

Research Article



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COMPARISON OF CONVENTIONAL MEDIAL AND MODIFIED LATERAL THORACOLUMBAR INTERFACIAL PLANE BLOCKS WITH JUST GA IN PARTICIPANTS HAVING LUMBAR DISC OPERATIONS

Dr Reema Wadhawa

Associate Professor, Department of Anaesthesiology, Shri Balaji Institute of Medical Science, Raipur, Chhattisgarh

Email ID- Reema.tavar@gmail.com

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ABSTRACT

Background: Thoracolumbar interfascial plane block is a frequent procedure utilized during lumbar disc surgery. It has changed throughout time. However, statistics on its change are limited in India.

Aim: The current study aims to compare conventional medial and modified lateral thoracolumbar interfascial plane blocks with just GA in participants having lumbar disc surgery.

Methods: 200 subjects aged 18-70 years were randomly assigned to one of three groups: Group cTLIP, which received a conventional TLIP block with 20 mL of 0.25% ropivacaine with GA, Group mTLIP, which received a modified TLIP block with 20 mL of 0.25% ropivacaine with GA, and Group C, which received only GA using multimodal analgesia.

Results: cTLIP and mTLIP had considerably greater perioperative opioid usage than group C ($p < 0.001$). However, cTLIP and mTLIP showed equivalent opioid intake and pain levels ($p = 0.767$). Pain was greatly reduced in Group C ($p = 0.001$). Rescue analgesia was required in all Group C individuals, as well as 15.2% of cTLIP and mTLIP participants. No patients in the cTLIP or mTLIP groups experienced nausea and vomiting during the first 24 hours, however 61.8% of Group C subjects did, which was significant ($p = 0.001$).

Conclusion: The current study found that the modified TLIP block had no more analgesic effectiveness than the traditional TLIP block. Both approaches produced the same intraoperative and postoperative analgesia for lumbar disc operations.

Keywords: analgesia, lumbar disc surgery, thoracolumbar interfascial plane block, perioperative analgesia

INTRODUCTION

Spinal operations are primarily performed to stabilize the discs and vertebrae of the spine. The operations often include extensive manipulation of the subcutaneous tissues, ligaments, and bone, which can cause severe discomfort afterward. In most situations, acute discomfort lasts at least three days. 1

The number of vertebrae affected is directly related to the degree of postoperative pain encountered. Long-term analgesic/opioid usage, along with underlying pain, makes these people very vulnerable to pain, complicating pain management even further. Effective pain treatment aids in early mobility and reduces hospital stay length. 2

Different analgesic treatments are utilized to treat postoperative pain following lumbar disc surgery. The TLIP (thoracolumbar interfascial plane) block was used to block the dorsal rami of the thoracolumbar nerves as they pass through paraspinous muscles. The erector spinae muscle consists of three muscles: iliocostalis, longissimus, and multifidus.

In medial or traditional TLIP block, a LA (local anaesthetic) is administered to the interfascial plane between the multifidus and longissimus muscles at the L3 vertebra using ultrasound guidance. 3

However, in lateral/modified TLIP, LA is administered in the interfascial plane between the longissimus and iliocostalis muscles. This is away from the midline and easy to do since it improves plane recognition. 4

The current study aimed to compare perioperative opioid consumption in two approaches: no block (only GA method) using intravenous (IV) multimodal analgesia and two approaches of TLIP block (lateral vs classical with GA) in subjects undergoing spinal disc surgeries.

MATERIALS AND METHODS

The current comparative randomized parallel design study compared perioperative opioid consumption in two approaches: no block (only GA method) using intravenous (IV) multimodal analgesia and two approaches of TLIP block as lateral vs classical with general Anaesthesia (GA) in subjects undergoing spinal disc surgery. The study was conducted after receiving authorization from the Institutional Ethical Committee. All individuals provided verbal and written informed permission before participating in the study.

The study comprised 200 participants with ASA (American Society of Anaesthesiologists) status I and II aged 18 to 70 years who underwent lumbar disc operations throughout the study period. The study excluded pregnant and lactating females, coagulopathy, systemic infection, local infection (administration site), contraindications to regional technique, history of opioid tolerance, body mass index (BMI)>35 kg/m², scoliosis correction, major lumbar spine procedures such as large tumor removal, lumbar spine surgery, and subjects who refused to participate.

