



**A COMPARATIVE STUDY BETWEEN LEVOBUPIVACAINE 0.25% AND  
ROPIVACAINE 0.3% WITH DEXAMETHASONE AS ADJUVANT IN ULTRASOUND  
GUIDED FEMORAL NERVE BLOCK WITH NERVE STIMULATOR FOR  
POSTOPERATIVE ANALGESIA IN PATIENTS UNDERGOING TOTAL KNEE  
ARTHROPLASTY UNDER SUBARACHNOID BLOCK: A PROSPECTIVE  
INTERVENTIONAL RANDOMISED DOUBLE-BLIND STUDY**

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**ABSTRACT**

Effective postoperative pain management remains a critical aspect of patient care, particularly in lower limb orthopedic surgeries such as total knee arthroplasty (TKA). This prospective interventional randomized double-blind study aimed to compare the efficacy of two local anesthetic agents, Levobupivacaine 0.25% and Ropivacaine 0.3%, both supplemented with dexamethasone as an adjuvant, in ultrasound-guided femoral nerve block with a nerve stimulator for postoperative analgesia in patients undergoing TKA under subarachnoid block. The study involved 42 patients aged 20-80 years, with American Society of Anesthesiology (ASA) grade I to II, undergoing elective TKA. Randomization into two groups—Levobupivacaine with Dexamethasone (LD) and Ropivacaine with Dexamethasone (RD)—was done using a sealed envelope system. In conclusion, the study supported the use of Levobupivacaine 0.25% with Dexamethasone as a safer and statistically more effective option for ultrasound-guided femoral nerve blocks in total knee arthroplasty patients. The results contribute valuable insights to the ongoing quest for optimizing multimodal analgesia strategies in orthopedic surgeries.

**KEYWORDS:** Postoperative analgesia, Levobupivacaine 0.25%, Ropivacaine 0.3%, Dexamethasone, Total knee arthroplasty patients.

**1. INTRODUCTION**

Pain is an unpleasant, distressing sensory and emotional experience associated with actual or potential tissue damage.<sup>[1]</sup> Total knee arthroplasty (TKA) is associated with severe postoperative pain which leads to tachycardia, hypertension, increased O<sub>2</sub> demand and myocardial stress. Pain increases sympathetic activity, releases catabolic hormones, and reduces immunity.<sup>[2]</sup>

Postoperative pain management in lower limb orthopedic surgeries, especially TKA, stands as a crucial element in ensuring patient comfort, early ambulation, and reduced complications. Various multimodal analgesic techniques are in use for pain relief following TKA.<sup>[3,4]</sup> Recently, ultrasound-guided

continuous femoral nerve block (CFNB) using local anesthetics has gained popularity as an effective method for treating postoperative pain following unilateral TKA.<sup>[5,6,7,8]</sup> Local anesthetics produce motor blockade which delays early ambulation.

The multitude of available interventions underscores the complexity of tailoring an approach that balances efficacy and safety. Multimodal analgesia, combining different therapeutic strategies, has gained prominence, and among these, peripheral nerve blocks guided by ultrasound offer precision and effectiveness. In the present study, an attempt has been made to compare the efficacy of ropivacaine and levobupivacaine with dexamethasone in post-operative period analgesia.

## 2. MATERIALS AND METHODS

### Subjects

The present study was based on purposively selected 42 patients (age ranged between 20 - 80 years) belonging to American Society of Anesthesiology (ASA) grade I-II, who were undergoing TKA surgery in the Ortho operation theatre of the Fortis Hospital, Mohali, Punjab, India. It was a prospective interventional randomized comparative double blind study. The subjects were further divided into two groups for intervention. Group-LD consisted of randomly selected 21 patients who received 30 ml of 0.25% levobupivacaine + 1ml of dexamethasone (4 mg) a total of 31 ml. Similarly, Group-RD consisted of randomly selected 21 patients who received 30 ml of 0.3% ropivacaine + 1ml of dexamethasone (4 mg) a total of 31 ml. Written informed consent was taken from each participating subject. A prior explanation regarding the treatment was given to the subjects who were enrolled in the study. The study was approved by institutional ethical committee.

### Study Design Randomization

Patients were randomly assigned to two groups using a sealed envelope system. Group LD received femoral nerve block with 30 ml of 0.25% levobupivacaine + 1 ml of dexamethasone (4mg), totaling 31 ml. Group RD received femoral nerve block with 30 ml of 0.3% ropivacaine + 1 ml of dexamethasone (4mg), totaling 31 ml.

