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RETROLAMINAR BLOCK WITH ANALGESIC EFFECTIVENESS FOR OPIOID-FREE ANESTHESIA AND IMPROVED RECOVERY AFTER LUMBAR DISCECTOMY

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ABSTRACT

Background: Intraoperative regional analgesia and improved recovery remain the models for standard treatment aimed at minimizing the need for postoperative opioids during spine procedures. However, there is a scarcity of literature data for assessing the analgesic effectiveness of retrolaminar block in these parameters.

Aim: The current study sought to determine the analgesic effectiveness of retrolaminar block for opioid-free anesthesia and improved recovery after posterior lumbar discectomy.

Methods: The current study evaluated 144 participants undergoing elective posterior lumbar discectomy who were randomly divided into two groups of 72 subjects each. Group I subjects had an intra-operative bilateral retrolaminar block with 0.25% bupivacaine in 15mL dose, 10% of 200mg magnesium sulfate on each side, and 8mg of 2mL dexamethasone. Group II served as a control group and was given standard general anesthesia. The outcomes evaluated were Aldrete score ≥9, time of discharge from PACU, time to discharge (time of admission to PACU), and recovery time (time from isoflurane withdrawal to first verbal).

Results: A retrolaminar group had substantially shorter discharge, recovery, and extubation times than a control group ($p<0.001$). The retrolaminar group experienced substantially decreased postoperative pain levels for up to 8 hours compared to 2 hours in the control group ($p<0.001$). The retrolaminar group consumed considerably less ketorolac post-operatively than controls ($p<0.001$).

Conclusions: The current study shows that intra-operative retrolaminar block is an effective and simple regional anesthetic approach that is also opioid-free and aids in the recovery process following posterior lumbar discectomy.
Keywords: anesthesia, opioid-free anesthesia, posterior lumbar discectomy, retrolaminar block, regional anesthesia

INTRODUCTION

Lumbar discectomy is a frequent treatment used to treat back and leg discomfort caused by disc issues. Pain management after discectomy might be difficult since pre-existing chronic pain and discomfort from earlier surgical operations are more common. Effective pain management is critical for the successful rehabilitation and prompt release of patients having lumbar discectomy.1

Opioid usage after surgery is typically associated with a variety of adverse effects, including an increased risk of opioid addiction, urine retention, disorientation, gastrointestinal difficulties, itching, vomiting, respiratory depression, and nausea. As a result, replacing opioids with alternative pain medicines can aid enhance recovery after surgical operations while also lowering the risk of opioid addiction and enhancing perioperative outcomes. OFA, or opioid-free anaesthesia, is a strategy for avoiding the use of opioids during surgical operations.2

Better and faster recovery pathways after surgery are effective strategies for incorporating opioid-free pain management treatments into clinical practice. These paths often employ a mix of regional anaesthetic procedures during surgery, nonsteroidal anti-inflammatory medications, and acetaminophen in a variety of combinations. Retrolaminar block is now being evaluated as a means of administering analgesia that has a lower risk of pleural damage and is more effective and safer than other truncal blocks. During the discectomy, the surgeon or anaesthesiologist administers a local anaesthetic into the retrolaminar region.3

The current study sought to investigate the opioid-free anaesthetic benefits of intraoperative retrolaminar block on improved recovery and analgesia in participants following posterior lumbar discectomy.

MATERIALS AND METHODS

The current prospective clinical evaluation research sought to determine the analgesic effectiveness of retrolaminar block for opioid-free anesthesia and improved recovery after posterior lumbar discectomy. The research subjects were members of the Institute's Department of Surgery. All individuals provided written and verbal informed permission before participating in the study.

The present study looked at patients who had a posterior lumbar discectomy under anesthesia, comprising both genders and ages ranging from 21 to 65 years old, with a BMI (body mass index) of 25-30 kg/m2 and an ASA (American Society of Anesthesiologists) physical status of 1 or 2.

