International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 15, No. 4, April 2026 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_15.4.2026.97

Original Research

Evaluation of Analgesic Effect of Continuous Adductor Canal Block Versus Continuous Femoral Nerve Block for Knee Arthroscopic Surgeries: A Randomised Clinical Trial

Dr. Harshita Kotian[1], Dr. Basavaraj Patil[2], Dr. Shivanand L Karigar[3], Dr. Priya Shetty[4]

[1]Junior Resident, Department of Anaesthesiology, BLDE(DU) Shri B M Patil Medical College, Hospital and Research Centre, Vijayapura, Karnataka, India.
[2]Professor, Department of Anaesthesiology, BLDE(DU) Shri B M Patil Medical College, Hospital and Research Centre, Vijayapura, Karnataka,India.
[3]Professor, Department of Anaesthesiology, BLDE(DU) Shri B M Patil Medical College, Hospital and Research Centre, Vijayapura, Karnataka, India.
[4]Junior Resident, Department of Anaesthesiology, BLDE(DU) Shri B M Patil Medical College, Hospital and Research Centre, Vijayapura, Karnataka, India.

Corresponding author:
Dr. Basavaraj Patil
Professor, Department of Anaesthesiology,BLDE(DU) Shri B M Patil Medical College,Hospital and Research Centre,Vijayapura, Karnataka, India
Email id: drbnp2000@gmail.com

Received: 16-03-2026 Revised: 28-03-2026 Accepted: 11-04-2026 Published: 14-04- 2026

ABSTRACT

Introduction: Effective postoperative pain management is essential for early mobilization and functional recovery following knee arthroscopic surgery. Continuous femoral nerve block (CFB) provides effective analgesia but may cause quadriceps weakness. Continuous adductor canal block (CAB) has emerged as a motor-sparing alternative. The study aimed to compare the efficacy and safety of CAB versus CFB in patients undergoing elective knee arthroscopic surgeries.

Materials and Methods: In this prospective, randomized, assessor-blinded clinical trial, 60 patients (ASA I–II) scheduled for elective knee arthroscopy under spinal anaesthesia were randomly allocated into two groups (n=30 each). Group A received CAB and Group F received CFB using 0.2% ropivacaine infusion at 5 mL/hour for 24 hours. Time to first rescue analgesia, Visual Analogue Scale (VAS) scores at 6, 12, and 24 hours, total analgesic consumption, painless range of motion, and complications were observed in both groups.

Results: Baseline characteristics were comparable between groups. VAS scores were significantly lower in Group A at 6 hours (0.53 ± 0.63 vs. 1.30 ± 0.92; p=0.001), 12 hours (0.67 ± 0.80 vs. 1.80 ± 1.61; p=0.002), and 24 hours (0.70 ± 0.65 vs. 1.63 ± 1.30; p=0.001). Time to first rescue analgesia was significantly prolonged in Group A (18.62 ± 1.57 hours vs. 15.46 ± 3.97 hours; p=0.003). Total analgesic consumption was lower in Group A (0.60 ± 0.56 g vs. 1.10 ± 0.76 g; p=0.008). Painless range of motion was significantly greater in Group A (65.83 ± 5.88° vs. 48.50 ± 11.76°;). No complications were observed.

Conclusion: CAB provides superior analgesia, reduced analgesic requirement, and better preservation of quadriceps function compared to CFB in knee arthroscopic surgeries.

Keywords: Continuous Adductor canal block; Continuous Femoral nerve block; Knee arthroscopy; Postoperative analgesia; Regional anaesthesia.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

Effective relief of postoperative pain remains a cornerstone of modern anaesthetic practice [1]. Inadequately controlled perioperative pain not only causes significant patient discomfort but also adversely affects physiological homeostasis and surgical recovery [2]. Acute postoperative pain activates neuroendocrine stress responses, leading to increased sympathetic activity, impaired pulmonary function, delayed wound healing, and a higher risk of thromboembolic events [3]. Furthermore, poorly managed pain may delay ambulation, prolong hospital stay, reduce patient satisfaction, and predispose to the development of chronic postsurgical pain [4]. Hence,

DOI: 10.69605/ijlbpr_15.4.2026.97

an evidence-based and procedure-specific analgesic strategy is essential for optimizing postoperative outcomes [4].

