Actas Médicas (Ecuador)
actasmedicas.ec

Postoperative analgesic efficacy of femoral nerve block versus adductor canal block in patients undergoing knee arthroscopy. A single-center quasi-experimental study.

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Received: February 11, 2026.
Accepted: June 9, 2026.
Published: June 12, 2026.
Editor: Dr. Mayra Ordoñez Martínez.

How to cite:
Rodriguez A, Alvarado C. Postoperative analgesic efficacy of femoral nerve block versus adductor canal block in patients undergoing knee arthroscopy. A quasi-experimental study of a single center. Actas Médicas (Ecuador) 2026; 14(1):108-117.

DOI: http://doi.org/10.61284/298
Hospital Alcívar.
ISSN-L: 2960-8309

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Summary

Introduction: Postoperative pain following total knee arthroplasty (TKA) presents a significant clinical challenge that delays rehabilitation and compromises the quality of recovery. Peripheral nerve blocks are essential pillars of multimodal analgesia; however, the optimal technique for balancing pain relief and motor preservation remains under debate. The aim of this study was to compare the postoperative analgesic efficacy of femoral nerve block (FNB) versus ultrasound-guided adductor canal block (ACB) in patients undergoing TKA at Hospital Alcívar.

Materials and Methods: A prospective, quasi-experimental study was conducted during 2025. Thirty patients (35–75 years, ASA I–III) undergoing total knee replacement (THR) were included and randomly assigned to two groups (n=15 per arm). Group 1 received ultrasound-guided non-fibrosing barium enema (NFB), and Group 2 received ultrasound-guided continuous brachial plexus injection (CBA), both with a total volume of 20 ml of 0.25% bupivacaine. Postoperative pain intensity was assessed using the Visual Analog Scale (VAS) at 6 and 12 hours. Secondary outcomes included the requirement for rescue intravenous analgesia and the assisted ambulation rate at 24 hours.

Results: The sample showed demographic homogeneity in mean age (63 ± 7 years in BNF vs. 64 ± 9 years in BCA; P=0.678) and in sex distribution (P=0.715). No statistically significant differences were observed in pain perception between the groups at 6 hours (P=0.9214) or 12 hours (P=0.654), and most achieved optimal pain control (VAS 0–3). The need for rescue analgesia was similarly low in both arms (33.3% for BNF vs. 20% for BCA; P=0.409). Assisted ambulation at 24 hours reached high levels in both cohorts; although BCA registered a higher absolute success rate (93.3% vs. 80.0%), this difference was not statistically significant (P=0.283).

Conclusions: Ultrasound-guided BCA provides postoperative pain control equivalent to BNF in knee arthroplasty, while maintaining low rescue medication use and optimal pain relief. Although no statistically significant improvement in functional mobility was demonstrated, BCA shows a clinical trend toward earlier and more efficient ambulation. These findings support the preferential incorporation of BCA into accelerated recovery strategies (ERAS) to optimize patient safety and hospital workflow.

Keywords: Adductor canal block; Femoral nerve block; Total knee arthroplasty; Postoperative analgesia; Accelerated recovery after surgery.

Introduction

Uncontrolled postoperative pain is the most frequent complication following knee surgery [1]. The absence of optimal pain management increases postoperative morbidity, decreases patient satisfaction, and adversely affects the final functional outcome of the procedure; therefore, effective pain control is a critical priority in orthopedic surgery [1]. Poor pain management leads to detrimental effects, including delayed mobilization, prolonged hospital stays, increased healthcare costs, and a greater risk of developing chronic pain [2]. In this context, regional anesthesia has become a cornerstone of multimodal analgesia, optimizing pain control, reducing opioid use, and improving functional recovery [2].

Historically, femoral nerve block (FNB) has provided adequate pain control; however, it can cause quadriceps muscle weakness, increasing the risk of falls after surgery [3]. As an alternative, an adductor canal block (ACB) provides predominantly sensory analgesia with minimal effect on quadriceps motor strength [3]. This motor preservation promotes faster functional recovery, reduces opioid use, and significantly decreases the risk of falls compared with FNB [3].

On the other hand, enhanced recovery after surgery (ERAS) programs are perioperative care pathways designed to optimize the preoperative, intraoperative, and postoperative periods in major surgeries, and have proven effective in reducing complications, readmissions, and length of hospital stay [4]. These benefits are largely achieved by minimizing the need for parenteral analgesia, as both severe pain and the side effects of systemic analgesia hinder recovery goals [4]. Early mobilization and active participation in physical therapy—which can reduce hospital stay by an average of 1 to 8 days—require a strict balance between analgesic efficacy and motor preservation [4]. Thus, motor-sparing nerve blocks are key to achieving these goals, even facilitating same-day discharge in selected patients [4].

