach with short direct access, where only the tip of the needle is seen in the ultrasound image. Once needle is seen under the fascia, a mixture of 1ml lidocaine, 2ml of Levobupivacaine and 40 mg of depomedron is injected around the nerve. The fascia can be seen lifted by the injectate material.

Patients were observed for 10 minutes after injection and pain score (visual analogue scale 0-10, where 0 being no pain and 10 being worst pain possible) was recorded 10 minutes after the procedure.

Patients were followed up in clinic at 6 weeks, 3 months, 6 months and 9-12 months after injection to assess the pain relief, and pain score was recorded at every visit. Any complication relevant to the procedure was also documented. At follow up visits, pain score was recorded by a member of the team and not the performing surgeon to reduce bias in the study.

We analysed the data of our first 24 patients to see the outcomes in term of pain relief and complication rate of this procedure and to ascertain its efficacy in medium to long term.

24 patients underwent this procedure from August 2019 to Feb 2020, and were included in the study. In an effort to anonymize patients data for confidentiality and to reduce the bias, each patient on the clinic procedure log book who had this injection was given a code number from 1-24 (1 being the first patient who had injection and the 24 being the last patient). Using their Health Card (HC) number their pain score was recorded on an excel sheet from the CERNER. The variables collected on the Excel sheet were patient's specific code number, age, pain

score before injection, pain score 10 minutes after injection, pain score at 6 weeks, 3 months, 6 months, 9 months and any complications. Simple statistical analysis was performed to find out the percentage of patients who had good pain relief (Pain score less than 4) following the injection, how long the pain relief lasted, and complication rate.

## Results

All patients were in severe pain before the injection and scored 10/10 on visual analogue scale. Twenty three out of 24 (96%) patients reported no pain or nearly no pain (pain score less than 2) and complete relief of tenderness 10 minutes after injection. Twenty one patients (88%) remain pain free at 3 months follow up. Excellent pain relief (pain score 4 or less) was maintained in 83% of patients at 6 months. 54 % of the patients stated recurrence of pain and discomfort (with pain score more than 5) at 9 months follow-up. However, symptoms were not as severe as before injection. No procedure related complication was recorded.

## Discussion

Low Back Pain (LBP) is very common presentation, and a major health burden causing significant disability and loss of work days [8]. Two-thirds of adults experience LBP in their life time, and in majority of the cases (85% of patients) the etiology of back pain remain nonspecific [1].

The true incidence of Superior Cluneal Nerve Entrapment Neuropathy (SCN-EN) is unknown. Strong and Davila [9] reported incidence of 9.8% in their patient's population, admitted with LBP, based on their diagnostic criteria. Kunai et al [10] diagnosed 14% of their patients suspected of SCN disorder. They found SCN disorder patients were significantly older and have significantly more vertebral fractures in thoraco-lumbar spine and lumbar spine than the other group of patients presenting with LBP and radiculopathy. Furthermore, they reported 20% of patients with thoraco-lumbar vertebral fractures suffering from SCN entrapment pain. Many other studies have mentioned an increase SCN symptoms in people with previous vertebral compression fractures [11] and bone harvest from posterior iliac crest [12]. In our study group, none of the patients had had previous surgery or fracture and they were relatively young. Although our study was not looking at incidence of SCNE however, we diagnosed 24 patients in about a year from one spine clinic which is a significant number considering our population.

Majority of patients suffering from SCN-EN at osteo-facial tunnel present with back pain in lower lumbar and gluteal region, with radiation down to leg which is usually exacerbated by lumbar movements and can be misdiagnosed as lumbar spine disorder [7]. In a study by kunai et al [10] they found about 50% patients presenting with leg pain. They also found that 42% of the patient operated for SCN entrapment had previous unnecessary lumbar spine surgery. This can be a significant contribution to failed back surgery syndrome which we know is a difficult entity to treat, hence, better avoided.

Earlier studies [7] described SCN consists of lateral rami of dorsal roots T11-L4, however later cadaveric studies has shown the nerve receiving its origin from L3 -L5 and also as low as S1 [12]. This anatomical bases explain why a significant number of these patients can present with symptoms mimicking radiculopathy. Furthermore, broader origin of SCN and anastomosis could explain sciatica like symptoms in SCN-E. It is highly likely that the limitation of lumbar motion and leg symptoms could

lead to misdiagnosis and unnecessary spine surgery.

