

# Study of Nerve Root Blockade on Postoperative Pain Control in Lumbar Spinal Surgery at Tertiary Health Care Center

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## ABSTRACT

**Introduction:** For patients undergoing major spine surgeries, postoperative pain typically lasts for at least 3 days. Postoperative pain is not only a matter of worsened patient-oriented outcomes, such as quality of life; it also substantially affects recovery, increases postoperative morbidities and prolongs the length of hospital stay. In this study we assessed nerve root block for postoperative pain control in lumbar spinal surgery at tertiary health care center.

**Material and Methods:** Present study was a prospective study conducted in Adesh institute of medical sciences & research, Bathinda. The study was done in patients with ASA class I and II, aged between 20-65 yrs, belonging to either sex, who had undergone elective lumbar spine surgery under general anaesthesia.

**Results:** After applying inclusion & exclusion criteria, total 35 patients were included in present study. VAS score was assessed pre-operatively, then post-operatively at 2, 6, 12, 24 & 48 hrs. Mean length of stay was 7.3±4.1 days. 69% patients were mobilized within 24 hours. Average VAS score for back & legs were 2.9±3.2 & 4.3±1.9 respectively.

**Conclusion:** In our small study we noted that nerve root blockade in lumbar spinal surgery for postoperative analgesia is a good emerging modality, which can be safely used.

**Keywords:** Nerve Root Blockade; Lumbar-Spinal Surgery; Post-Operative

## INTRODUCTION

Lumbar spine surgeries are commonly performed across the globe. With advancement in surgical techniques, instrumentation & radio diagnosis spine surgery outcome is very much improved.

For patients undergoing major spine surgeries, postoperative pain typically lasts for at least 3 days. Postoperative pain is not only a matter of worsened patient-oriented outcomes, such as quality of life, it also substantially affects recovery, increases postoperative morbidities and prolongs the length of hospital stay.<sup>1,2</sup>

In an effort to improve pain control, evidence-based multimodal analgesia techniques involving administration of analgesics through different modalities acting at different sites within the central and peripheral nervous have been implemented. The use of regional anaesthesia and analgesia to inhibit the neural conduction from the surgical site to the spinal cord and decrease spinal cord sensitization is an important part of multimodal analgesia.<sup>3</sup>

In clinical practice, procedure-specific analgesia is increasingly used. This approach is based on the fact that

the character and adverse effects of acute postoperative pain vary with the intensity of pain and that the treatment strategy should reflect that. In this study we assessed nerve root block for postoperative pain control in lumbar spinal surgery at tertiary health care center.

## MATERIAL AND METHODS

Present study was a prospective study conducted in Adesh institute of medical sciences & research, Bathinda. The study was done after getting approval from the Institutional Medical Ethics committee. Duration of study was 1 year (August 2019-August 2020). All operative procedure & analgesia method informed to patients. Patients were familiarized with the Visual Analogue Scale (VAS) and also with the type of questions they were going to face after the end of the surgery regarding the intensity of their pain. After written informed consent, patients were included in present study.

**Inclusion criteria** -- American Society of Anesthesiologists Physical Status (ASA PS) class I and II, aged between 20-65 yrs, belonging to either sex, who had undergone elective lumbar spine surgery under general anaesthesia

**Exclusion criteria** - Patients with pre operative motor weakness and new onset immediate post operative motor weakness were excluded from the study.

A standard technique of general anaesthesia protocol was followed & standard monitoring devices- noninvasive blood pressure (NIBP), pulse Oximeter, electrocardiograph (ECG) leads were used for measurement of baseline parameters in each case. Nerve block in lumbar region was performed intra-operatively by the surgeon using landmark technique. Depending on surgery ipsilateral or bilateral nerve block procedure was done. Intraoperatively transverse processes identified. with a 20-G needle 20 mL of 0.5% bupivacaine injected. For L1-L4, injected at postero-superior edge of the

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transverse process just lateral to the zygapophysial joint. For the L5 level, injections were made at the transverse process of L5 and at the sacroiliac groove midway between L5 transverse process and sacral ala and infiltration performed. Patients were shifted to post-anaesthesia care unit (PACU) and vital parameters were continuously monitored. After administration of the nerve block, pain score by using VAS (Visual Analog Score) method & side effects such as nausea, vomiting, respiratory depression, motor blockade (Bromage scale >1), deep sedation (Ramsay sedation scale >3), shivering, bradycardia and hypotension were closely monitored. Data (demographic, clinical, post-operative) was collected. Data was summarized by routine descriptive statistics namely Mean & Standard Deviation for numerical variables and counts & percentage (%) for categorical variables.

## RESULTS

After applying inclusion & exclusion criteria, total 35 patients were included in present study. Demographic characteristics are given in table 1.

(ASA, American Society of Anaesthesiologists)

We noted a fall in VAS score after nerve block. VAS score was assessed pre-operatively, then post-operatively at 2, 6, 12, 24 & 48 hrs (VAS visual analog scale) are given in table 2.

Age (years)	43.27±13.21
Weight (kg)	68.75±8.32
Sex (M : F)	
Male	20
Female	15
ASA	
I	27
II	8
Duration of surgery (min)	96.11±23.76

**Table-1:** Demographic characteristics of patients

VAS	(n=20)
Preop	7.11±1.64
Postop 2 hrs	5.32±1.78
postop 6 hrs	5.10±2.08
postop 12 hrs	4.93±2.06
postop 24 hrs	4.43±2.01
postop 48 hrs	4.84±1.45

**Table-2:** VAS of dorsal ramus nerve block following lumbar spine surgery

Characteristic	Number (percentage)
Mean length of stay [in days]	7.3±4.1
Mobilised unaided in 0–24 hours	
Yes	24 (69)
No	11 (31)
VAS back score average	2.9±3.2
VAS legs score average	4.3±1.9

**Table-3:** Other post-operative characteristics

Mean length of stay was 7.3±4.1 days. 69% patients were mobilised within 24 hours. Average VAS score for back & legs were 2.9±3.2 & 4.3±1.9 respectively table 3.