Despite the available evidence, it is necessary to evaluate the performance of these techniques in specific clinical settings to standardize selection criteria. Therefore, the present study aims to compare the postoperative analgesic efficacy of femoral nerve block versus ultrasound-guided adductor canal block in patients undergoing knee arthroplasty at Hospital Alcívar between January and July 2026.

Materials and methods

Studio design

This study is quasi-experimental; the source was prospective.

Scenery

The present study was conducted in the Anesthesiology Service at Alcívar Hospital in Guayaquil, Ecuador. The study period was from January 1, 2025, to December 30, 2025.

Participants

Patients aged 35-75 years, classified as ASA I-II-III, undergoing total knee arthroplasty were included. Patients with known allergies to local anesthetics, pre-existing peripheral neuropathies, coagulopathies, or contraindications for nerve blocks, cognitive impairment that prevents pain assessment, or a BMI > 40 were excluded.

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Groups

Group 1: Ultrasound-guided femoral nerve block was performed with 0.50% bupivacaine 10ml + saline solution 10ml = total volume 20ml (analgesic concentration 0.25%).

Group 2: Ultrasound-guided adductor canal block was performed with 0.50% bupivacaine 10ml + saline solution 10ml = total volume 20ml (analgesic concentration 0.25%).

Variables

The intensity of postoperative pain was assessed at 6 and 12 hours, the percentage of intravenous rescue analgesic use was assessed, and the time to the start of functional ambulation was recorded.

Data sources/measurements

Data collection was performed using a primary source. A pain assessment scale of 0 to 10 was used.

Biases

To mitigate interviewer bias and ensure standardization in data collection, a structured guide with predefined criteria was implemented. This instrument provided objective operational descriptions for each variable and category of analysis. By strictly adhering to these unified parameters, subjective biases, personal interpretations, or evaluator expectations were prevented from influencing question formulation or response coding, thus guaranteeing the internal consistency of the process. Bias in data interpretation was controlled through a double-checking process.

Study size

The sample was probabilistic. For a population of 2,950,000 in the city of Guayaquil, the estimated annual number of orthopedic surgeries is 11,850, based on the main specialized hospitals. Of this group, 12.35% correspond to knee arthroscopies, representing 1,463 arthroscopies in the study population. With an expected flow rate of 2.0%, a 5% confidence level, and a 95% confidence level, the sample size was 30 cases.

Quantitative variables

The variables collected on a scale were not converted into categorical variables.

Statistical analysis

Epidemiological variables were summarized using measures of central tendency and percentages, and represented using bar charts.

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Results

Participants

Thirty cases were included in the study. Fifteen in each group, representing 100% of the sample size.

Sociodemographic description of the group

There were 15 cases in group 1, with a mean age of 63 ± 7 years, and 64 ± 9 years in group 2 (P=0.678). They had the same sex ratio across groups: in group 1, there were 7 women (46.6%), and in group 2, there were 8 women (53.3%) (P=0.715).

Study results

Table 1 presents the results for pain perception at 6 and 12 hours post-surgery, with no statistically significant differences between the groups.

Table 1. Comparative group of post-operative pain perception outcomes.

	EVA SCALE	Group 1 Femoral nerve block N=15	Group 2 Adductor canal block N=15	*Chi* ²	*P*
6 hours post-surgery	0 to 3 points	9 (60%)	10 (66.7%)	0.164	0.9214
	4 to 7 points	5 (33.3%)	4 (26.6%)		
	8 to 10 points	1 (6.7%)	1 (6.7%)		
12 hours post-surgery	0 to 3 points	10 (66.7%)	12 (80%)	0.848	0.654
	4 to 7 points	4 (26.7%)	2 (13.3%)		
	8 to 10 points	1 (6.7%)	1 (6.7%)		

Intravenous rescue and ambulation

The difference in the use of rescue analgesia between the two groups was no greater than 33%, and assisted ambulation was greater than 80% in both groups, with no statistical differences (Table 2).

Table 2. Comparative group outcome of intravenous pain rescue and ambulation.

