

# Comparison of Ultrasound-Guided Adductor Canal Block Versus Femoral Nerve Block for Postoperative Analgesia in Total Knee Arthroplasty

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## Abstract

**Background:** Total Knee Arthroplasty (TKA) is a procedure that causes a great deal of postoperative pain which can hinder early mobilization and functional recovery. Femoral Nerve Block (FNB) has been for many years been utilized for postoperative pain relief, but may be associated with some weakness of the quadriceps muscle that can impede early mobilization. The Adductor Canal Block (ACB) has proven to be an alternative that is motor-sparing, and may allow for adequate postoperative pain management without sacrificing muscle function. Ultrasound guided Adductor Canal Block is as effective as Femoral Nerve Block for Postoperative Analgesia after Total Knee Arthroplasty. Hypothesis Testing: A comparison between Ultrasound guided Adductor Canal Block and Femoral Nerve Block for Postoperative Analgesia following Total Knee Arthroplasty. **Material and Methods:** This prospective randomized comparative study compared 80 patients who had unilateral TKA under spinal anesthesia. The patients were randomly divided into two groups: Group A (ACB) received ultrasound-guided Adductor Canal Block (20 mL of 0.25% bupivacaine) and Group F (FNB) received ultrasound-guided Femoral Nerve Block (20 mL of 0.25% bupivacaine). The Visual Analogic Scale (VAS) was used for the assessment of postoperative pain. Secondary outcomes were: 24-hour opioid consumption, quadriceps strength, time to ambulation, hospital stay, patient satisfaction, and adverse events. **Results:** Demographic and baseline characteristics were comparable between groups ( $p > 0.05$ ). VAS pain scores at 6, 12, 24, and 48 hours postoperatively were similar in both groups ( $p > 0.05$ ). Twenty-four-hour morphine consumption was comparable between Group A and Group F ( $12.8 \pm 4.3$  mg vs.  $13.4 \pm 4.7$  mg;  $p = 0.56$ ). Quadriceps muscle strength was significantly better preserved in the ACB group ( $4.3 \pm 0.6$  vs.  $2.9 \pm 0.8$ ;  $p < 0.001$ ). Patients receiving ACB achieved earlier ambulation ( $18.2 \pm 3.1$  h vs.  $26.7 \pm 4.5$  h;  $p < 0.001$ ) and had a shorter hospital stay ( $4.2 \pm 0.9$  days vs.  $5.1 \pm 1.1$  days;  $p = 0.002$ ). Patient satisfaction scores were comparable between groups. **Conclusion:** Ultrasound-guided Adductor Canal Block provides postoperative analgesia comparable to Femoral Nerve Block while preserving quadriceps strength and facilitating earlier ambulation after TKA. ACB may therefore be preferred as part of enhanced recovery protocols.

**Keywords:** Adductor Canal Block, Femoral Nerve Block, Total Knee Arthroplasty, Postoperative Analgesia, Ultrasound Guidance.

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## INTRODUCTION

One of the more common orthopedic surgeries for end-stage osteoarthritis is Total Knee Arthroplasty (TKA). Though progress in peri-operative management, postoperative pain following TKA remains a significant challenge for everyone involved in rehabilitation, patient satisfaction and hospital stay, therefore, good management of postoperative pain is a crucial part of enhanced recovery after surgery (ERAS) following this surgery.<sup>[1]</sup> Perioperative nerve block is common for knee replacement surgery (TKA) to provide postoperative pain. Femoral nerve block (FNB) has long been thought to be an effective block for anterior knee pain and to lower post-operative opioid consumption; however, it is important to note that this is a traditional belief. However, motor blockade can lead to some serious weakness of the quadriceps muscles, making up walking and raising falls risk at the start of ambulation, which this FNB can cause in the muscles. The restrictions have spurred interest in the use of other regional anaesthetic methods that could achieve the same level of analgesia without compromising motor function.<sup>[2]</sup> The motor sparing alternative, adductor canal

block (ACB), has proved to be a promising procedure compared with FNB. ACB is directed to saphenous nerve and other sensory branches in adductor canal so that it provides analgesia primarily to the anteromedial aspect of the knee, while it relatively maintains the strength of the quadriceps. This can aid early mobilization and increased participation in physiotherapy and more rapid functional recovery following TKA.<sup>[3,4]</sup> A few studies and systematic reviews have compared ACB and FNB in TKA patients. Based on available evidence, the use of ACB for postoperative pain is equivalent to FNB and has the added benefit of preserving the muscle strength of the quadriceps, while also

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demonstrating better early functional outcomes. The current procedure-specific recommendations for pain management also recommend the use of single-shot ACB within multimodal pain management strategies for TKA, especially if early rehabilitation and mobilization is important.