All individuals completed a regular pre-anesthetic examination and were taught how to express pain on the NRS (numerical rating scale), PCA (patient-controlled analgesia), and how to use a PCA pump if they felt discomfort. All subjects were separated into three groups: cTLIP, mTLIP, and Group C. Before Anaesthesia induction, baseline vitals were observed in the operating room, including neuromuscular monitoring (NMT), pulse oximeter (SpO₂), non-invasive blood pressure (NIBP), electrocardiogram (ECG), and hemodynamic parameters. A cannula was used to secure intravenous (IV) access, and salt solution was administered.

Preoxygenation was performed with 100% oxygen, followed by Anaesthesia induction with 1.5-2 µg/kg IV fentanyl, 2-4% isoflurane, 100% oxygen, and 2-2.5mg/kg IV propofol at a minimum alveolar concentration (MAC) of 0.8-1.2. Following the induction of Anaesthesia, NMT was commenced.

For tracheal intubation, 0.5mg/kg IV atracurium was administered with a TOF (train of four) count of zero. The airway was secured with an adequately sized ETT. After setting the ETT, the individuals were supine and Foley's catheter was inserted. 66 patients in the cTLIP group had a traditional TLIP block with 20mL of 0.25% Ropivacaine and GA. In the mTLIP group, 66 participants had a modified lateral TLIP block with 20mL of 0.25% Ropivacaine and GA, while in the Group C/control group, just GA was administered without the block. The premedication was 150mg ranitidine the night before and early morning of operation, combined with 0.25mg oral alprazolam.

In the cTLIP group, L3 was identified, and a curvilinear probe was put transversely at the level of the L3 vertebra in the midline, with an acceptable depth of 3-8 cm set on the USG screen. After identifying the corresponding spinous process and interspinous muscles, namely multifidus, longissimus, and iliocostalis (from medial to lateral), was inserted in the plane in a lateral-to-medial direction, at an angle of about 30° to the skin, and advanced toward the multifidus muscle through the belly of the longissimus muscle.

After the needle tip reached the longissimus/multifidus interfascial muscle plane near the superior articular process, 15mL of 0.25% ropivacaine was administered with intermittent negative aspiration, and the remaining 5mL of 0.25% was injected below the ipsilateral thoracolumbar fascia. The procedure was then repeated on the contralateral side.

In the mTLIP group, following L3 identification, the needle was placed at an angle of 30° to the skin from lateral to medial direction and proceeded towards the longissimus muscle after the needle reached the longissimus/iliocostalis muscle junction. 0.25% ropivacaine (15ml) was administered periodically to confirm negative aspiration, and the remaining 5ml was administered below the ipsilateral thoracolumbar fascia, with a similar technique done on the opposite side.

The spread was confirmed immediately after administration by ultrasonography in two groups, whereas group C received just GA via IV. 1-2% isoflurane was utilized for anaesthesia maintenance in oxygen and 50:50 air to achieve the goal MAC of 0.8-1.2. Intermittent boluses of IV atracurium 0.2 mg/kg guided by NMT (TOF count zero) were used to maintain intraoperative neuromuscular blockade. 0.5-1.0 µg/kg IV fentanyl was administered when MAP or heart rate rose by more than 20% from baseline. Ondansetron 4 mg (IV) and 1mg/kg paracetamol were administered 30 minutes prior to surgical

completion. After surgery, glycopyrrolate was administered at a dose of 7-10 µg/kg, followed by IV neostigmine at a dose of 50-70 µg/kg to reverse residual neuromuscular blockade.

All individuals were extubated after meeting the extubation criteria, and then transferred to the PACU (post-Anaesthesia care unit). NRS scores (at rest and movement) were taken at 0, 1, 3, 6, and 24 hours after entering the PACU. The NRS provided values of 0, 1-3, 4-7, and >7 for no pain, mild pain, moderate pain, and severe pain, respectively. In NRS >3 patients, a bolus of fentanyl 1.0 µg/kg was delivered, followed by the use of a fentanyl-based IV PCA pump providing 20 µg fentanyl at each button press and lockout of 15 minutes. The maximum dosage limit was 80 µg/h and 320 µg in 4 hours.

The timing of administering the initial bolus dosage was recorded as the first analgesic necessity during the first 24 hours. All individuals received 15 mg/kg IV paracetamol every 6 hours for 24 hours following surgery. The number of bouts of PONV (postoperative nausea and vomiting) was recorded within the first 24 hours. PONV was graded as 0, 1, 2, or 3 based on whether there was no nausea or vomiting, nausea but no vomiting, vomiting once in 30 minutes, or vomiting twice in 30 minutes. Subjects with scores greater than 1 received IV ondansetron 4 mg. In case of no alleviation, IV metoclopramide 150 µg/kg was given as a rescue antiemetic.