### Pre-operative Evaluation and Preparation

Patients underwent thorough pre-anaesthetic check-ups and pre-operative investigations, including CBC, serum electrolytes, random blood sugars, renal and liver function tests, electrocardiogram (ECG), chest X-ray, and coagulation profile. Patients were educated about the visual analogue scale (VAS) for pain assessment.

### Intraoperative Procedures

Subarachnoid block was administered, followed by femoral nerve block in the supine position under ultrasound guidance. For group LD, 0.25% levobupivacaine with dexamethasone was used, and for group RD, 0.3% ropivacaine with dexamethasone

was used. Continuous monitoring of vitals was performed.

### Postoperative Monitoring

Patients were shifted to the post-anesthesia care unit, and further monitoring continued in the orthopedic ICU. Pain was assessed using VAS at various time intervals (0, 2, 4, 8, 12, 16, 20 hours). Postoperatively, intravenous paracetamol was given, and rescue analgesia (intravenous diclofenac) was administered if VAS>4.

### Statistical Analysis

Standard descriptive statistics (mean  $\pm$  standard deviation) were determined for directly measured variables. Chi-square was used for comparison between the two groups, followed by post hoc Bonferroni. Data were analyzed using SPSS (Statistical Package for Social Science) version 20. A 5% level of probability was used to indicate statistical significance.

## 3. RESULTS

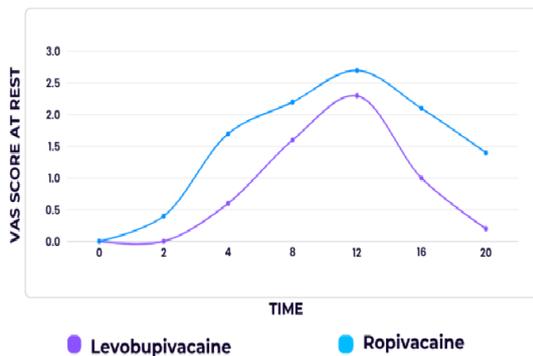
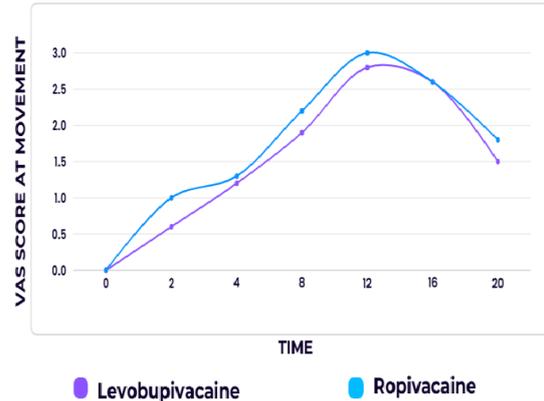
A total of 42 post-operative patients of TKA were purposively selected, and then randomly allocated into two groups and completed the study protocol. Table 1 and 2 showed the hour-wise distribution of post-operative pain scores in rest and in movement in TKA patients applied with Levobupivacaine + Dexamethasone and Ropivacaine + Dexamethasone respectively (also shown in Fig. 1 & Fig. 2). The pain experienced during rest and movement was assessed using VAS scores. Levobupivacaine group had lower VAS scores both during rest and movement compare to ropivacaine group though at rest the difference was statistically significant but during movement the difference was not statistically significant. The pain scores after completion of first anesthesia and 2, 4, 8, 12, 16 and 20 hours, were significantly lower in patients anesthetized with Levobupivacaine + Dexamethasone in rest ( $X^2 = 8.907$ ;  $p < 0.05$ ) than the patients anesthetized with Ropivacaine + Dexamethasone. But in movement, this difference was not statistically significant ( $X^2 = 6.088$ ;  $p > 0.05$ ).

**Table 1: Hour-wise distribution of post operative pain scores in rest and in movement in TKA patients applied with Levobupivacaine + Dexamethasone.**

Time (hours)	At rest				At movement			
	0	1	2	3	0	1	2	3
0	21(100.0)	0 (0.00)	0 (0.00)	0 (0.00)	21(100.0)	0 (0.00)	0 (0.00)	0 (0.00)
2	21(100.0)	0 (0.00)	0 (0.00)	0 (0.00)	20(95.27)	1 (4.76)	0 (0.00)	0 (0.00)
4	12 (57.14)	4 (19.05)	4 (19.05)	1 (2.76)	6 (28.57)	3 (14.28)	6 (28.57)	6 (28.57)
8	4 (19.05)	2 (9.52)	14 (66.66)	1 (4.76)	0 (0.00)	3 (14.28)	11 (58.38)	7 (33.33)
12	3 (14.28)	6 (28.57)	10 (47.62)	2 (9.52)	0 (0.00)	1 (4.76)	15 (71.43)	5 (23.81)
16	6 (28.57)	11 (58.38)	4 (19.05)	0 (0.00)	1 (4.76)	1 (4.76)	18 (85.71)	0 (0.00)
20	0 (0.00)	7 (33.33)	4 (19.05)	0 (0.00)	1 (4.76)	3 (14.28)	16 (76.19)	0 (0.00)

