



International Journal of Medical Anesthesiology

E-ISSN: 2664-3774
P-ISSN: 2664-3766
www.anesthesiologypaper.com
IJMA 2024; 7(3): 52-54
Received: 21-05-2024
Accepted: 29-06-2024

Ghada Magdy Behery
Anesthesiology & Surgical
I.C.U and Pain Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

**Shimaa Elsaied Ibrahim
Shaban**
Anesthesiology & Surgical
I.C.U and Pain Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

**Mohammad Ali Mohammad
Abduallah**
Anesthesiology & Surgical
I.C.U and Pain Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Nadia Hassan Fattoh
Anesthesiology & Surgical
I.C.U and Pain Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Corresponding Author:
Ghada Magdy Behery
Anesthesiology & Surgical
I.C.U and Pain Medicine
Department, Faculty of
Medicine, Tanta University,
Tanta, Egypt

Analgesia patients scheduled for elective arthroscopic anterior cruciate ligament reconstruction with focus on popliteal plexus block and adductor canal block

Ghada Magdy Behery, Shimaa Elsaied Ibrahim Shaban, Mohammad Ali Mohammad Abduallah and Nadia Hassan Fattoh

DOI: <https://doi.org/10.33545/26643766.2024.v7.i3a.487>

Abstract

Anterior cruciate ligament (ACL) injuries are painful and incapacitating, and they are usually treated as outpatient surgical procedures employing an arthroscopic method. On the other hand, a lot of patients report that within the first 24 hours after ACL reconstruction (ACLR), they have excruciating postoperative pain. After anterior cruciate ligament repair, saphenous nerve block, or more frequently, adductor canal block (ACB), exhibits inconsistent outcomes for postoperative pain management. Maintaining or reducing the loss of quadriceps strength is the key advantage of ACB since it speeds up walking and recuperation after knee surgery. However, using it in ACLR has led to inconsistent outcomes. Leg weakness may result from adding a tibial nerve block, which may successfully cover the hamstring tendon graft region but raise the risk of falling. By using our approach, it is easier to conduct the combined adductor and PP block, which saves time for day-case surgery. All it takes is noting the location of the artery about the sartorius muscle to perform both blocks without altering the patient's posture.

Keywords: Analgesia, Elective arthroscopic ACL reconstruction, Popliteal plexus block, Adductor canal block, Pain management, Regional anesthesia, ACL surgery

Introduction

Anterior cruciate ligament (ACL) sprains or tears brought on by trauma are among the most frequent injuries to the knee [1]. ACL injury is debilitating and frequently must be repaired through an outpatient procedure called an arthroscopic procedure. However, on the first postoperative day following ACL repair (ACLR), individuals have excruciating agony [2]. Effective post-operative pain management is critical to the healing process and the pleasure of the patient. Psychological variables have a significant role in forecasting the results of ACLR procedures for patients. Additionally, there is a negative correlation between function and life quality assessment. There is continuous work to reduce muscular weakness following surgery and increase analgesia following surgery [3,4]. An innovative technique for providing pain relief following knee surgery is the adductor canal block (ACB). By obstructing the sensory branches of the saphenous nerve and the nerve that runs from the vastus medialis to the knee, it effectively relieves pain in the medial and anterior aspects of the knee [5]. With little to no impact on the ankle musculature, the popliteal plexus block (PPB) is a new sensory block to the posterior knee compartment that anesthetizes the sensory tibial genicular post-obturator nerve branches [6].

Nowadays, outpatient procedures are virtually exclusively used for ACL restoration. Although this has reduced expenses and improved patient satisfaction [7], it has also made postoperative pain management more difficult. Because functional recovery and quality-of-life evaluations are strongly correlated with pain levels, effective pain management is crucial in outpatient ACL repair [8,9].

Management of postoperative pain after ACLR

Given the strong correlations between pain levels and quality-of-life evaluations [10] and functional recovery [9], effective pain management is crucial in outpatient ACLR. There isn't an agreement on it now. Multimodal analgesia refers to the utilization of several pain management modalities to maximize the positive analgesic benefits while reducing the

negative effects associated with opioids [11]. A combination of nonsteroidal anti-inflammatory medicines (NSAIDs), acetaminophen (or paracetamol), low dosage ketamine, the surgeon's perioperative administration of local anesthetics, regional anesthesia treatments, and gabapentin are often utilized pharmaceuticals with this kind of analgesic approach [11].

- **Nonpharmacological agent:** Nonpharmacological methods can be somewhat helpful in the treatment of acute pain. Information sharing, psychological strategies including diversion, relaxation, and cognitive behavioral treatments, transcutaneous electrical nerve stimulation (TENS), acupuncture, manual therapies, hydrotherapy, and physiotherapy are a few of them [12].
- **Pharmacological agents** [13]

1. Non-opioid analgesics [14]

- Paracetamol
- NSAIDs

2. **Opioid treatments:** Opioid receptor-specific binding and activation occur in the central and peripheral nervous systems when opioid analgesics bind to and activate certain receptor sites. By several methods, these receptors block the transmission of pain when they are triggered, resulting in analgesia [15].

3. Adjuvant analgesics [16]

- Anticonvulsants
- Ketamine
- Dexamethasone

4. Peripheral nerve block

▪ Femoral nerve block FNB

(FNB) is regarded as the typical peripheral nerve block for patients having ACLR and is frequently utilized as an analgesic treatment. But quadriceps muscular strength significantly decreases after FNB, which can lead to delayed mobilization and an increased risk of falling [17, 18].

