

Efectividad y seguridad de tres esquemas analgésicos sin opioide intratecal en cirugía de rodilla bajo anestesia raquídea en un Centro de Referencia del Caribe Colombiano durante el 2025-1

Nombres y apellidos:

Abieser Saeed Salas Carrillo

Código estudiantil: 2022116740182

Vladimir José Humanez Durango

Código estudiantil: 2023116750647

Trabajo de Investigación presentado como requisito para optar el título de:

Especialista en Anestesiología

Tutores:

Dr. Antonio José Morales Roncallo
MD | Spec. Anestesiología

Dr. Henry Joseth González Torres
Bio. | Spec. App. Stat. | M.Sc. Bio. (GenPop) | Dr.Sc. BioMed

RESUMEN

El dolor postoperatorio en cirugía de rodilla es un desafío clínico relevante, asociado con retraso en la movilización, más complicaciones y estancias hospitalarias prolongadas. En este contexto, la analgesia multimodal sin opioides ha cobrado importancia, especialmente en procedimientos con anestesia raquídea sin opioide intratecal por su seguridad. Sin embargo, la evidencia comparativa entre paracetamol solo, paracetamol con AINES y opioides sistémicos sigue siendo limitada, especialmente en Latinoamérica.

Objetivo: Evaluar la efectividad y seguridad de tres esquemas analgésicos postoperatorios, paracetamol solo, paracetamol combinado con AINES y opioides en pacientes sometidos a cirugía de rodilla bajo anestesia raquídea sin opioide intratecal, en términos de control del dolor, estabilidad hemodinámica y recuperación funcional.

Metodología: Se desarrolló un estudio analítico comparativo, prospectivo y observacional en un centro de referencia del Caribe colombiano durante 2025. Se incluyeron 34 pacientes ≥ 18 años con cirugía electiva de rodilla y técnica anestésica única. Los desenlaces evaluados fueron: intensidad del dolor (EVA en 24 h), signos vitales posoperatorios (FC, PAS, PAD), eventos adversos (náuseas, emesis), tiempo hasta la deambulaci3n y duraci3n de la estancia hospitalaria. Las comparaciones se realizaron mediante ANOVA, Chi-cuadrado/Fisher y regresi3n logística multivariada para identificar factores asociados a estancia >48 horas.

Resultados: De los 34 pacientes incluidos, 18 recibieron PCM, 12 PCM + AINES y 4 opioides. No hubo diferencias significativas en edad, sexo, ASA ni comorbilidades entre grupos. La intensidad del dolor no mostr3 variaci3n significativa seg3n el esquema analgésico, aunque PCM + AINES present3 tendencia a menores puntajes EVA. No se observaron diferencias en frecuencia cardíaca, PAS o PAD entre los tres grupos. La incidencia de náuseas y emesis fue baja, predominando en el grupo de opioides. La mayoría de los pacientes logró deambulaci3n en ≤ 24 horas, sin diferencias significativas por esquema. En el análisis multivariado, la estancia >48 h se asoci3 principalmente con EVA posoperatoria más alta y presencia de artrosis, no con el tipo de analgesia administrada.

Conclusi3n: En cirugía de rodilla con anestesia raquídea sin opioide intratecal, los esquemas con paracetamol solo o combinado con AINES mostraron una analgesia comparable a la de los opioides, con mejor tolerabilidad y sin afectar la estabilidad hemodinámica ni la recuperación funcional. Estos resultados respaldan las estrategias multimodales sin opioides como una alternativa eficaz y segura en protocolos de recuperaci3n acelerada en el Caribe colombiano.

Palabras clave: analgesia multimodal; paracetamol; antiinflamatorios no esteroideos; opioides; cirugía de rodilla; recuperación funcional; dolor postoperatorio.

ABSTRACT

Postoperative pain following knee surgery is a significant clinical challenge, as it is associated with delayed mobilization, increased complications, and prolonged hospital stays. In this context, multimodal opioid-free analgesia has gained importance, particularly in procedures performed under spinal anesthesia without intrathecal opioids due to its favorable safety profile. However, comparative evidence between paracetamol alone, paracetamol combined with NSAIDs, and systemic opioids remains limited, especially in Latin America.