Knee arthroscopy, though minimally invasive, is frequently associated with considerable postoperative pain, particularly within the first 24 hours [5]. Surgical manipulation within the joint, capsular distension, and synovial irritation stimulate abundant nociceptive fibres around the knee, resulting in significant discomfort [5]. Inadequate analgesia can limit early physiotherapy, reduce range of motion, and delay functional recovery [6]. Since early mobilization is pivotal in orthopaedic rehabilitation, analgesic techniques that provide effective pain relief without compromising motor function are of paramount importance [7].

The adoption of Enhanced Recovery After Surgery (ERAS) protocols has emphasized multimodal analgesia strategies that minimize opioid consumption while facilitating early mobilization and functional recovery [8]. Continuous peripheral nerve blocks have gained prominence for providing sustained, site-specific analgesia with fewer systemic adverse effects [9]. Continuous femoral nerve block (CFB) has traditionally been considered the standard regional technique for postoperative knee analgesia [9]. However, its association with quadriceps muscle weakness may hinder ambulation and increase the risk of falls.

Continuous adductor canal block (CAB) has emerged as a motor-sparing alternative that primarily targets the sensory components of the knee while preserving quadriceps strength [10]. While substantial evidence exists comparing CAB and CFB in major knee surgeries such as total knee arthroplasty, data evaluating their role in arthroscopic knee procedures under spinal anaesthesia remain limited. Therefore, the present study was undertaken to compare the analgesic efficacy, preservation of motor function, and safety profile of continuous adductor canal block versus continuous femoral nerve block in patients undergoing elective knee arthroscopic surgeries.

MATERIALS AND METHODS

This prospective, randomized clinical trial was conducted in the Orthopaedic Operation Theatre Complex of B.L.D.E. (DU) Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura, over a period of one year from August 2024 to August 2025. The study was approved by the Institutional Ethics Committee (BLDE (DU)/IEC-SBMPMC/078/2023-24) and registered with the Clinical Trials Registry of India (CTRI No.: CTRI/2024/07/070941). Written informed consent was obtained from all participants prior to enrolment.

A total of 60 adult patients posted for elective knee arthroscopic surgery were included in the study. Patients aged 18–60 years of either sex with American Society of Anaesthesiologists (ASA) physical status I or II were eligible. Patients with infection at the block site, coagulation disorders, polytrauma, chronic analgesic use, body mass index >35 kg/m², fixed knee deformities, or refusal to participate were excluded.

The sample size was calculated based on previously published data by Sinha C et al., who reported a mean (± SD) time to first rescue analgesic requirement of 14.40 ± 4.32 hours for femoral nerve block and 16.90 ± 3.37 hours for adductor canal block [11]. Using these values as reference, and assuming equal allocation between the two groups, a study power of 80%, and a two-sided alpha error of 0.05, the minimum required sample size was determined. Based on this calculation, 30 patients were included in each group, resulting in a total sample size of 60 participants to detect a clinically significant difference in the duration of postoperative analgesia.

The study was conducted using a randomized, assessor-blinded design. Group allocation was performed using a computer-generated randomization sequence. While the anaesthesiologist performing the block was aware of the assigned intervention due to the nature of the procedure, patients and the postoperative outcome assessor responsible for recording Visual Analogue Scale (VAS) scores and other outcome measures were blinded to group allocation. Data analysis was performed without disclosure of group identity to minimize assessment bias.

Participants were allocated into two equal groups: Group A received continuous adductor canal block (CAB), and Group F received continuous femoral nerve block (CFB). All patients underwent standardized pre-anaesthetic evaluation and routine investigations. Spinal anaesthesia was administered under aseptic precautions using 3–3.5 mL of 0.5% hyperbaric bupivacaine at the L3–L4 or L4–L5 interspace. Intraoperative monitoring was standardized for all patients.

At the completion of surgery, the allocated ultrasound-guided continuous peripheral nerve block was performed. In Group A, the adductor canal was identified at the mid-thigh level, and after hydro-dissection with 10 mL of 0.2% ropivacaine, a 20G perineural catheter was inserted and secured. In Group F, the femoral nerve was identified at the femoral crease, and a similar catheter placement technique was employed. In both groups, 0.2% ropivacaine was infused at 5 mL/hour for 24 hours using a syringe pump.

