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A Prospective Study in Analgesic Effect of Distal Sodium Channel Blockers (DSCB) in Patients with Sciatica

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Abstract:-

Objective: This Study was performed to explore the amount and duration of the analgesic effect of DSCB in patients with sciatica and assisting the patient in overcoming his symptoms and ending his/her cycle of pain and disability.
Methods: In total, 100 patients with sciatica were treated with DSCB injections. All the patients were evaluated by VAS scores and improvement of SLRT before treatment and 1 week, 1 month and 3 months after treatment.
Results: After one injection, the patient's pain was greatly decreased and they stopped taking NSAIDs. The VAS scores and SLRT were significantly better after than before injection.
Conclusions: DSCB injections are effective treatment for acute Sciatica pain with or without nerve root compression

Keywords:- *Sciatica, Low Back Pain, Intervertebral Disc Prolapse, Distal Sodium Channel Blockers (DSCB)*

I. INTRODUCTION

Pain is an unpleasant sensation due to inflammatory response anywhere in the body. A plethora of medical and surgical methods compete with other semi and non-invasive methods for treating pain. A common cause patients present to their physicians is low back ache. Approximately 40% of adults will experience sciatica (low back ache with or without radiation to the legs) at some point in their lives, while clinically significant sciatica affects only 4%-6%. A disc bulge in an MRI associated with severe radiculopathy and sciatica is immediately diagnosed as a slipped disc and aggressive management strategies are developed to treat the offending disc. The patient is not concerned with the cause of pain, he/she wants relief from his symptoms. Distal sodium channel blockers offer a new method of pain management in numerous types conditions ranging from Sciatica, Tennis elbow, Golfer's elbow, Periarthritis shoulder, Scapulotendinitis, Cervical brachialgia, Post-surgical pain etc., DSCB is simpler, cheaper and more effective than a single IM injection of Diclofenac sodium or parenteral administration of Paracetamol, which produce much inferior quality and lesser lasting pain relief.

II. PATIENTS AND METHODS

➢ *Patients*

This study included patients with Sciatica who were diagnosed and treated at our hospital from November 2020 to November 2022. In all patients there is nerve root compression at the levels of either L3-L4 or L4-L5 or L5-S1 or at both levels identified on MRI. All patients underwent failed conservative treatment either with rest and physiotherapy or one or more anti-neuropathic drugs. Each patient provided written and informed consent and the study was approved by the institutional review board. The inclusion criteria was the patients who are advised surgery for minimal nerve root or cord compression with SLRT of varying degrees ranging from 30 – 60 degrees. The exclusion criteria was the patients with allergic reactions to sodium channel blockers. In symptomatic patients, Neurological examination, The VAS scores, SLRT and **Nerve tenderness was assessed prior to injection by palpation** in the OP department. Imaging was done. The VAS scores and SLRT were repeated 3 min, 7 min, 10 min, 1 week, 30 days and 90 days after the injection was given.

➢ *Preparation of drugs*

A cocktail of drugs of 3 ml of 1% xylocaine, 1ml/40mg of Triamcinolone acetate, 30 mcg of clonidine diluted with 4 ml of distilled water is taken into a 10 cc syringe.

➢ *Treatment of patients*

After identifying the exact level of IVDP/LCS from MRI imaging, the above cocktail is injected into specific points which are determined by palpating the tender points either by asking the patient to mark the area of the pain that is felt over the dermatomal areas of L4,L5 and S1 or by manual palpation of the tender nerves. 5 ml of drug is usually given at the sinus tarsi injection point when the tenderness and imaging correlated with pathology at L4-L5 level and 3 ml is injected into the other injection points like medial

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calcaneal nerve injection point if the pathology and the nerve tenderness is at L5-S1 level. Then, the patient is observed in the recovery room and he/she will be monitored for around 10 minutes and then the patient will be discharged and asked to do back strengthening exercises rigorously (physical therapy)

➢ *Clinical evaluation*

The patients were examined clinically and evaluated with VAS scores and SLRT by the examiner before injection and were repeated 3 min, 7 min, 10 min, 1 week, 30 days and 90 days after the injection was given. The VAS score ranges from 0 to 10, with 0 representing no pain and 10 representing the worst possible pain, and the improvement of SLRT post injection represents the improvement in the functional activity of patient.

III. RESULTS

Patients in the current study ranged from 19 years to 61 year old with mean average of 43.5 years. There were 15 patients are in the age group of 21-30 years, 33 patients are in the age group of 31-40 years, 39 patients are in the age group of 41-50 years and 10 patients in the age group of 51-60 years respectively. Hence, 97% of the study population are of working class.

Out of 100 patients, 39% had complete pain relief with VAS score of 1, 53% had mild noticeable pain after 3 months which occurs after prolonged walking and relieves on taking rest, combining these 2 categories, 92% patients has relieved from the pain with DSCB injections.

Out of 100 patients, 64% shown improvement of SLRT to 90 degrees post injection and 30% shown improvement of SLRT to 80 degrees, combining these 2 categories, 94% of the patients has shown improvement of SLRT after injection. Participants of the study did not report any significant complications.