The trial excluded participants with coagulopathy, heart disease, liver disease, renal disease, lung illness, pain management medication, allergies to the study medicines, and impaired mental condition. The research subjects' primary objectives were time to discharge (time from admission to discharge from PACU with Aldrete score of ≥9) and recovery time (time from withdrawal of isoflurane to first reaction to vocal commands). Secondary outcomes studied were surgical side effects such as Total ketorolac consumption during the first 24 hours, time until the first request for rescue analgesia (ketorolac), pain intensity at rest and during movement assessed at 30 minutes, 2 hours, 4 hours, 8 hours, 12 hours, and 24 hours post-operatively using a visual analog scale (VAS), and tracheal extubation time were all measured.

A physical and general examination, as well as comprehensive surgical and medical histories and regular investigations, were performed one day before to surgery. Prior to surgery, all individuals were instructed to fast for 6 hours for solids and 2 hours for clear fluids. In the preparation room, VAS was discussed using a 0-10 scale, with 0 representing no pain feeling and 10 representing the greatest pain sensation, to determine postoperative pain severity.

After moving patients to the operation room, an IV (intravenous) cannula was placed and warmed IV fluid was administered. An IV bolus dosage of 0.05 mg/kg midazolam was given. The individuals were fitted with standard monitoring equipment, including end-tidal carbon dioxide (EtCO2), non-invasive automated blood pressure, temperature, pulse oximeter, and a five-lead ECG, and a urine catheter was placed before baseline data were taken. For 3-5 minutes, 100% oxygen was supplied. The participants were then separated into two groups of 72 each, with Group I forming a retrolaminar group and Group II serving as a control. Both groups had anesthetic induction with 0.5 µg/kg dexmedetomidine and 2mg/kg IV propofol over 10 minutes, followed by endotracheal intubation facilitation with 0.5 mg/kg IV atracurium.

In the retrolaminar group, anesthesia was maintained with 1.5% isoflurane in a combination of 0.1 mg/kg/h atracurium, 50% air, and 50% oxygen (O2). In the control group, anesthesia was maintained with 1.5% isoflurane, 0.1 mg/kg/hour atracurium, 1 µg/kg fentanyl, and a 50% O2 and 50% air combination. Mechanical ventilation in both groups was adjusted to maintain EtCO2 levels of 30-35 mmHg. Before the procedure, both groups were administered 15 mg/kg IV paracetamol.

Subjects were held in the prone position while a surgical incision was performed to reach the targeted spinous process. Aside from the spinous process, an 18-G needle from a 20-mL syringe was inserted and progressed until the needle tip made contact with the lamina.

Following negative aspiration, a solution of 15 mL bupivacaine 0.25%, 2 mL (8 mg) dexamethasone, and 2 mL (200 mg) magnesium sulfate 10% was prepared and injected. The identical procedure was followed on the other side. The depth of

anesthesia was guided by a monitor. Additionally, the PSI (Patient State Index) was set between 25 and 50 to guarantee adequate hypnosis and analgesia. For participants with PSI >50 in the retrolaminar group, 0.5 µg/kg IV fentanyl was administered and documented as therapy. Postoperative problems, such as bradycardia and hypotension, increased by more than 20% from baseline, and were treated with 0.01 mg/kg atropine and 0.5 mg/kg ephedrine.

At the completion of the procedure, inhalational anesthesia was discontinued and residual neuromuscular blockade was treated with 0.01 mg/kg IV atropine and 0.05 mg/kg IV neostigmine. All patients were extubated, and the time from isoflurane discontinuation to extubation was recorded, as well as the time from isoflurane discontinuation to first spoken instruction. Subjects were moved to the PACU utilizing conventional monitors. Pain intensity during movement and rest was measured using the VAS at 30 minutes, 2, 4, 8, 12, and 24 hours after surgery. Every 6 hours, 1g of IV paracetamol was given to treat discomfort. When the VAS was ≥4, a 30mg ketorolac bolus was administered as rescue analgesia. The time until the first request for rescue analgesia (ketorolac) and the total amount of ketorolac used in the first 24 hours after surgery were also recorded.