Objective: To evaluate the effectiveness and safety of three postoperative analgesic regimens, paracetamol alone, paracetamol combined with NSAIDs, and opioids in patients undergoing knee surgery under spinal anesthesia without intrathecal opioids, focusing on pain control, hemodynamic stability, and functional recovery.

Methods: A prospective, observational, comparative analytical study was conducted in a referral center in the Colombian Caribbean in 2025. A total of 34 patients ≥ 18 years undergoing elective knee surgery with a single anesthetic technique were included. Outcomes assessed included pain intensity (VAS at 24 h), postoperative vital signs (HR, SBP, DBP), adverse events (nausea, vomiting), time to ambulation, and length of hospital stay. Comparisons were performed using ANOVA, Chi-square/Fisher's exact tests, and multivariate logistic regression to identify factors associated with stays >48 hours.

Results: Among the 34 patients included, 18 received PCM, 12 PCM + NSAIDs, and 4 opioids. No significant differences were observed among groups in age, sex, ASA status, or comorbidities. Pain intensity did not show significant variation between analgesic regimens, although PCM + NSAIDs showed a trend toward lower VAS scores. No group differences were found in heart rate, SBP, or DBP. Nausea and vomiting incidence was low, with a higher proportion in the opioid group. Most patients ambulated within ≤ 24 hours, with no significant differences by regimen. In multivariate analysis, hospital stays >48 h were mainly associated with higher postoperative VAS scores and presence of osteoarthritis, not with the analgesic regimen used.

Conclusion: In knee surgery performed under spinal anesthesia without intrathecal opioids, paracetamol alone or combined with NSAIDs provided analgesia comparable to opioid regimens, with better tolerability and without compromising hemodynamic stability or functional recovery. These findings support opioid-free

multimodal strategies as an effective and safe alternative in enhanced recovery protocols in the Colombian Caribbean.

Keywords: multimodal analgesia; paracetamol; nonsteroidal anti-inflammatory drugs; opioids; knee surgery; functional recovery; postoperative pain.

REFERENCIAS BIBLIOGRÁFICAS

1. Zhao C, Liao Q, Yang D, Yang M, Xu P. Advances in perioperative pain management for total knee arthroplasty: a review of multimodal analgesic approaches. *J Orthop Surg Res.* 2024 Dec;19(1):843.
2. Kehlet H, Joshi GP. Enhanced Recovery After Surgery: Current Controversies and Concerns. *Anesth Analg.* 2017 Dec;125(6):2154–5.
3. Gerbershagen HJ, Aduckathil S, van Wijck AJM, Peelen LM, Kalkman CJ, Meissner W. Pain intensity on the first day after surgery: a prospective cohort study comparing 179 surgical procedures. *Anesthesiology.* 2013 Apr;118(4):934–44.
4. Wainwright TW, Gill M, McDonald DA, Middleton RG, Reed M, Sahota O, et al. Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. *Acta Orthop.* 2020 Jan;91(1):3–19.
5. Karpetas GZ, Spyraiki MK, Giakoumakis SI, Fligou FG, Megas PD, Voyagis GS, et al. Multimodal analgesia protocol for pain management after total knee arthroplasty: comparison of three different regional analgesic techniques. *J Musculoskelet Neuronal Interact.* 2021 Mar;21(1):104–12.
6. Renard Y, El-Boghdady K, Rossel JB, Nguyen A, Jaques C, Albrecht E. Non-pulmonary complications of intrathecal morphine administration: a systematic review and meta-analysis with meta-regression. *Br J Anaesth.* 2024 Oct;133(4):823–38.
7. Kaye AD, Urman RD, Cornett EM, Hart BM, Chami A, Gayle JA, et al. Enhanced recovery pathways in orthopedic surgery. *J Anaesthesiol Clin Pharmacol.* 2019 Apr;35(Suppl 1):S35–9.
8. Wheeler M, Oderda GM, Ashburn MA, Lipman AG. Adverse events associated with postoperative opioid analgesia: A systematic review. *J Pain.* 2002 Jun;3(3):159–80.
9. Nwagbologu N, Sarangarm P, D'Angio R. Effect of Intravenous Acetaminophen on Postoperative Opioid Consumption in Adult Orthopedic Surgery Patients. *Hosp Pharm.* 2016 Oct;51(9):730–7.
10. Lu B, Tian AX, Fan ZR, Zhao XW, Jin HZ, Ma JX, et al. Effectiveness of oral vs intravenous acetaminophen on pain management following total joint arthroplasty: A systematic review and meta-analysis. *World J Orthop.* 2025 Apr;16(4):104452.
11. Olivella G, Natal-Albelo E, Rosado E, Rivera L, Tresgallo R, Vidal-Figueroa J, et al. Opioid-Sparing Multimodal Analgesia Efficacy in Hispanic Patients