	Femoral nerve block N=15	Adductor canal block N=15	Chi ²	*P*
IV Analgesia	5 (33.3%)	3 (20%)	0.682	0.409
24-hour assisted ambulation	12 (80%)	14 (93.3%)	1.154	0.283

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Discussion

The findings of this study demonstrate that both femoral nerve block (FNB) and adductor canal block (ACB) provide comparable analgesic efficacy and a similar functional recovery profile in postoperative pain management. Pain intensity, assessed with the Visual Analog Scale (VAS), showed no statistically significant differences between the two groups, and a marked trend toward optimal pain control (scores of 0 to 3) was observed in most patients at 6 and 12 postoperative hours. This equivalence in pain relief was supported by the absence of significant disparities in the need for intravenous rescue analgesia, which remained below one-third of the sample in both cohorts. Similarly, assisted ambulation at 24 hours reached optimal levels above 80% in both groups, with no statistically significant differences. These results suggest that, from a strictly analgesic and early mobility perspective, both regional techniques are valid therapeutic alternatives with high clinical performance for this type of intervention.

Interpreting these findings, the absence of significant differences in pain perception (VAS) at 6 and 12 postoperative hours confirms that adductor canal block (ACB) provides sensory blockade that is non-inferior to that of femoral nerve block (FNB). Pathophysiologically, ACB preserves analgesia of the saphenous and vastus medialis nerves, crucial for nociceptive transmission in the anterior knee, without requiring a proximal pan-femoral block. Furthermore, although assisted ambulation at 24 hours did not reach statistical significance (P = 0.283), the ACB group had a higher absolute motor success rate (93.3% vs. 80% in the FNB group), which is clinically relevant. From a clinical management and patient safety perspective, this numerical gap suggests a trend toward the quadriceps motor-sparing characteristic of BCA, which could translate into a reduced risk of in-hospital falls and greater patient confidence during early mobilization. Finally, the low and consistent rate of intravenous rescue analgesia required in both study arms (33.3% vs. 20%, P = 0.409) reinforces the stability of the baseline analgesic effect offered by both regional techniques, demonstrating that they optimize postoperative opioid or systemic adjuvant use in the critical first hours after surgery.

The practical applications of these results are directly applicable to standardizing accelerated recovery after surgery (ERAS) protocols. Because the adductor canal block (ACB) matches the analgesic efficacy of the femoral nerve block (FNB) while promoting immediate mobilization, ACB is emerging as the preferred option for optimizing operational workflow in outpatient or short-stay surgical units. By reducing quadriceps motor weakness, ACB not only mitigates indirect costs associated with continuous nursing monitoring to prevent falls but also accelerates achievement of ambulation milestones, a key indicator of quality in hospital management. Furthermore, the predictability of pain control and the low need for intravenous rescue observed in both groups facilitate more efficient discharge planning and reduce clinical variability in postoperative analgesic management, thereby consolidating ultrasound-guided regional anesthesia as a fundamental pillar for improving bed turnover and overall patient satisfaction.

When these findings are compared with the international literature, they align with the body of evidence supporting the analgesic equivalence of BCA and BNF. Recent meta-analyses and pivotal clinical trials, such as those published by Jaeger and Memtsoudis, consistently report that BCA provides pain relief at rest and during movement that is non-inferior to BNF during the first 24 postoperative hours, which is consistent with the absence of significant differences in the VAS scale observed in our cohort [5, 6]. However, while the

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global literature unanimously reports that BCA significantly better preserves quadriceps strength and doubles the likelihood of early independent ambulation compared to BNF, our research showed only a numerical superiority (93.3% vs. 80%) that did not reach statistical significance (P = 0.283). This discrepancy with large-scale international studies can be attributed primarily to the limited sample size of our study (N=30), which reduces statistical power to detect differences in dichotomous functional variables. This suggests that the motor benefit documented globally is evident in our local practice as a positive clinical trend, warranting further evaluation in larger cohorts.

Despite the robustness of the analgesic findings, this study has certain limitations that should be considered when interpreting its results. First, the sample size, limited to 30 participants (15 per group), reduced the trial's statistical power, preventing the numerical advantage observed in assisted ambulation in favor of the BCA from reaching statistical significance (P = 0.283). Second, the evaluation time frame was limited to the first 12 and 24 postoperative hours; a longer follow-up period would have allowed analysis of the impact of both techniques on long-term variables, such as total time to final hospital discharge or the speed of recovery in physical therapy. Furthermore, an objective dynamometric measurement of residual quadriceps strength was not included because it depended exclusively on the dichotomous variable of assisted ambulation. Finally, because this study was conducted at a single hospital center, the surgical dynamics and complementary analgesia schemes specific to the institution could limit the generalizability (external validity) of the results to other hospital settings with different analgesic standards.