The individuals were ready for release from PACU when their Aldrete score was ≥9.4. The discharge time was calculated as the time between PACU arrival and discharge from PACU. Any adverse effects, such as nausea and vomiting, were examined and treated. These adverse effects were treated with 4 mg of intravenous Ondansetron.

RESULTS

The current prospective clinical evaluation research sought to determine the analgesic effectiveness of retrolaminar block for opioid-free anesthesia and improved recovery after posterior lumbar discectomy. The current study included 144 individuals who had elective posterior lumbar discectomy and were randomly divided into two groups of 72 people each, with Group I getting an intraoperative bilateral retrolaminar block and Group II acting as a control.

The demographic characteristics of the research respondents from both groups were statistically equivalent ($p>0.05$). The study individuals in Group I and II had mean ages of 43.0±11.0 and 46.5±11.6 years, respectively. In Group I, there were 30 males and 42 females, whereas Group II (controls) included 34 males and 38 females. Group I had 44 and 28 subjects from ASA I and II, respectively, while Group II had 30 and 42 from ASA I and II.

L4-5 and L5-S1 surgery were performed on 38 and 34 participants from Group I, and 44 and 28 subjects from Group II, respectively. The surgery length was 97.9±14.9 and 100.5±16.4 minutes for Group I and II, respectively (Table 1).

Extubation duration was substantially longer in Control Group II (325.02±69.1) compared to the retrolaminar group (1170.6±8.5) in terms of postoperative analgesia and recovery measures ($p<0.001$). Recovery time was substantially longer in the control group compared to Group I (retrolaminar group), with $p<0.001$. Discharge time was substantially longer in the control group compared to Group I ($p<0.001$). The control group took significantly longer from call to first rescue analgesia than the retrolaminar group ($p < 0.001$). The control group required 92.3±25.21 mg of rescue analgesics, but Group I required just 47.3±19.45 mg ($p<0.001$) (Table 2).

At 30 minutes, 2 hours, and 4 hours postoperatively, retrolaminar (group I) pain scores were 0.62±0.47, 1.5±03, and 2.4±0.3, respectively, compared to 2.4±0.63, 4.1±0.43, and 4.3±0.49 in the control group with $p<0.001$ at rest, and 1.5±0.46, 2.3±0.49, and 3.4±0.3 in a retrolaminar group compared to 3.4±0.63, 4.6±0.3, and 5.51±0.49 respectively in the control group with $p<0.001$ during 8 hours postoperatively, the retrolaminar group experienced substantially greater pain levels (4.5±0.65 and 5.5±0.67 during rest and movement, respectively) compared to the control group (3.5±0.75 and 3.9±0.73, respectively, $p<0.001$). There was no statistically significant difference between the two groups 12 and 24 hours after surgery. The study found no statistically significant difference between the study groups in terms of bradycardia and intraoperative hypotension. No participants in Group I (retrolaminar group) required intraoperative fentanyl. Only four patients in the retrolaminar group had nausea, compared to 16 in the control group, which was statistically significant ($p=0.03$). In terms of postoperative vomiting, there was no statistically significant difference between the groups.

DISCUSSION

The current study evaluated 144 participants having elective posterior lumbar discectomy who were randomly divided into two groups of 72 subjects each, with Group I receiving an intraoperative bilateral retrolaminar block and Group II serving as a control. The demographic characteristics of the research respondents from both groups were statistically equivalent ($p>0.05$).

The study individuals in Group I and II had mean ages of 43.0±11.0 and 46.5±11.6 years, respectively. In Group I, there were 30 males and 42 females, whereas Group II (controls) included 34 males and 38 females. In Group I, there were 44 and 28

participants from ASA I and II, respectively, while Group II included 30 and 42 individuals from ASA I and II. L4-5 and L5-S1 surgery were performed on 38 and 34 participants from Group I, and 44 and 28 subjects from Group II, respectively.