**Aims and Objectives**

To compare ultrasound-guided Adductor Canal Block with Femoral Nerve Block for postoperative analgesia in patients undergoing Total Knee Arthroplasty

**MATERIALS AND METHODS**

**Study Design & Setting:** This prospective randomized comparative study was conducted in the Department of Anesthesiology in a Tertiary Care Teaching Hospital, central India for a period of one year from January 2025 – December 2025

**Study population:** A total of 80 patients fulfilled the inclusion criteria were enrolled in this study

**Inclusion Criteria**

- Patients age between 50–80 years, both gender
- ASA Physical Status I–III
- Scheduled for unilateral primary TKA
- Patients who provided Informed written consent

**Exclusion Criteria**

- Allergy to local anesthetic or Coagulopathy
- Infection at injection site
- Neurological disorders affecting lower limbs
- Patients who not provided Informed written consent

Patients were equally randomized into two groups (40 in each group)

**Group A (ACB):** Ultrasound-guided Adductor Canal Block using 20 ml of 0.25% bupivacaine

**Group F (FNB):** Ultrasound-guided Femoral Nerve Block using 20 ml of 0.25% bupivacaine

Basic socio-demographics and hemodynamic data were collected for all the study patients

The following outcomes measures were assessed

**Primary Outcome**

- VAS pain score (0–10)

**Secondary Outcomes**

- Morphine consumption (24 hours)
- Quadriceps strength (MRC scale)
- Time to ambulation
- Length of hospital stay
- Patient satisfaction score

**Statistical Analysis:** Data analyzed using SPSS Version 27. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons of parameters among groups were performed using Student's t-test and Chi-square test. A p-value of less than 0.05 was considered statistically significant.

**RESULTS**

The demographic and baseline clinical characteristics were comparable between the Adductor Canal Block (ACB) and Femoral Nerve Block (FNB) groups. No statistically significant differences were observed in age, gender distribution, body mass index, or ASA physical status ( $p > 0.05$ ), indicating adequate baseline homogeneity between the study groups.

**Table 1: Demographic Characteristics among the groups**

Variable	Group A (n=40)	Group F (n=40)	p-value
Age (years)	66.4 ± 7.1	65.9 ± 6.8	0.74
Male/Female	18/22	17/23	0.82
BMI (kg/m <sup>2</sup> )	29.1 ± 3.8	28.7 ± 4.1	0.65
ASA I/II/III	8/25/7	9/24/7	0.93

Postoperative pain scores at rest were similar in both groups at 6, 12, 24, and 48 hours following surgery. No statistically significant differences were observed between the ACB and FNB groups at any assessment time point ( $p > 0.05$ ), demonstrating comparable analgesic efficacy.

**Table 2: Comparisons of VAS Pain Scores at Rest**

Time	Group A	Group F	p-value
6 h	3.2 ± 0.8	3.0 ± 0.7	0.21
12 h	3.8 ± 0.9	3.6 ± 0.8	0.28
24 h	3.5 ± 0.8	3.3 ± 0.7	0.26
48 h	2.8 ± 0.6	2.7 ± 0.5	0.40

Total 24-hour postoperative morphine consumption was comparable between the two groups. The slight reduction observed in the ACB group was not statistically significant

( $p = 0.56$ ), indicating similar opioid requirements following TKA

**Table 3: Comparisons of Opioid Consumption in the groups**

Variable	Group A	Group F	p-value
Morphine Consumption (mg/24 h)	12.8 ± 4.3	13.4 ± 4.7	0.56

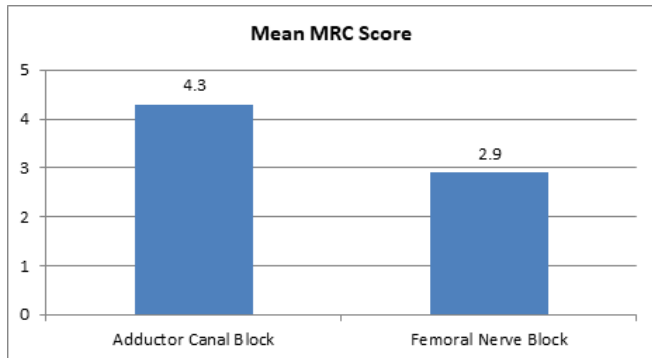
Patients receiving ACB demonstrated significantly greater quadriceps muscle strength and earlier ambulation compared with those receiving FNB ( $p < 0.001$ ). Hospital stay was

significantly shorter in the ACB group ( $p = 0.002$ ), while patient satisfaction scores were similar between groups.