**Table 2: Hour-wise distribution of post operative pain scores in rest and in movement in TKA patients applied with Ropivacaine + Dexamethasone.**

Time (hours)	At rest				At movement			
	0	1	2	3	0	1	2	3
0	21 (100.0)	0 (0.00)	0 (0.00)	0 (0.00)	21 (100.0)	0 (0.00)	0 (0.00)	0 (0.00)
2	14 (66.66)	4 (19.05)	3 (14.28)	0 (0.00)	6 (28.57)	7 (33.33)	6 (28.57)	1 (4.76)
4	4 (19.05)	7 (33.33)	8 (38.09)	1 (4.76)	1 (4.76)	0 (0.00)	10 (47.62)	9 (42.86)
8	1 (4.76)	9 (42.86)	8 (38.09)	3 (14.28)	0 (0.00)	0 (0.00)	13 (61.90)	6 (28.57)
12	1 (4.76)	8 (36.09)	12 (57.14)	0 (0.00)	0 (0.00)	2 (9.52)	15 (71.43)	4 (19.09)
16	3 (14.28)	15 (71.43)	3 (14.28)	0 (0.00)	1 (4.76)	1 (4.76)	19 (90.48)	0 (0.00)
20	5 (23.81)	13 (61.90)	3 (14.28)	0 (0.00)	1 (4.76)	3 (14.28)	17 (80.95)	0 (0.00)

**Figure 1: Visual analog scale score at rest.****Figure 2: Visual analog scale score during movement.**

#### 4. DISCUSSION

The goal of ever in TKA surgeries is the early mobilization using adequate postoperative analgesia without motor blockade. This early ambulation is delayed by pain and motor block that may increase the incidence of venous Thromboembolism.<sup>[9,10]</sup> The sound sleep of the patients may be deprived by the uncontrolled pain and may lead to chronic psychological problems.<sup>[11]</sup> The ineffective postoperative pain management may result in delayed discharge and increase the cost of treatment.<sup>[12]</sup>

Various multimodal analgesic techniques are employed for postoperative pain relief in TKA<sup>[13,6]</sup> and patient-controlled regional analgesic. The findings of the present study showed that the post-operative patients anesthetized with Levobupivacaine + Dexamethasone experienced less severe pain as compared to the patients anesthetized with Ropivacaine + Dexamethasone. The peak in the VAS scale was lower in the LD group, indicating better postoperative analgesia with Levobupivacaine. Motor block effects were similar in both groups, but the duration was slightly shorter in the RD group. This suggested that Levobupivacaine might provide effective analgesia with a more favorable motor block profile as compared to Ropivacaine. Patients in the RD group required analgesia earlier than those in the LD group. This finding further supported the superior analgesic efficacy of Levobupivacaine. The study noted adverse events, including nausea, vomiting, and dizziness, with no significant differences between the groups.

Importantly, no cases of post-block neuropathy, nerve injury, or allergic reactions were observed.

Similar kind of findings were reported by and.<sup>[15]</sup> Thus, Levobupivacaine's pharmacological profile, with less cardiac and neurotoxic effects, made it a favorable choice for lower limb orthopedic surgeries.

The findings of the present study have clinical implications for pain management in knee surgeries, emphasizing the importance of the choice of local anesthetic and adjuvants in femoral nerve blocks. Enhanced postoperative pain control can contribute to early ambulation, reduced opioid use, and improved patient comfort.

#### Limitations and Future Directions

The study suggests the need for further investigations with larger sample size and long-term follow-ups. The findings encourage future studies to explore optimal dosage regimens and the potential benefits of combining different adjuvants with Levobupivacaine.

#### 5. CONCLUSION

In conclusion, the study supported the use of Levobupivacaine 0.25% with Dexamethasone as a safer and statistically more effective option for ultrasound-guided femoral nerve blocks in total knee arthroplasty patients. The results contribute valuable insights to the ongoing quest for optimizing multimodal analgesia strategies in orthopedic surgeries.

## 6. DECLARATION BY AUTHORS

The authors hereby declared that it was their original piece of research and had not been sent to any other journal for publication.

**7. ETHICAL APPROVAL:** Approved.

## 8. ACKNOWLEDGEMENT

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**10. CONFLICT OF INTEREST:** The authors declare noconflict of interest.

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