

Effect of Peripheral Nerve Blocks with Low Dose Lignocaine for the Treatment of Acute Lumbosacral Radiculopathy: A Pilot Study

Vijay Adabala*, Praveen Talawar, Ajit Kumar, Jharana Mohanta, Sumedha Suresh

Department of Anesthesiology, All India Institute of Medical Sciences Rishikesh, Rishikesh, India.

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ABSTRACT

Background: One of the most common ailments that plagues patients is Low back pain. Approximately 80% of the population developing some form of back pain in their lifetime. Up regulated sodium channels is the basic cause in the nerve root or dorsal root ganglion for the mechano-sensitization. Functionally both ends of the pseudo unipolar neuron are the same hence injecting the drug in the peripheral end of the nerve will block these sodium channels.

Methods: Open labelled single group pilot study was conducted on patients reporting at the Pain Clinic of AIIMS, Rishikesh after obtaining consent. In the operation theatre patients received one or two peripheral nerve blocks at a maximum according to their nerve involvement. Outcomes were assessed immediately after injection and at 1st, 2nd, 3rd week after the proposed interventions.

Results: 30 patients were included in the study. No procedural complications were noted in these 30 patients as the given dose is very less and the site of injection is peripheral. Significant fall in NRS is observed at every visit. Only two patients reported back to pain clinic without pain relief.

Conclusion: Peripheral nerve block injection can be used as adjuvant for acute low back ache which is very simple can be administered in an OPD setting without the help of fluoroscopy guidance. Further studies with control group are needed to establish their efficacy.

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One of the most common ailments that plagues patients is Low back pain (LBA). Approximately 80% of the population developing some form of back pain in their lifetime. Radicular pain is one of the most common causes for the Low back pain, which may result from irritation of the nerve fibers or dorsal root ganglia. It can be due to intervertebral disc prolapse, degenerative spondylolisthesis or spinal canal stenosis [1].

Up regulated sodium channels is the basic cause in the nerve root or dorsal root ganglion for the mechano-sensitization. Functionally both ends of the pseudo unipolar neuron are the same hence injecting the drug in the peripheral end of the nerve will block these sodium channels. [2]. Till date there were no studies to prove the

efficacy of peripheral nerve blocks as an alternative to lumbar epidurals for Low back pain. We would like to share our experience of these nerve blocks with low dose of local Anaesthetics far below the therapeutic level, as the treatment option for acute lumbosacral radiculopathy.

Methods

Study Design

Open labelled, single group pilot study was conducted on patients reporting at the Pain Clinic of AIIMS, Rishikesh after explaining the details of the study to the patients and obtaining their consent for participation in the same. This study was approved by AIIMS Rishikesh Institute ethics committee and registered under clinical

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*Corresponding author.

E-mail address: vijay.adabala96@gmail.com

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trials.gov ID NCT04215757. As there are no previous studies done on this topic, a total of 30 patients were recruited for the study. Peripheral nerve blocks are given with land mark technique.

Inclusion Criteria

Patients of age 18 to 60 years having LBA with radiculopathy involving up to two segmental levels with the average pain score of ≥ 5 on an 11-point NRS (Numeric Rating Score) and tenderness over the concordant peripheral nerves (Gore sign +).

Exclusion Criteria

Patients having coagulopathy and/or patients on anticoagulants, patients with infection at the site of injection, hypersensitivity to local anesthetic agent, evidence of significant sensory or progressive motor deficit, presence of cancer as a cause of back pain and patients with the history of previous lumbar spine surgery/epidural steroid injection were excluded from the study.

Intervention

Patients were taken to the minor operation theater with full ASA monitoring, under all aseptic precautions they were given one or two peripheral nerve blocks according to their involvement.

For L5 radiculopathy

1.5inche 25G needle was used to block Posterior tibial nerve. It was inserted just posterior to the pulse of posterior tibial artery or if not palpable midway between Achilles tendon and the posterior aspect of medial malleolus. Drug used was 1.5ml of 2% lignocaine diluted to 10ml (0.3%).

Block for S1 radiculopathy

Sural nerve block was given with 1.5ml of 2% lignocaine diluted to 10ml (0.3%). Needle is inserted lateral to the tendon and is directed toward the lateral malleolus as 5-10 ml of local anesthetic is injected.