**Table 4: Comparisons of Functional Outcomes**

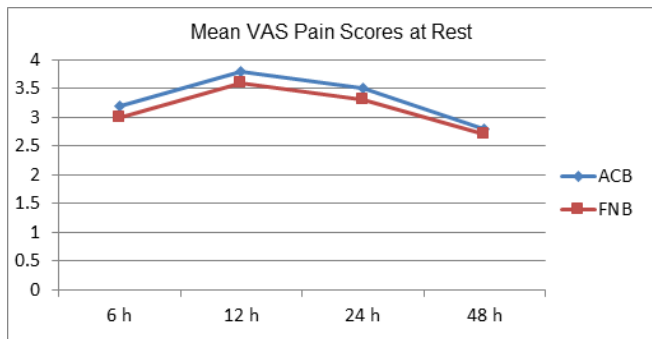
Variable	Group A	Group F	p-value
Quadriceps Strength (MRC)	4.3 ± 0.6	2.9 ± 0.8	<0.001
Time to Ambulation (h)	18.2 ± 3.1	26.7 ± 4.5	<0.001
Hospital Stay (days)	4.2 ± 0.9	5.1 ± 1.1	0.002
Satisfaction Score (/10)	8.8 ± 0.9	8.4 ± 1.0	0.08

The mean quadriceps muscle strength score was significantly higher in the ACB group (4.3±0.6) compared with the FNB group (2.9±0.8), indicating superior preservation of motor function following Adductor Canal Block.



**Figure 1: Comparison of mean MRC quadriceps strength score**

Mean postoperative VAS pain scores at rest remained comparable between the ACB and FNB groups throughout the 48-hour observation period. Both groups demonstrated a gradual reduction in pain intensity over time, with no statistically significant intergroup differences.



**Figure 2: Comparison of Postoperative VAS Pain Scores**

**DISCUSSION**

The demographic variables were comparable between both groups, indicating that the observed postoperative differences were mainly related to the analgesic technique rather than baseline patient characteristics.

In the present study, postoperative VAS pain scores at rest were comparable between the ACB and FNB groups at 6, 12, 24 and 48 hours. Similarly, 24-hour morphine consumption was also not significantly different between the two groups. These findings suggest that ACB provides analgesia equivalent to FNB after total knee arthroplasty. This observation is consistent with the Indian systematic review by Karkhur et al,<sup>[8]</sup> who reported that ACB and FNB provide comparable analgesic efficacy after total knee arthroplasty,

while ACB offers better early mobilization. Comparable findings were also reported by international randomized studies, where ACB produced similar pain relief and opioid-sparing effects when compared with FNB.<sup>[9,10]</sup>

The most important finding of the present study was the significantly better preservation of quadriceps muscle strength in the ACB group. This difference can be explained by the motor-sparing nature of ACB, which mainly blocks the saphenous nerve and sensory branches in the adductor canal, whereas FNB blocks both sensory and motor fibers of the femoral nerve, causing quadriceps weakness. Similar observations were made in Indian literature by Jaeger P et al,<sup>[11]</sup> who concluded that ambulation and mobilization were less inhibited by ACB than by FNB following total knee arthroplasty.

Time to first ambulation was significantly shorter in patients receiving ACB. Early ambulation is a key component of enhanced recovery after surgery protocols and is particularly important after knee arthroplasty because it improves physiotherapy participation, reduces stiffness, and may decrease thromboembolic and pulmonary complications. Indian studies on regional analgesia for knee arthroplasty, including the work of Roy et al,<sup>[12]</sup> on ultrasound-guided multimodal nerve block techniques, have emphasized the importance of effective analgesia with early postoperative mobilization.

Hospital stay was significantly shorter in the ACB group than in the FNB group. This may be attributed to better quadriceps preservation and earlier ambulation, which allowed earlier participation in rehabilitation. Although patient satisfaction was slightly higher in the ACB group, the difference was not statistically significant. This could be because both blocks were successful in relieving pain but the satisfaction may be dependent on several factors such as nursing care, physiotherapy, patient expectations, and surgical outcome.<sup>[13]</sup>

The results of the current study also agree with those of Govil et al,<sup>[14]</sup> who assessed ultrasound-guided ACB following knee arthroplasty and found it to be valuable in multimodal postoperative pain management.