Iwamoto et al [11] noted a significant proportion of patients suffering from failed back surgery syndrome, following lumbar spine fusion surgery, were in fact due to SCN-EN and its treatment dramatically improved their severe LBP. The question arises; was their pain misdiagnosed as of lumbar spine origin, and was the surgery performed unnecessarily. Many studies have reported that SCN-EN pain can mimic radiculopathy, leading to unnecessary surgery [10,12,14]. In our daily practice as spine surgeons, we face this dilemma. Therefore, all the patients we recruited in our study had an MRI scan to rule out any lumbar pathology, and at least had 6 months of non-operative treatment prior to having the injection.

Kunai et al [10] reported 10% of all the patients who presented with LBP had SCN entrapment neuropathy, and 50% of them have leg symptoms. We noticed that nearly all our patients presented with symptoms mimicking radiculopathy - a finding similar to previously reported by Trescot [14]. Therefore, spine surgeons should be aware that SCN disorder is not rare, and may not only cause LBP but can also present with leg pain.

Kuniya et al [10] suggested a diagnostic criteria, consisting of maximal point tenderness at the presumed osteofibrous tunnel, and palpation at this place reproducing patients symptoms with 85% accuracy. Use of high resolution US scan help to visualize the nerve and diagnosis of MCN-EN [3,6]. Swelling of the nerve on the affected side compared to non-affected side is another significant sign of nerve entrapment [7]. We noticed this swelling in about 50% of our patients.

A cadaveric study by Neilson et al [6] found that the SCN nerve consistently emerged from the lateral third of the erector spinae muscle just cranial to the iliac crest. We feel this is the best starting point to visualize SCN under ultrasound, and injecting under the fascia help spread across the lateral third of erector spinae muscle. The approximate location of SCN in term of distance from the lumbar sagittal midline to the most medial of the superior cluneal nerves has been reported to be an average 7.4 cm [6]. However it depends upon the body physique and size of the patient. Kuniya et al [5], in a cadaveric study, described the position MCN in majority of cases to be about 4.5 cm linear distance from posterior superior iliac spine.

Cluneal nerve injections / blocks are in use for the treatment of low back pain [2]. However, there is insufficient published evidence about their safety and efficacy and are hence considered experimental and diagnostic. Kunai et al [10] reported 85% clinical pain relief from injection. In our study we observed 96% of our patients had complete pain relief following the injection. This may be due to the use of high resolution US guidance and combination of expertise from radiologist and spine surgeon. Our findings are supported by a cadaveric study by Neilson et al [6], in which they used High Resolution Ultrasound Scan (HRUS) to guide their SCN blocks. Their study confirms that the SCN can be visualized and assessed with HRUS, although some patient's factors, like obesity and muscle atrophy, can affect the efficacy. Dissection of their specimens following the injection stated 100% success rate of the relevant spread of injectate material. High resolution US helped us to inject precisely under the fascia which could be seen lifted off while injecting.

Kerri et al [3] found local anesthetic injection very beneficial to rapidly relieve pain. Furthermore, they postulated that addition of corticosteroid in the injection can enhance the thera-

peutic benefits. However, they also warned about several undesirable effects of steroid. In our study we have not noticed any problem with use of steroid. We used a small amount of steroid and injection was done deep to the fascia, under US guidance to avoid infiltration in superficial plane. Kerri et al [3] stated that although US is not necessary however, we feel it's use can help in direct visualization of nerve, optimize medication delivery, and increase its safety profile.

Different success rate and number of repeat injections has been reported in literature with some studies showing medium to good results following local anesthetic and steroid injection [15-17]. Kuniya et al [5] reported good pain relief in 68% of their patients after 1-3 blocks, while Maigene and Doursounian et al [17] reported a success rate of only about 28 %, despite having blocks 3 times. In most of these studies, the injection technique relies upon anatomic land marks. In our study, we have added high resolution ultrasound scan, which has helped us to inject precisely and to improve accuracy, compared to previous studies.

We achieved 96% success rate of diagnosis and immediate pain relief after 1st injection and we believe this is due to:

1. Careful selection of patients and following strict diagnostic criteria.
2. Use of high resolution US scan to guide in correct placement of injection.
3. Combining the expertise of experienced radiologist and spinal surgeon in one stop clinic.

### Conclusion

The incidence of severe low back pain due to SCN-E and MCN-E is unexpectedly high, and their diagnosis and treatment can be challenging. Spine surgeons should be aware of SCN entrapment neuropathy as a possible cause of pain in patients, presenting with LBP and refractory to simple treatment. We believe a careful selection of patients following a good clinical examination, normal lumbar MRI scan, use of high resolution US scan and combining expertise provides 96% accuracy in diagnosis of SCN-E. US guided cluneal nerve block using local anesthetic and steroid provides excellent immediate pain relief, which lasts for over for 6 months and continued good pain relief for 9 months. It is a safe and effective treatment modality with no significant complications, and best be performed as a one stop clinic with radiologist and spine surgeon.

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