- Undergoing Total Knee Arthroplasty. JB JS open access. 2023;8(1).
12. Milani P, Castelli P, Sola M, Invernizzi M, Massazza G, Cisari C. Multimodal Analgesia in Total Knee Arthroplasty: A Randomized, Double-Blind, Controlled Trial on Additional Efficacy of Periarticular Anesthesia. *J Arthroplasty*. 2015 Nov;30(11):2038–42.
 13. Gehling M, Tryba M. Risks and side-effects of intrathecal morphine combined with spinal anaesthesia: a meta-analysis. *Anaesthesia*. 2009 Jun;64(6):643–51.
 14. Kessler ER, Shah M, Gruschkus SK, Raju A. Cost and quality implications of opioid-based postsurgical pain control using administrative claims data from a large health system: opioid-related adverse events and their impact on clinical and economic outcomes. *Pharmacotherapy*. 2013 Apr;33(4):383–91.
 15. Shan S, Shi Q, Zhang H. Influencing factors on the quality of recovery after total knee arthroplasty: development of a predictive model. *Front Med*. 2024;11:1427768.
 16. Kehlet H, Dahl JB. Anaesthesia, surgery, and challenges in postoperative recovery. *Lancet (London, England)*. 2003 Dec;362(9399):1921–8.
 17. Pogatzki-Zahn EM, Segelcke D, Schug SA. Postoperative pain-from mechanisms to treatment. *Pain reports*. 2017 Mar;2(2):e588.
 18. Beverly A, Kaye AD, Ljungqvist O, Urman RD. Essential Elements of Multimodal Analgesia in Enhanced Recovery After Surgery (ERAS) Guidelines. *Anesthesiol Clin*. 2017 Jun;35(2):e115–43.
 19. Memtsoudis SG, Fiasconaro M, Soffin EM, Liu J, Wilson LA, Poeran J, et al. Enhanced recovery after surgery components and perioperative outcomes: a nationwide observational study. *Br J Anaesth*. 2020 May;124(5):638–47.
 20. Chunduri A, Aggarwal AK. Multimodal Pain Management in Orthopedic Surgery. *J Clin Med*. 2022 Oct;11(21).
 21. Kianian S, Bansal J, Lee C, Zhang K, Bergese SD. Perioperative multimodal analgesia: a review of efficacy and safety of the treatment options. *Anesthesiol Perioper Sci*. 2024 Jan;2(1):9.
 22. McCorquodale CL, Greening R, Tulloch R, Forget P. Opioid prescribing for acute postoperative pain: an overview of systematic reviews related to two consensus statements relevant at patient, prescriber, system and public health levels. *BMC Anesthesiol*. 2023 Aug;23(1):294.
 23. Wang L, Hong X, Xue Y, Su Z. Effect of opioid sparing strategies on postoperative pain and perioperative hemodynamics in patients undergoing laparoscopic cholecystectomy: a randomized controlled study. *BMC Anesthesiol*. 2025 Feb;25(1):100.
 24. Franzoni S, Rossi SMP, Cassinadri A, Sangaletti R, Benazzo F. Perioperative Pain Management in Total Knee Arthroplasty: A Narrative Review of Current Multimodal Analgesia Protocols. *Appl Sci*. 2023 Mar;13(6):3798.
 25. Mousad AD, Nithagon P, Grant AR, Yu H, Niu R, Smith EL. Non-Opioid Analgesia Protocols After Total Hip Arthroplasty and Total Knee Arthroplasty: An Updated Scoping Review and Meta-Analysis. *J Arthroplasty*. 2025 Jun;40(6):1643-1652.e6.