## DISCUSSION

The number of patients with chronic pain undergoing surgical procedures is increasing, presenting a unique challenge to peri-operative pain management. Suffering chronic pain along with long-term analgesia use leads to altered pain perception, which can complicate pain management.<sup>4</sup>

Control of postoperative pain is essential to reducing postoperative morbidity, as it allows early mobilization and hospital discharge. Multimodal analgesia is a useful postoperative pain management strategy that combines different analgesics that act through different mechanisms at different sites in the nervous system. This strategy results in additive or synergistic analgesia that can be achieved with lower doses of major analgesics, and thus, fewer adverse effects compared to the sole administration of individual analgesics.<sup>3,5</sup>

Patients undergoing spine surgery usually experience severe postoperative pain. Ischemia and partial denervation of paraspinal muscles during surgery are responsible for local secretion of inflammatory cytokines, leading to recruitment of circulating macrophages and additional secretion of cytokines.<sup>6</sup>

In the literature there are many reports describing different techniques of pain relief ranging from systemically administered analgesia to other procedures such as intrathecal morphine, epidural opioids, ultrasound-guided bilateral paravertebral catheters, intraoperative infiltrations of local anesthesia into the wound, onto the neural root sheath or at the facet joint.

Among the various analgesia modalities following spinal surgery, the lumbar dorsal ramus nerve (DRN) block is a simple, minimally invasive option. However, there is a paucity of literature detailing its efficacy in pain management following minor lumbar spine decompression surgery.<sup>7</sup> The co-existence of dual sensory innervation of the back has been described; one arising directly from the spinal nerve segmentally, whereas the other derived from a non-segmental ascending innervation through the paravertebral sympathetic chain. Thus, blockage of the DRN impacts on both segmental and non-segmental innervation.<sup>8,9</sup> As a result, DRN block has been proposed as an effective treatment method for chronic back pain.

Local anaesthetics tends to prolong anti-inflammatory effects due to prostaglandins antagonism, lysosomal enzyme release and possible inhibition of leukocyte migration.<sup>9</sup> The nerve roots do not become sensitized to pain signals until the inflammatory process is generated.<sup>10</sup>

DRN block using various imaging modalities has been described such as fluoroscopy-guided, under CT-guidance or USG guided. Al-Alami A et al concluded that USG guided DRN block prior to spine surgery offers preemptive analgesia to patients with advantages such as stable intraoperative hemodynamics, minimal intraoperative narcotic use and

have smooth emergence from GA with less side effects and better postoperative pain score.<sup>6</sup> In present study we also noted a better post-operative analgesia with minimal side-effects. However Williams MG et al in their study concluded that dorsal ramus nerve block was not superior to local anaesthetic field infiltration of surgical wound in minor one or two level lumbar spinal decompression surgery in terms of alleviating pain, reducing opiate requirements, or facilitating earlier mobilisation and discharge.<sup>11</sup>

Opiates are often used as a first line analgesia and their efficacy in spinal surgery is well established, however, side effects often limit their use.<sup>12</sup> Furthermore, the proportion of non-cancer chronic pain patients treated with long-term opioids is rising. Opiate use in this context is associated with issues of tolerance, dependency and addiction.<sup>13</sup>

Bupivacaine with or without methylprednisolone has been reported to provide good postoperative analgesia after spine surgery. When compared with direct administration of opioids, use of gelfoam soaked in opioids in epidural space prolongs the effect of epidural opioid.<sup>14,15</sup> Epidural analgesia have been shown to be superior to intravenous analgesia with respect to quality of pain control, incidence of adverse effects and pulmonary, cardiac, and gastrointestinal dysfunction.<sup>16</sup> Instillation of the affected nerve roots by the surgeon before wound closure may represent an excellent alternative, being superior to at-closure infiltration.<sup>17</sup> An argument in favour of root infiltration may be the need for lower local anaesthetic doses than infiltration of the more extended skin and subcutaneous tissue. However, instillation with 200 mg ropivacaine followed by 10 mg/h was found to be more effective than systemic analgesia while plasma concentrations remained below toxic levels.<sup>2</sup>

Singh A et al. noted that continuous wound irrigation/instillation (of 0.25% levobupivacaine- 20 mL bolus was followed by infusion at 5 mL/h.) is an effective post-operative pain control technique after microdiscectomy, and is superior to epidural analgesia (of 0.25% levobupivacaine-10 mL bolus was followed by infusion at 5 mL/h) and intravenous patient controlled analgesia (morphine 1 mg IV, with a lockout period of 10 min after each bolus, and the maximum allowed dose was 15 mg/5 h). It is associated with haemodynamic stability and minimal side effects.<sup>18</sup>

Patient controlled analgesia (PCA) via either intravenous or epidural route has been considered standard management after major orthopedic or spinal surgery and there have been many comparative studies on the effectiveness and complication of epidural PCA with intravenous. Postoperative pain score (visual analog scale) were significantly lower in the epidural PCA group when compared with that in the IV PCA group.<sup>19,20,21</sup>

## CONCLUSION

In our small study we noted that nerve root blockade in lumbar spinal surgery for postoperative analgesia is a good emerging modality, which can be safely used. However larger comparative studies are required for better evaluation of analgesic effect of nerve root blockade.

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