Outcomes

$\geq 50\%$ or ≥ 4 point reduction in an 11-point numeric scale (NRS 11) at immediately after injection, of 1st, 2nd, 3rd and 4th weeks after the proposed interventions

Results

Total 30 patients were given peripheral nerve blocks. Demographic data are being presented (Table 1). (Follow up was done for all the patients from the time of arrival to pain clinic for 1 month. We observed a significant fall in NRS score when scores were compared pre and post block (Table2). Statistical analysis was done with Student T test using SPSS Statistics (IBM Corporation, Somers, NY) software, version 20.0.

No procedural complications were noted in these 30 patients as the given dose is very less and the site of injection is peripheral. Per patient in an average received four block in one month. Significant fall in NRS is observed at every visit. Pre block NRS values varied every week initially later we observed a significant reduction of NRS when we compared with first week. Only two patients reported back to pain clinic without pain relief for which rescue medication was given. One patient was referred to spine clinic in view of surgical intervention.

Table 1- Demographic data of the patients.

S.No.	Parameter	Values (mean+SD)
1.	Number of Patients	30
2.	Gender (male : female)	18:12
3.	Age (years)	48+12
4.	Weight (kilograms)	64+11
5.	Height (cms)	165+9
6.	BMI	23+1.5

Table 2- Showing the NRS values pre and post block for four weeks (mean + SD).

	NRS (Pre Block)	NRS (Post Block)	P Value
0 WEEK	8.8+0.99	3.73+0.86	0.001*
1 WEEK	7.60+0.9	3.67+1.4	0.001*
2 WEEK	3.20+0.99	2.27+0.69	0.001*
3 WEEK	4.40+0.81	2.53+1.04	0.001*
4 WEEK	3.67+1.4	3.13+1.2	0.043*

Discussion

Disturbance in voltage-gated sodium channels was supposed to be the cause of pain in the cases of radiculopathy. The standard of treatment in many pain centers for pain particularly the lumbosacral pain is to treat with calcium channel blockers and anticonvulsants. Till date local anaesthetics were not used much for radiculopathy in view of short duration of action and their side effects.

Hyper excitability and spontaneous firing develops at the site of injury and also in the dorsal root ganglion cell bodies after the nerve injury. This hyper excitability results at least partly from accumulation of sodium

channels at the site of injury [3]. The correlation between excitation of voltage gated sodium channels and the generation of pain has been reported in the literature [4].

The mechanism of action of local anaesthetics (LAs) used for the treatment of peripheral pain is through the blocking of the sodium channels useful in the axon conduction of sensory nerves. Even in the non-blocking concentration, LAs suppress oscillations of the resting membrane potential without significant sensory and motor blockage. [5] Michel et al also found similar findings in their study that low dose local anaesthetic application produced pain relief within short time and long duration of pain relief in their sub-therapeutic range [5]. Spiking in sensory neurons is triggered by sub-threshold membrane potential oscillations (SMPOs). These oscillations are maintained by depolarizing impulse to reach the threshold. The aromatic ring of the local Anaesthetics improves lipid solubility which makes the LA to spread along the myelin sheath to the proximal site where pain is getting generated [6].

On application of LA at low concentrations at the peripheral sites, then the analgesic dosages we observed an immediate significant pain relief to the patient NRS. Hammodi A [6] found similar findings in four patients. He applied 0.6% lignocaine at anatomical gates A, B, C, D whereas we observed similar findings with 0.3% lignocaine concentration.

The epidural and trans-foraminal injections done for radiculopathy have got well known side-effects. These include: Allergic reactions, neurological deterioration, CSF leaks, intravascular injections, headache, urinary retention, hematomas, seizures, and death in various proportions [7-8]. To prevent these side-effects sterile conditions and controlled environment like operation theaters were needed, which indirectly increases the cost and duration of blocks [9]. Many studies have proved that the epidural or trans-foraminal injections were in effective and unsafe in controlling the pain and pathology of the patient [10-11]. In comparison to this, in our study we performed the blocks in the outpatient setting which resulted in the same level of pain control without the afore mentioned side-effects.

We observed that the pain scores of the patient were fluctuating in the initial weeks which coincides with the time of action of local Anaesthetics. But as the time progressed the pain relief was greater than the action of local Anaesthetics which could be explained by the physiological role of local Anaesthetics blocking the membrane oscillations of the axon, thus blocking the transmission of action potential [5]. This principle could be applicable for both acute and chronic pain management services.

Conclusion

Peripheral nerve block injection can be used as adjuvant for acute low back ache which are very simple can be administered in an OPD setting without the help of fluoroscopy guidance. Further studies with control group are needed to establish their efficacy.

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