Postoperatively, patients were monitored hourly for 24 hours. Pain was assessed using the Visual Analogue Scale (VAS; 0–10). Intravenous paracetamol 1 g was administered as rescue analgesia when VAS ≥4. The primary outcome measure was time to first rescue analgesia. Secondary outcomes included VAS scores at 6, 12, and 24 hours, total analgesic consumption within 24 hours, painless range of knee motion, and procedure-related complications. After 24 hours, the catheter was removed under aseptic precautions.

©2026 Int. J. Life Sci. Biotechnol. Pharma. Res

DOI: 10.69605/ijlbpr_15.4.2026.97

Data were entered into Microsoft Excel and analysed using SPSS version 20. Continuous variables were expressed as mean ± standard deviation and categorical variables as number and percentage. Independent t-test or Mann–Whitney U test was applied for continuous variables as appropriate, and Chi-square test was used for categorical variables. A p-value <0.05 was considered statistically significant. All analyses were performed using a two-tailed level of significance.

RESULTS

Baseline characteristics were comparable between the two study groups. The mean age was 33.47 ± 10.98 years in Group A and 34.67 ± 10.41 years in Group F (p = 0.477). The sex distribution was similar, with 22 males and 8 females in Group A and 23 males and 7 females in Group F (p = 0.766). Mean body weight was 69.00 ± 8.03 kg in Group A and 67.50 ± 7.74 kg in Group F (p = 0.433). The duration of surgery was also comparable between the groups (100.83 ± 22.36 minutes vs. 94.00 ± 26.18 minutes; p = 0.284). These findings confirm adequate randomization and homogeneity of baseline parameters between the study arms (Table 1).

Table 1. Baseline Characteristics of Study Participants

Parameter	Group A (CAB) (n=30)	Group F (CFB) (n=30)	p-value
Age (years)	33.47 ± 10.98	34.67 ± 10.41	0.477
Sex (M/F)	22 / 8	23 / 7	0.766
Weight (kg)	69.00 ± 8.03	67.50 ± 7.74	0.433
Duration of surgery (min)	100.83 ± 22.36	94.00 ± 26.18	0.284

Data expressed as mean ± SD or number of patients.

Postoperative pain scores assessed using the Visual Analogue Scale were significantly lower in Group A at all measured time intervals. At 6 hours, the mean VAS score was 0.53 ± 0.63 in Group A compared with 1.30 ± 0.92 in Group F (p = 0.001). At 12 hours, the scores were 0.67 ± 0.80 and 1.80 ± 1.61, respectively (p = 0.002). Similarly, at 24 hours, Group A demonstrated lower pain scores than Group F (0.70 ± 0.65 vs. 1.63 ± 1.30; p = 0.001). These results indicate superior and sustained analgesia with continuous adductor canal block during the first 24 postoperative hours (Table 2).

Table 2. Postoperative Pain Scores (VAS)

Time Point	Group A (CAB)	Group F (CFB)	p-value
6 hours	0.53 ± 0.63	1.30 ± 0.92	0.001
12 hours	0.67 ± 0.80	1.80 ± 1.61	0.002
24 hours	0.70 ± 0.65	1.63 ± 1.30	0.001

Data expressed as mean ± SD; VAS – Visual Analogue Scale (0–10).

Analysis of postoperative analgesic outcomes revealed that the time to first rescue analgesia was significantly prolonged in Group A compared with Group F (18.62 ± 1.57 hours vs. 15.46 ± 3.97 hours; p = 0.003). Total analgesic consumption during the first 24 hours was also significantly lower in Group A (0.60 ± 0.56 g) than in Group F (1.10 ± 0.76 g; p = 0.008). Furthermore, painless range of motion was markedly greater in Group A (65.83 ± 5.88°) compared to Group F (48.50 ± 11.76°), demonstrating a highly significant difference (p = 0.00001). No procedure-related complications were observed in either group during the study period (Table 3).