26. Neuman MD, Feng R, Carson JL, Gaskins LJ, Dillane D, Sessler DI, et al. Spinal Anesthesia or General Anesthesia for Hip Surgery in Older Adults. *N Engl J Med.* 2021 Nov;385(22):2025–35.
27. Owen AR, Amundson AW, Larson DR, Duncan CM, Smith HM, Johnson RL, et al. Spinal Versus General Anesthesia in Contemporary Revision Total Knee Arthroplasties. *J Arthroplasty.* 2023 Jun;38(6S):S271-S274.e1.
28. Johnson RL, Kopp SL, Burkle CM, Duncan CM, Jacob AK, Erwin PJ, et al. Neuraxial vs general anaesthesia for total hip and total knee arthroplasty: a systematic review of comparative-effectiveness research. *Br J Anaesth.* 2016 Feb;116(2):163–76.
29. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Commi. *J pain.* 2016 Feb;17(2):131–57.
30. Kincaid S, How J, Agrawal DK. Multimodal Analgesia in the Perioperative Period of Major Surgeries: An In-depth Analysis. *Anesth Crit care (Houston, Tex).* 2025;7(3):68–76.
31. Sinatra R. Role of COX-2 inhibitors in the evolution of acute pain management. *J Pain Symptom Manage.* 2002 Jul;24(1 Suppl):S18-27.
32. Maund E, McDaid C, Rice S, Wright K, Jenkins B, Woolacott N. Paracetamol and selective and non-selective non-steroidal anti-inflammatory drugs for the reduction in morphine-related side-effects after major surgery: a systematic review. *Br J Anaesth.* 2011 Mar;106(3):292–7.
33. Patterson DC, Cagle PJ, Poeran J, Zubizarreta N, Mazumdar M, Galatz LM, et al. Effectiveness of intravenous acetaminophen for postoperative pain management in shoulder arthroplasties: A population-based study. *J Orthop Transl.* 2019 Jul;18:119–27.
34. Kokki H. Nonsteroidal anti-inflammatory drugs for postoperative pain: a focus on children. *Paediatr Drugs.* 2003;5(2):103–23.
35. Leth MF, Bukhari S, Laursen CCW, Larsen ME, Tornøe AS, Jakobsen JC, et al. Risk of serious adverse events associated with non-steroidal anti-inflammatory drugs in orthopaedic surgery. A protocol for a systematic review. *Acta Anaesthesiol Scand.* 2022 Nov;66(10):1257–65.
36. Cheung CK, Adeola JO, Beutler SS, Urman RD. Postoperative Pain Management in Enhanced Recovery Pathways. *J Pain Res.* 2022;15:123–35.
37. Halvey EJ, Haslam N, Mariano ER. Non-steroidal anti-inflammatory drugs in the perioperative period. *BJA Educ.* 2023 Nov;23(11):440–7.
38. Ghai B, Jafra A, Bhatia N, Chanana N, Bansal D, Mehta V. Opioid sparing strategies for perioperative pain management other than regional anaesthesia: A narrative review. *J Anaesthesiol Clin Pharmacol.* 2022;38(1):3–10.
39. Pawasauskas J, Houlihan P, Kelley M. Impact of IV acetaminophen in a post-operative orthopedic population: a retrospective review. *J Pain.* 2013

Apr;14(4):S84.