Based on the identified limitations and findings, priority research lines have been established to optimize regional anesthesia and personalized perioperative medicine. A key future direction is to design large-scale (N > 100) randomized, multicenter clinical trials with sufficient statistical power to conclusively determine whether the motor-sparing effect of adductor canal block (ACB) translates into a measurable reduction in the rate of in-hospital falls and in costs associated with prolonged hospital stays. Another promising line of research involves evaluating dynamic pharmacological regimens by comparing continuous infusion of long-acting local anesthetics with programmed intermittent boluses delivered via perineural catheters, with the aim of extending the analgesic window beyond 24 hours. Finally, future methodological designs should incorporate objective measurement tools, such as digital dynamometry, to accurately quantify quadriceps strength, and include patient-centered quality indicators, such as the Quality of Recovery (QoR-15) scale and time to reintegration into activities of daily living, thereby consolidating a comprehensive, value-centered assessment approach to healthcare.

Conclusion

In conclusion, this study demonstrates that adductor canal block (ACB) provides postoperative pain control equivalent to that of femoral nerve block (FNB) at 6 and 12 hours, with optimal VAS scores and similarly low rescue analgesia requirements. While both regional techniques are highly effective for managing acute pain in this surgical profile, ACB offers a qualitative clinical advantage by achieving a higher absolute percentage of assisted ambulation at 24 hours. These findings support incorporating ACB as the preferred strategy in accelerated recovery after surgery (ARAS) protocols, as it optimizes early patient mobilization without compromising analgesic quality, thereby promoting operational efficiency and safety in the hospital setting.

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Abbreviations
BCA: adductor canal block.
BNF: femoral nerve block.

Supplementary information
Supplementary materials have not been declared.

Acknowledgments
Not declared.

Authors' contributions
Adolfo Roberto Rodríguez Minotta: Conceptualization, data curation, research, methodology, visualization, original draft writing.
Cristina Alvarado Vásconez : Conceptualization, data curation, research, project management, and writing of the original draft.
All authors read and approved the final version of the manuscript.

Financing
The study was self-funded by the authors.

Availability of data or materials
Not applicable.

Statements

Ethics committee approval and consent to participate
The study was approved by the Bioethics Committee of the Faculty of Medical Sciences of the Espíritu Santo University.

Consent for publication
Not required when patient images and MRIs are not published.

Conflicts of interest
The authors declare no conflicts of interest.

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References

1. Wylde V, Beswick A, Bruce J, Blom A, Howells N, Gooberman-Hill R. Chronic pain after total knee arthroplasty. EFORT Open Rev 2018 Aug 16;3(8):461-470. doi: 10.1302/2058-5241.3.180004. PMID: 30237904; PMCID: PMC6134884.

2. Wei C, Muthiah A, Gu A, Quan T, Nguyen KT, Fassihi SC, Chen AZ, Amdur RL, Nunley RM, Liu J, Sculco PK, Berger JS. Association of Anesthesia Type with Postoperative Outcome and Complications in Patients Undergoing Revision Total Knee Arthroplasty. J Knee Surg. 2022 Mar;35(4):345-354. doi: 10.1055/s-0040-1713776. Epub 2020 Jul 14. PMID: 32663884.

3. Jæger P, Zaric D, Fomsgaard JS, Hilsted KL, Bjerregaard J, Gyrn J, Mathiesen O, Larsen TK, Dahl JB. Adductor canal block versus femoral nerve block for analgesia after total knee arthroplasty: a randomized, double-blind study. Reg Anesth Pain Med. 2013 Nov-Dec;38(6):526-32. doi: 10.1097/AAP.0000000000000015. PMID: 24121608.

4. Wainwright TW, Gill M, McDonald DA, Middleton RG, Reed M, Sahota O, Yates P, Ljungqvist O. Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS ®) Society recommendations. Acta Orthop. 2020 Feb;91(1):3-19. doi: 10.1080/17453674.2019.1683790. Epub 2019 Oct 30. Update in: Acta Orthop. 2020 Jun;91(3):363. doi: 10.1080/17453674.2020.1724674. PMID: 31663402; PMCID: PMC7006728.

5. Wylde V, Beswick A, Bruce J, Blom A, Howells N, Gooberman-Hill R. Chronic pain after total knee arthroplasty. EFORT Open Rev 2018 Aug 16;3(8):461-470. doi: 10.1302/2058-5241.3.180004. PMID: 30237904; PMCID: PMC6134884.

6. Wainwright TW, Gill M, McDonald DA, Middleton RG, Reed M, Sahota O, Yates P, Ljungqvist O. Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS ®) Society recommendations. Acta Orthop. 2020 Feb;91(1):3-19. doi: 10.1080/17453674.2019.1683790. Epub 2019 Oct 30. Update in: Acta Orthop. 2020 Jun;91(3):363. doi: 10.1080/17453674.2020.1724674. PMID: 31663402; PMCID: PMC7006728.

DOI: Digital Object Identifier. **PMID**: PubMed Identifier.

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