Table 3. Postoperative Analgesic Outcomes

Parameter	Group A (CAB)	Group F (CFB)	p-value
Time to first rescue analgesia (hours)	18.62 ± 1.57	15.46 ± 3.97	0.003
Total analgesic consumption (g)	0.60 ± 0.56	1.10 ± 0.76	0.008
Painless range of motion (degrees)	65.83 ± 5.88	48.50 ± 11.76	0.00001

Data expressed as mean ± SD.

DISCUSSION

The present study demonstrated that continuous adductor canal block (CAB) provided superior postoperative analgesia compared with continuous femoral nerve block (CFB) in patients undergoing elective knee arthroscopic surgeries. Patients receiving CAB showed significantly lower VAS scores at 6, 12, and 24 hours, a longer duration before the first rescue analgesic requirement (18.62 ± 1.57 hours vs. 15.46 ± 3.97 hours), reduced cumulative analgesic consumption within 24 hours (0.60 ± 0.56 g vs. 1.10 ± 0.76 g), and a significantly greater painless range of knee motion (65.83 ± 5.88° vs. 48.50 ± 11.76°). These findings indicate that CAB provides effective postoperative analgesia while preserving quadriceps motor function, thereby facilitating early mobilization following arthroscopic knee procedures.

The results of the present study are consistent with several previously published studies evaluating CAB and CFB for knee surgeries. Sinha C et al. reported

©2026 Int. J. Life Sci. Biotechnol. Pharma. Res

DOI: 10.69605/ijlbpr_15.4.2026.97

that patients receiving continuous adductor canal block experienced a significantly longer duration before first rescue analgesia (16.90 ± 3.37 hours) compared with those receiving continuous femoral nerve block (14.40 ± 4.32 hours), along with reduced 24-hour analgesic consumption (0.70 ± 0.47 g vs. 1.70 ± 0.65 g) and greater painless knee flexion (55.67 ± 10.40° vs. 40.00 ± 11.37°) [11]. These findings closely parallel the outcomes observed in the present study. Similarly, Dhumey T et al. demonstrated that although the duration of analgesia between the two techniques was comparable, adductor canal block preserved quadriceps motor power significantly better, with 80% of patients achieving full motor function (Bromage score 0) compared with only 26.67% in the femoral nerve block group [12]. These observations support the improved painless range of motion noted in the CAB group in the present study.

Further evidence highlighting the motor-sparing advantage of adductor canal block has been reported in other clinical investigations and meta-analyses. Abdallah FW et al. demonstrated that adductor canal block provided postoperative analgesia comparable to femoral nerve block while significantly preserving quadriceps strength, with maximal voluntary quadriceps contraction values more than twice as high in the adductor canal group [13]. In addition, a meta-analysis by Mahdy EW et al., involving 1457 patients across 18 studies, concluded that although femoral nerve block may provide slightly stronger analgesia in some cases, adductor canal block significantly reduces quadriceps weakness and thereby facilitates early ambulation [14]. Similarly, Espelund et al. demonstrated that adductor canal block significantly reduced pain during knee flexion and ambulation following arthroscopic knee surgery [15]. Taken together, these findings support the results of the present study, indicating that continuous adductor canal block provides effective analgesia with superior preservation of quadriceps function compared with continuous femoral nerve block, making it particularly advantageous in procedures where early postoperative mobilization is essential.

The present study has certain limitations that should be acknowledged. First, the sample size was relatively small and conducted at a single tertiary care centre, which may limit the generalizability of the findings to broader populations and different surgical settings. Second, the follow-up period was restricted to the first 24 postoperative hours; therefore, longer-term outcomes such as persistent pain, rehabilitation milestones, length of hospital stay, and patient-reported satisfaction were not evaluated. Third, although outcome assessors were blinded, the anaesthesiologist performing the block could not be blinded due to the nature of the intervention, which may introduce procedural bias. Additionally, objective assessment of quadriceps strength using dynamometry was not performed; instead, painless range of motion was used as a functional surrogate. Also, number of arthroscopic ports used during the surgery was not standardized, which may have influenced postoperative pain. Future multicentric studies with larger sample sizes, extended follow-up, and objective motor function assessment are warranted to further validate these findings.