A total 6 patients (6%) were transferred to neurosurgery for surgical management as their symptoms were not relieved post injection. The procedure was repeated twice for these patients before advising the surgical management. These patients were followed up and we found Disc extrusion to be the cause of their low back pain.

Out of 23 patients, who underwent the procedure twice, 6 were advised surgery and 17 patients were relieved of their symptoms after 2nd injection

Table 1 VAS scores at various time points

VAS Score	Initial	3mins	7 mins	10 mins	1 week	1 month	3months
1	0	1%	12%	28%	39%	39%	39%
2	0	12%	44%	40%	49%	48%	53%
3	0	9%	0%	0%	0%	2%	2%
4	0	37%	29%	28%	7%	0%	2%
5	0	16%	7%	2%	3%	3%	2%
6	0	19%	6%	2%	2%	4%	2%
7	61%	6%	2%	0%	0%	2%	0%
8	39%	0%	0%	0%	0%	1%	0%
9	0	0%	0%	0%	0%	0%	0%
10	0	0%	0%	0%	0%	0%	0%

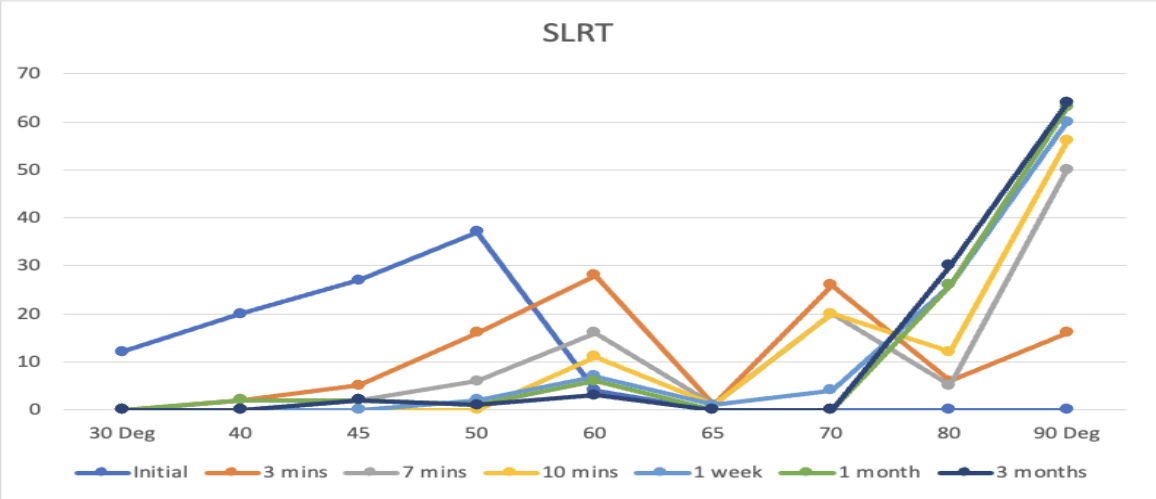
Table 2. Table showing number of injections given

No. of injections	Percentage
Single injection	77%
Two injections	23%

Table 3. SLRT at various time points

SLRT Degrees	Initial	3 mins	7 mins	10 mins	1 week	1 month	3 months
30⁰	12%	0%	0%	0%	0%	0%	0%
40⁰	20%	2%	0%	0%	0%	2%	0%
45⁰	27%	5%	2%	0%	0%	2%	2%
50⁰	37%	16%	6%	0%	2%	1%	1%
60⁰	4%	28%	16%	11%	7%	6%	3%
65⁰	0%	1%	1%	1%	1%	0%	0%
70⁰	0%	26%	20%	20%	4%	0%	0%
80⁰	0%	6%	5%	12%	26%	26%	30%
90⁰	0%	16%	50%	56%	60%	63%	64%

Table 4. Graph showing improved SLRT



IV. DISCUSSION

Sciatica contribute significantly to global health. There is a significant impact of lower back ache on individuals, households, communities, and the health care system. In countries with low incomes, the impact is profound.

Approximately $90.7 billion was spent on back ache in the USA in 1998. Pain in lower back was assumed to cost $9.17 billion dollars in the UK in 2000.

A number of factors contribute to sciatica :

- Mechanical compression (IVDP, LCS etc)
- Inflammation causing neuritis/inflammation of the nerve roots
- immune mediate.

Most sciatica patients are treated conservatively, i.e., Bed rest, back exercises, analgesics (NSAIDs, Pregabalin, Gabapentin etc), physiotherapy (Short wave diathermy). Yet, certain patients will need further treatment if the conservative management fails to work. A few studies comparing surgical and nonsurgical treatments of sciatica have concluded that surgical treatment gives immediate relief from pain but both conservative and non-conservative methods will have the same kind of outcomes in the long run.

V. JUSTIFICATION OF DSCB INJECTION

The disease process of Sciatica as is due to inflammation, immunity and mechanical compression. There is no adequate symptomatic relief provided by NSAIDs and rest of the treatments for sciatica will either be epidural steroid or surgery which carries their own complications.