Groups I and II had surgeries that lasted 97.9±14.9 and 100.5±16.4 minutes, respectively. These findings were equivalent to those of An K et al5 in 2015 and Peng Q et al6 in 2022, who evaluated participants having anesthesia and had demographic data similar to the current investigation.

The study results indicated that postoperative analgesia and recovery parameters in study subjects, extubation time was considerably longer in Control Group II with 325.02±69.1 compared to the retrolaminar group with 1170.6±8.5 and $p<0.001$. Recovery time was substantially longer in the control group compared to Group I (retrolaminar group), with $p<0.001$. Discharge time was substantially longer in the control group compared to Group I ($p<0.001$). The control group took substantially longer to call for a first rescue analgesic than the retrolaminar group ($p<0.001$). The control group required 92.3±25.21 mg of rescue analgesics, but Group I only required 47.3±19.45 mg ($p<0.001$). These findings were congruent with those of Gupta I et al7 in 2022 and Adhikary SD et al8 in 2018, who observed postoperative analgesia and recovery characteristics comparable to those found in the current investigation.

At 30 minutes, 2 hours, and 4 hours postoperatively, retrolaminar (group I) had significantly lower mean postoperative pain scores (0.62±0.47, 1.5±03, and 2.4±0.3, respectively) compared to the control group (2.4±0.63, 4.1±0.43, and 4.3±0.49, respectively) with $p<0.001$ at rest, and 1.5±0.46, 2.3±0.49, and 3.4±0.3 in the retrolaminar group compared to 3.4±0.63, 4.6±0.3, and 5.51±0.49 in the control group with $p<0.001$. At 8 hours postoperatively, the retrolaminar group had substantially greater pain levels at rest (4.5±0.65) and during movement (5.5±0.67) compared to the control group (3.5±0.75 and 3.9±0.73 at rest and movement, respectively, $p<0.001$). There was no statistically significant difference between the two groups at 12 and 24 hours postoperative. These findings were consistent with the findings of Zhao Y et al9 in 2022 and Liu D et al10 in 2022, who reported mean postoperative pain scores measured by VAS following retrolaminar block that were comparable to the results of the current research.

There was also no statistically significant difference between the research groups in terms of bradycardia or intraoperative hypotension. No participants in Group I (retrolaminar group) required intraoperative fentanyl. Only four patients felt nausea in the retrolaminar group, compared to 16 in the control group, a statistically significant difference ($p=0.03$). Regarding postoperative vomiting, there was no statistically significant difference between the two groups. These findings were consistent with earlier studies conducted by Nobukuni K et al11 in 2021 and Abdelbaser I et al12 in 2022, in which the authors stated that the retrolaminar group had a much lower incidence of postoperative unpleasant symptoms such as nausea.

CONCLUSIONS

Given its limitations, the current study shows that intra-operative retrolaminar block is an effective and simple method of regional anesthetic, as well as an opioid-free procedure that aids in recovery following posterior lumbar discectomy. Future research including a greater number of participants having various types of surgical operations, as well as a larger number of controls, are required to establish a conclusive conclusion.

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TABLES

Variables	**Group I (n=72)**	**Group II (n=72)**
Mean age (years)	43.0±11.0	46.5±11.6
Gender		
Males	30	34
Females	42	38
ASA type		
I	44	30
II	28	42
Surgery type (lumbar discectomy)		
L4-5	38	44
L5-S1	34	28
Surgery duration (min)	97.9±14.9	100.5±16.4

Table 1: Demographic and surgical data in two groups of study subjects

Parameters	**Group I (n=72)**	**Group II (n=72)**	**p-value**
Extubation time	1170.6±8.5	325.02±69.1	<0.001
Recovery time	271.5±24.4	538.0±46.9	<0.001
Discharge time	446.7±29.2	773.7±37.0	<0.001
Time to first rescue analgesic call (ketorolac)	7.3±0.79	1.2±0.43	<0.001
Total rescue analgesic dose (mg)	47.3±19.45	92.3±25.21	<0.001

Table 2: Postoperative analgesia and recovery parameters in study subjects