CONCLUSION

The present study demonstrates that continuous adductor canal block provides superior postoperative analgesia compared to continuous femoral nerve block in patients undergoing elective knee arthroscopic surgeries. CAB was associated with significantly lower pain scores, prolonged time to first rescue analgesia, reduced total analgesic consumption, and better preservation of quadriceps function as evidenced by improved painless range of motion, without an increase in complications. These findings suggest that continuous adductor canal block offers an effective, motor-sparing, and safe regional analgesic technique that facilitates early mobilization and functional recovery in arthroscopic knee procedures.

REFERENCES

1. Gautam A, Pande C, Pande M. Postoperative Pain Management: Evaluating the Role of Multimodal Analgesia. J Pharm Bioallied Sci. 2025;17(Suppl 1):S314-S316.
2. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. J Pain Res. 2017;10:2287-2298.
3. Haroutounian S. Postoperative opioids, endocrine changes, and immunosuppression. Pain Rep. 2018;3(2):e640.
4. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. J Pain Res. 2017;10:2287-2298.
5. Rathod V, Shrivastav S, Gharpinde MR. Knee Arthroscopy in the Era of Precision Medicine: A Comprehensive Review of Tailored Approaches and Emerging Technologies. Cureus. 2024;16(10):e70932.
6. Alqahtani TA, Kardm SM, Alnakhli HH, Alyazedi FM, Kandakurti PK, Reddy RS. Impact of early vs. delayed physical therapy on functional recovery, proprioception, and return to sport after anterior cruciate ligament (ACL) reconstruction: a cross-sectional study. J OrthopSurg Res. 2025;20(1):644.
7. Ilias Basha AM, Mohan Reddy KBV, Kumar Babu AP, Sujin S. A comparative study on evaluating the outcome of displaced isolated medial malleolus fracture managed with tension band wiring (TBW) versus malleolar screws fixation. Int J Pharm Pharm Sci. 2024;16(3):43-6.
8. Grossi P. Enhanced Recovery After Surgery (ERAS) Protocols in Orthopaedic Surgery: Opioids or Not Opioids? J Pain Res. 2025;18:1683-1695.
9. Jogie J, Jogie JA. A Comprehensive Review on the Efficacy of Nerve Blocks in Reducing Postoperative Anesthetic and Analgesic Requirements. Cureus. 2023;15(5):e38552.
10. Yu R, Wang H, Zhuo Y, Liu D, Wu C, Zhang Y. Continuous adductor canal block provides better performance after total knee arthroplasty compared with the single-shot adductor canal block?: An

©2026 Int. J. Life Sci. Biotechnol. Pharma. Res

DOI: 10.69605/ijlbpr_15.4.2026.97

updated meta-analysis of randomized controlled trials. Medicine (Baltimore). 2020;99(43):e22762.
11. Sinha C, Singh AK, Kumar A, Kumar A, Kumar S, Kumari P. Analgesic effect of continuous adductor canal block versus continuous femoral nerve block for knee arthroscopic surgery: a randomized trial. Braz J Anesthesiol. 2022;72(5):553-559.
12. Dhumey T, Bhalerao N, Paul A, Wanjari D. Adductor Canal Block Versus Femoral Nerve Block for Postoperative Pain Management in Anterior Cruciate Ligament Reconstruction: A Prospective Interventional Study. Cureus. 2024;16(7):e64625.
13. Abdallah FW, Whelan DB, Chan VW, Prasad GA, Endersby RV, Theodoropolous J, et al. Adductor Canal Block Provides Noninferior Analgesia and Superior Quadriceps Strength Compared with Femoral Nerve Block in Anterior Cruciate Ligament Reconstruction. Anesthesiology. 2016;124(5):1053-64.
14. Mahdy EW, Abd El-Hamid AM, Elbarbary DH. Comparison between adductor canal block and femoral nerve block for different knee surgical procedures. A meta-analysis of randomized trials. Egyptian Journal of Anaesthesia. 2021;37(1):491-500.
15. Espelund M, Fomsgaard JS, Haraszuk J, Mathiesen O, Dahl JB. Analgesic efficacy of ultrasound-guided adductor canal blockade after arthroscopic anterior cruciate ligament reconstruction: a randomised controlled trial. Eur J Anaesthesiol. 2013;30(7):422-8.

©2026 Int. J. Life Sci. Biotechnol. Pharma. Res