Inflammation leads to alterations in the DRG and nerve root sensitising the nociceptors. DSCB uses unique feature of the Nociceptor which is its pseudo unipolar axon, the unique property is that its ends, both central and peripheral, have complementary functional characteristics. Peripheral nerves which carries these axons will selectively become sensitive to mechanical pressure ("mechanosensitised") causing tender points which can be identified on palpation. Radiculopathy in early stages is due to increased excitability and sensitisation of DRG and root resulting in projected pain, with pain

specifically along the distribution of the peripheral sensory nerve fibers. Injection of SCB along its peripheral nerve endings, therefore, blocks the sodium channels that are upregulated in the root or DRG, reducing the mechanosensitivity of the neurons and thus reducing pain.

J. J. Keegan and F. D. Garrett in 1942 reported about distribution of cutaneous nerves as segments in the extremities. He described the regular pattern of serial dermatomes in the limbs extending as continuous patterns from the dorsal midline of the body down the arms and legs. Kortelainen in 1985 noticed the partial utility of preexisting maps. So the pain, neurological changes, CT and operative findings were correlated, it has been noticed that the S1 root was affected even with L2-3 (1%) L3-4(1.5%) L4-5(34%) and L5-S1(63%) discs, possibly due to the traversing root was . Indicating that S1 dermatome can be affected by discs at many levels.

Our study correlates with the above study with the patients having tenderness over the medial calcaneal point which is considered as the tender point of L5-S1 pathologies in majority of the patients.

In 1992, Nitta used SNRB (selective nerve root block) along with the symptom analysis. This is supposed to be best study about dermatomes and their correlation with cutaneous manifestations and the nerve root affected. It was concluded that marked difference between L4, L5, and S1 may be caused by the diversity of the dorsal rami of the spinal nerves and double control by the lateral cutaneous nerve of the thigh. Direct correlation with the cutaneous symptoms and neural symptoms is too unsophisticated. Dermatomes are more unpredictable due to inter segmental connections in dorsal spinal rootlets. It is essential to note that dermatome is area of skin innervated by particular nerve root, DRG or spinal segment and they are not peripheral nerve fields. With all the available evidence, Lee has described the best available map. In this map the overlap of C7 and L5 is recognised.

In our study we have directly correlated pain with the nerve physically and have been able to relieve the symptoms by utilizing same tender area for blocking involved sodium channels.

Case series that published as old as in 1960 where distal to lesion block was studied to relieve pain from a large area supplied by the nerve by blocking the afferent from that area. “Evidence that local anesthetic injections of the afferent pathway, distal to the location of the lesion, may stop the pain or paraesthesia that may far outlast the duration of the anesthesia; and blocking a peripheral nerve supplying a large part but not the whole of the region where the pain or paraesthesia are felt may remove these sensations from the entire region.” No explanation as to the mechanism was given and was not suggested. Another study by Xavier et al highlights peripheral inputs as a cause of pain during distal block study.

Using a double-blind study, Tajiri et al assessed the efficacy of an injection of the common peroneal branch of sciatic nerve in the treatment of lumbar disc herniation. In nine patients, the common peroneal branch of sciatic nerve was blocked near the fibular head using 2% lidocaine and in 10 patients using saline. The average pain scale score decreased from 3.1 to 0.6 in the lidocaine group, whereas it decreased from 3.0 to 2.6 in the placebo group. The Lasègue’s test (SLRT) result increased in the lidocaine group from 61 to 84 degrees, but from 44 degrees to 50 degrees in the placebo group. Lower leg pain lessened more in the lidocaine group than in the placebo group. The paper concluded lower leg pain disappeared or decreased with a lidocaine block at a site distal to the lumbar lesion suggesting impulses that are transmitted distal to the lesion may be important for the generation of sciatic radicular pain.

Our study correlates with the above study with the decrease in average VAS scores from 7 or 8 to 1 or 2 in 92% of the participants and improvement of SLRT from 40 degrees to 80 or 90 degrees in 94% patients.

The range of motion of the back improved with the relief of pain. In some patients with both nerves tender and patchy pain distribution along both dermatomes, but more tenderness was noted on symptomatic side and also relevant narration of the patient, namely pain along the back of the leg, calf and heel had sural tenderness more than Deep peroneal nerve tenderness. All symptomatic patients responded to DSCB injection given at the distal end by relief of pain

VI. CONCLUSIONS

Lasègue’s test (SLRT) and VAS scores have improved post DSCB injection in 94% and 92% patients respectively. The tenderness over the tender nerve points is reduced after DSCB injection. The range of motion of the back has improved with the relief of pain. Patient’s quality of life and performance of daily activities has improved after injection as the pain and disability cycle is interrupted. The acceptance level of this treatment is higher in the patients as this does not require heavy expenses and can be done as simple out-patient procedure. Increasing certainty in treatment outcome improves the compliance of the patients. It may also be possible to predict that surgical intervention may not be needed in cases with minimal nerve root compression. We conclude with the above data that signifies the effectiveness of the DSCB injections that result in significant clinical and statistical improvements in the patients with Sciatica.

Declaration of conflicting interest

The authors declare that there is no conflict of interest

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