Thus, the current study reveals that ACB is not inferior in terms of postoperative analgesia and opioid requirement, whereas is superior in functional recovery parameters such as quadriceps strength, ambulation time, hospital stay. The results of this study warrants using ultrasound guided ACB as a preferred technique of regional anesthesia for TKR, particularly in enhanced recovery programmes, where early mobilization is a key objective.

**CONCLUSION**

Adductor Canal Block is as equally effective for postoperative pain as Femoral Nerve Block in patients undergoing Total Knee Arthroplasty with ultrasound guidance. ACB, however, has a lot of benefits when it comes to maintaining strength of the quadriceps muscle, getting patients out of bed and walking

sooner, and decreasing hospital length of stay. Hence, ultrasound-guided ACB can be regarded as a better regional analgesic technique with lesser effect on the motor function, and a better choice than the FNB for postoperative pain after TKA.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

### REFERENCES

1. Lavand'homme PM, Kehlet H, Rawal N, Joshi GP. Pain management after total knee arthroplasty: PROSPECT recommendations. *European Journal of Anaesthesiology*. 2022;39(9):743–757.
2. Kim DH, Lin Y, Goytizolo EA, et al. Adductor canal block versus femoral nerve block for total knee arthroplasty: a randomized controlled trial. *Anesthesiology*. 2014;120(3):540–550.
3. Grevstad U, Mathiesen O, Valentiner LS, Jaeger P, Hilsted KL, Dahl JB. Effect of adductor canal block versus femoral nerve block on quadriceps strength, mobilization, and pain after total knee arthroplasty. *Regional Anesthesia and Pain Medicine*. 2015;40(1):3–10.
4. Memtsoudis SG, Yoo D, Stundner O, et al. Subartorial adductor canal block for analgesia after total knee replacement. *International Orthopaedics*. 2015;39:673–680.
5. Macrinici GI, Murphy C, Christman L, et al. Prospective, double-blind, randomized study to evaluate single-injection adductor canal nerve block versus femoral nerve block after total knee arthroplasty. *Regional Anesthesia and Pain Medicine*. 2017;42(1):10–16.
6. Rodriguez-Patarroyo FA, Cuello N, Molloy R, et al. A guide to regional analgesia for total knee arthroplasty. *EFORT Open Reviews*. 2021;6(12):1181–1192.
7. Kuang MJ, et al. Is adductor canal block better than femoral nerve block in primary total knee arthroplasty? A meta-analysis. *Journal of Arthroplasty*. 2017;32(12):3828–3838
8. Karkhur Y, Mahajan R, Kakralia A, Pandey AP, Kapoor MC. A comparative analysis of femoral nerve block with adductor canal block following total knee arthroplasty: A systematic literature review. *Journal of Anaesthesiology Clinical Pharmacology*. 2018;34(4):433–438
9. Desai D, Sonawane K, Dixit H, Mistry T. Comparative analysis of dual versus single subsartorial block for postoperative analgesia after total knee arthroplasty: A randomized double-blind study. *Indian Journal of Anaesthesia*. 2025.
10. Gao F, Ma J, Sun W, Guo W, Li Z. Adductor canal block versus femoral nerve block for pain control after total knee arthroplasty: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2017;96(39):e8103.
11. Jaeger P, Zaric D, Fomsgaard JS, et al. Adductor canal block versus femoral nerve block and quadriceps strength: a randomized, double-blind, placebo-controlled, crossover study in healthy volunteers. *Anesthesiology*. 2013; 118(2):409–415. DOI: 10.1097/ALN.0b013e318279fa0d
12. Roy R, Agarwal G, Pradhan C, Kuanar D. Total postoperative analgesia for total knee arthroplasty: Ultrasound guided single injection modified 4 in 1 block. *Journal of Anaesthesiology Clinical Pharmacology*. 2020;36(2):261–264.
13. Sonawane K, Dixit H, Mistry T, Balavenkatasubramanian J. Anatomical and technical considerations of dual subsartorial block: A novel motor-sparing regional analgesia technique for total knee arthroplasty. *Open Journal of Orthopedics and Rheumatology*. 2021; 6:046-055.
14. Govil N, Parag K, Arora P, Khandelwal H, Singh A. Comparison of two different volumes of 0.5% ropivacaine used in ultrasound-guided adductor canal block after knee arthroplasty: A randomized, blinded study. *Indian Journal of Anaesthesia*. 2021;65:600-606.