40. Gan TJ. Mechanisms underlying postoperative nausea and vomiting and neurotransmitter receptor antagonist-based pharmacotherapy. *CNS Drugs*. 2007;21(10):813–33.
41. Memtsoudis SG, Sun X, Chiu YL, Stundner O, Liu SS, Banerjee S, et al. Perioperative comparative effectiveness of anesthetic technique in orthopedic patients. *Anesthesiology*. 2013 May;118(5):1046–58.
42. Lavand’homme PM, Kehlet H, Rawal N, Joshi GP, PROSPECT Working Group of the European Society of Regional Anaesthesia and Pain Therapy (ESRA). Pain management after total knee arthroplasty: PROcedure SPEcific Postoperative Pain ManagementT recommendations. *Eur J Anaesthesiol*. 2022 Sep;39(9):743–57.
43. van Deventer L, Bronstone A, Leonardi C, Bennett M, Yager P, Dasa V. A modern multimodal pain protocol eliminates the need for opioids for most patients following total knee arthroplasty: results from a retrospective comparative cohort study. *J Exp Orthop*. 2023 Feb;10(1):20.
44. Bronstone AB, Leonardi C, Brown J, Crabb R, Dasa V. Multimodal Opioid-sparing Analgesia for Total Knee Arthroplasty: Results from a Retrospective Case Series of 40 Patients. *J Orthop Exp Innov*. 2022 Mar;3(1).
45. Yin F, Ma W, Liu Q, Xiong LL, Wang TH, Li Q, et al. Efficacy and safety of intravenous acetaminophen (2 g/day) for reducing opioid consumption in Chinese adults after elective orthopedic surgery: A multicenter randomized controlled trial. *Front Pharmacol*. 2022;13:909572.
46. Hickman SR, Mathieson KM, Bradford LM, Garman CD, Gregg RW, Lukens DW. Randomized trial of oral versus intravenous acetaminophen for postoperative pain control. *Am J Health Syst Pharm*. 2018 Mar;75(6):367–75.
47. Sun L, Zhu X, Zou J, Li Y, Han W. Comparison of intravenous and oral acetaminophen for pain control after total knee and hip arthroplasty: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2018 Feb;97(6):e9751.
48. Huang PS, Gleason SM, Shah JA, Buros AF, Hoffman DA. Efficacy of Intravenous Acetaminophen for Postoperative Analgesia in Primary Total Knee Arthroplasty. *J Arthroplasty*. 2018 Apr;33(4):1052–6.
49. Moore RA, Wiffen PJ, Derry S, Maguire T, Roy YM, Tyrrell L. Non-prescription (OTC) oral analgesics for acute pain - an overview of Cochrane reviews. *Cochrane database Syst Rev*. 2015 Nov;2015(11):CD010794.
50. Vrancken D, Theunissen M, Joosten EA, Fiddelers AAA, Hoofwijk DMN, Buhre WFFA, et al. Procedure-Specific Pain Intensity Four Days After Day Surgery and the Relationship with Preoperative Pain: A Prospective Cohort Study. *Anesthesiol pain Med*. 2018 Dec;8(6):e81366.
51. Wheeler M, Oderda GM, Ashburn MA, Lipman AG. Adverse events associated with postoperative opioid analgesia: a systematic review. *J pain*. 2002 Jun;3(3):159–80.
52. Meylan N, Elia N, Lysakowski C, Tramèr MR. Benefit and risk of intrathecal morphine without local anaesthetic in patients undergoing major surgery:

- meta-analysis of randomized trials. *Br J Anaesth.* 2009 Feb;102(2):156–67.
53. White PF, Kehlet H. Improving Postoperative Pain Management. *Anesthesiology.* 2010 Jan;112(1):220–5.
 54. Tazreean R, Nelson G, Twomey R. Early mobilization in enhanced recovery after surgery pathways: current evidence and recent advancements. *J Comp Eff Res.* 2022 Feb;11(2):121–9.
 55. Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review. *JAMA Surg.* 2017 Mar;152(3):292–8.
 56. Walco JP, Rengel KF, McEvoy MD, Henson CP, Li G, Shotwell MS, et al. Association between Preoperative Blood Pressures and Postoperative Adverse Events. *Anesthesiology.* 2024 Aug;141(2):272–85.