Routine hemodynamic measures, such as respiratory rate (RR), were also evaluated postoperatively, and SpO₂ was tracked for the first 24 hours to ensure that SpO₂ was more than 94% and RR was greater than 10 minutes. To treat respiratory depression and pruritus, subjects with a respiratory rate of 70mmHg were given 0.25-1 µg/kg of IV naloxone. The study's primary outcome was total perioperative (intraoperative and postoperative) opioid intake in the first 24 hours. The secondary outcomes assessed were the incidence of drug-related complications, postoperative opioid consumption in the first 24 hours, time to first analgesic requirement after surgery, NRS score upon arrival in the PACU, and hemodynamic response to surgical stimulus during the operation in the two study groups.

The collected data were statistically analyzed using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) for descriptive measures, Student t-test, ANOVA (analysis of variance), Fisher's exact test, Mann-Whitney U test, and Chi-square test. The data were presented in the form of mean and standard deviation, as well as frequency and percentage. A p-value of <0.05 was considered.

RESULTS

The current comparative randomized parallel design study compared perioperative opioid consumption in two approaches: no block (only GA method) using intravenous (IV) multimodal analgesia and two approaches of TLIP block as lateral vs classical with general Anaesthesia (GA) in subjects undergoing spinal disc surgery. The study comprised 200 participants with ASA (American Society of Anesthesiologists) status I and II aged 18 to 70 years who underwent lumbar disc operations throughout the study period. The average age of study participants in Groups mTLIP, cTLIP, and C was 42.62±12.02, 41.01±11.69, and 40.91±12.21 years, respectively. There were 38 men and 28 females in mTLIP, 34 males and 32 females in cTLIP, and 30 males and 38 females in the C group. Weight, BMI, and ASA status distributions were statistically similar in the mTLIP, cTLIP, and C groups (Table 1).

Group C had considerably greater intraoperative opioid intake than Groups mTLIP and cTLIP ($P < 0.001$). Opioid use was comparable across the cTLIP and mTLIP groups ($p=0.101$). Group C had considerably greater postoperative opioid intake in the first 24 hours compared to the cTLIP and mTLIP groups ($p>0.05$). In addition, the cTLIP and mTLIP groups had equivalent postoperative opioid intake in the first 24 hours ($p=0.754$). Group C had considerably greater total perioperative fentanyl usage than the mTLIP and cTLIP groups ($p=0.002$). However, it was equivalent across the mTLIP and cTLIP groups ($p=0.765$) (Table 2).

The study found that in the mTLIP and cTLIP groups, only 15.2% of participants required boluses of rescue analgesics, but in Group C, all subjects required rescue analgesia. The time to first analgesic request was considerably longer in the mTLIP and cTLIP groups compared to Group C ($p<0.001$). However, the latency to the first analgesic request was comparable in two groups: mTLIP and cTLIP ($p=0.96$). On PACU arrival, NRS was considerably lower in the mTLIP and cTLIP groups compared to the control group ($p=0.001$). However, NRS was comparable across the mTLIP and cTLIP groups ($p=0.653$) (Table 2).

It was discovered that no patients in the mTLIP or cTLIP groups reported any PONV in the first 24 hours; however, 61.8% ($n=42$) of subjects in group C had nausea or vomiting ($p=0.001$). In group C, 18-22 and 2 patients showed PONV scores of 1, 2, and 3. patients with a PONV score of 2 required the first rescue antiemetic, whereas patients with a PONV score of 3 required the second. No subjects reported any opioid-related adverse effects, including as constipation, respiratory depression, or pruritus (Table 2).

DISCUSSION

The study comprised 200 participants with ASA (American Society of Anesthesiologists) status I and II aged 18 to 70 years who underwent lumbar disc operations throughout the study period.

The average age of study participants in Groups mTLIP, cTLIP, and C was 42.62 ± 12.02 , 41.01 ± 11.69 , and 40.91 ± 12.21 years, respectively. There were 38 men and 28 females in mTLIP, 34 males and 32 females in cTLIP, and 30 males and 38 females in the C group. Weight, BMI, and ASA status distributions were statistically similar in the mTLIP, cTLIP, and C groups.

These statistics were comparable to earlier studies by Eltaher E et al⁵ in 2021 and Ozmen O et al⁶ in 2019, in which authors analyzed participants with demographic data similar to the current study for lumbar disc operations. The study found that Group C consumed considerably more intraoperative opioids than Groups mTLIP and cTLIP ($P < 0.001$). Opioid use was comparable across the cTLIP and mTLIP groups ($p=0.101$). Group C had considerably greater postoperative opioid intake in the first 24 hours compared to the cTLIP and mTLIP groups ($p>0.05$). In addition, the cTLIP and mTLIP groups had equivalent postoperative opioid intake in the first 24 hours ($p=0.754$).

Group C had considerably greater total peri-operative fentanyl usage than the mTLIP and cTLIP groups ($p=0.002$). However, it was equivalent across the mTLIP and cTLIP groups ($p=0.765$). The current study's findings are congruent with those of Çiftçi B et al⁷ in 2020 and Hu Z et al⁸ in 2021, who found that intraoperative and postoperative opioid use following lumbar spine procedures were comparable.

In the mTLIP and cTLIP groups, only 15.2% of participants required boluses of rescue analgesics, but in Group C, all subjects required rescue analgesia. The time to first analgesic request was considerably longer in the mTLIP and cTLIP groups compared to Group C ($p<0.001$). However, the latency to the first analgesic request was comparable in two groups: mTLIP and cTLIP ($p=0.96$). On PACU arrival, NRS was considerably lower in the mTLIP and cTLIP groups compared to the control group ($p=0.001$).

However, NRS was comparable across the mTLIP and cTLIP groups ($p=0.653$). These findings were consistent with the findings of Abdildin YG et al⁹ in 2023 and Long G et al¹⁰ in 2023, in which the authors reported required boluses of rescue analgesics NRS following spine procedures equivalent to the current study. The study also revealed that no patients in the mTLIP or cTLIP groups reported any PONV during the first 24 hours, but 61.8% ($n=42$) of subjects in group C had nausea or vomiting ($p=0.001$).

PONV scores of 1, 2, and 3 were recorded in 18, 22, and 2 of the group C individuals, respectively. Patients with a PONV score of 2 required the first rescue antiemetic, whereas patients with a PONV score of 3 required the second. No subjects reported any opioid-related adverse effects, such as constipation, respiratory depression, or pruritus. These findings were consistent with those of Kumar A et al¹¹ in 2023 and Chen K et al¹² in 2019, who found similar outcomes for PONV following lumbar spine surgery to the current investigation.

CONCLUSION

The present study, within its limitations, concludes that the analgesic efficacy of the modified TLIP block was not superior when compared to conventional TLIP block. Both techniques have resulted in the same intraoperative and postoperative analgesia for lumbar disc surgeries. However, the study had a few limitations smaller sample size, shorter monitoring period, and single-institution nature. Hence, further longitudinal studies with larger sample sizes and longer monitoring are needed to reach a definitive conclusion.

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Parameters	Group mTLIP (n=66)	Group cTLIP (n=66)	Group C (n=68)
Mean age (years)	42.62±12.02	41.01±11.69	40.91±12.21
Gender			
Males	38	34	30
Females	28	32	38
Weight (kg)	63.77±06.59	64.86±08.47	65.60±10.33
BMI	23.59±02.10	24.16±02.77	23.79±02.92
ASA			
I	42	46	54
II	24	20	14

Table 1: Comparison of demographic data in three groups of study subjects

Parameters	Group cTLIP (n=66)	Group mTLIP (n=66)	Group C (n=68)	p-value
Surgery duration (min)	101.30±18.29	101.34±25.70	116.95±24.63	0.009
Anaesthesia duration (min)	123.04±20.65	141.59±30.05	158.07±27.19	0.001
Intraoperative fentanyl consumption (µg)	268.1±57.6	103±22.6	99.53±12.6	0.001
NRS on PACU arrival	8	6	5	0.001
Time to first analgesic (min)	0	55	135	0.001
Total postoperative fentanyl consumption (µg)	957.1±205	404±252.5	387.4±164	0.001
Total perioperative fentanyl consumption (µg)	1225.2±237	507.3±258.3	491.4±165.1	0.001
PONV incidence (Yes/No)	42/26	66/0	66/0	0.001
Need of bolus for postoperative rescue analgesics (Yes/No)	68/0	10/56	10/56	0.001
Number of boluses needed				0.001
0	0	56	56	
1	2	8	10	
2	6	2	0	
3	26	0	0	
4	28	0	0	
5	4	0	0	

6	2	0	0	
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Table 2: Comparison of intraoperative and postoperative parameters in study subjects