▪ Adductor canal block

The adductor canal block was first applied at the level of the distal thigh, distal to the quadriceps motor branches. Van der Wal [19] first reported this method as a very effective approach to the saphenous nerve. Analgesia and anesthesia of the medial calf and ankle are common uses for this block [20]. The saphenous nerve, the vastus medialis nerve, the medial femoral cutaneous nerve, the articular branches from the obturator, and the medial retinacular nerves are all believed to form part of an ACB. The medial, anterior, and lateral parts of the knee are innervated by this distribution [20].

▪ Popliteal plexus block (PP)

The PP entwines the popliteal artery and vein adjacent to the adductor hiatus in the popliteal fossa [21, 22]. The popliteal plexus, composed of the tibial nerve and posterior obturator nerve, innervates the posterior part of the knee [22]. It has been proposed that LA might also be injected at the distal portion of AC to anesthetize the articular branches innervating the posterior capsule of the knee, right before the femoral vessels descend to

form the popliteal vessels. The popliteal plexus block is the name given to this strategy [22].

Although PPB is a novel sensory block, it was confirmed in cadaveric studies that injection at the distal part of the AC stains branches of the popliteal plexus. Goffin P, *et al.* [23] injected 20 ml of solution containing methylene blue into the distal part of AC in eight fresh cadavers. After the cadavers' dissection, results showed staining of the popliteal plexus in the whole cadavers. Moreover, Runge, *et al.* [24] replicated the same outcomes using a lower volume. On ten cadaver sides, they injected ten milliliters of dye into the distal portion of the AC. To evaluate the injectate's spread and the popliteal plexus and posterior obturator nerve's genicular branch's coloring, dissection was performed. The genicular branch of the posterior obturator nerve and the popliteal plexus were stained in all ten dissections following distal AC injections, according to the results.

Gautier PE, *et al.* [25], also injected 20 ml solution containing 18 ml mepivacaine and 2 ml of radio-opaque contrast material (Isohexilisohehexil600) in the distal part of AC in fifteen healthy volunteers undergoing knee surgery. Dye detection by computerized tomography (CT) was done. Results showed that the Contrast solution was found in the popliteal fossa. Mahmoud A, *et al.* [6], reported that the time to first request rescue analgesia was delayed in combined ACB and PPB blocks than in ACB alone.

Conclusion

After arthroscopic ACLR, patients who got a combination of ACB and PPB showed improved pain management and a reduction in early postoperative discomfort as compared to those who received ACB alone as standard treatment.

References

1. Barnett S, Murray MM, Liu S, Micheli LJ. Resolution of pain and predictors of postoperative opioid use after bridge-enhanced anterior cruciate ligament repair and anterior cruciate ligament reconstruction. *Arthroscopy Sports Medicine and Rehabilitation*; c2020. p. 2.
2. Secrist ES, Freedman KB, Ciccotti MG, Mazur DW, Hammoud S. Pain management after outpatient anterior cruciate ligament reconstruction: A systematic review of randomized controlled trials. *American Journal of Sports Medicine*. 2016;44:2435-2447.
3. Okoroha KR, Keller RA, Jung EK, Khalil L, Marshall N, Kolowich PA, *et al.* Pain assessment after anterior cruciate ligament reconstruction: *Bone*-patellar tendon-*bone* versus *hamstring* tendon autograft. *Orthopaedic Journal of Sports Medicine*. 2016;4:2325967116674924.
4. Terkawi AS, Mavridis D, Sessler DI, Nunemaker MS, Doais KS, Terkawi RS, *et al.* Pain management modalities after total knee arthroplasty: A network meta-analysis of 170 randomized controlled trials. *Anesthesiology*. 2017;126:923-937.
5. Burckett-St Laurant D, Peng P, Girón Arango L, Niazi AU, Chan VW, Agur A, *et al.* The nerves of the adductor canal and the innervation of the knee: An anatomic study. *Regional Anesthesia and Pain Medicine*. 2016;41:321-327.
6. Mahmoud A, Boules M, Botros J, Mostafa M, Ragab S, Alsaied M. Analgesic impact of a *popliteal* plexus block to standard adductor canal block in arthroscopic

- anterior cruciate ligament reconstruction: A randomized blind clinical trial. *Pain Research and Management*. 2021;2021:1723471.
7. Krywulak SA, Mohtadi NG, Russell ML, Sasyniuk TM. Patient satisfaction with inpatient versus outpatient reconstruction of the anterior cruciate ligament: A randomized clinical trial. *Canadian Journal of Surgery*. 2005;48:201-206.
 8. Chmielewski TL, Jones D, Day T, Tillman SM, Lentz TA, George SZ. The association of pain and fear of movement/reinjury with function during anterior cruciate ligament reconstruction rehabilitation. *Journal of Orthopaedic and Sports Physical Therapy*. 2008;38:746-753.
 9. Filbay SR, Ackerman IN, Russell TG, Macri EM, Crossley KM. Health-related quality of life after anterior cruciate ligament reconstruction: A systematic review. *American Journal of Sports Medicine*. 2014;42:1247-1255.
 10. Koyonos L, Owsley K, Vollmer E, Limpisvasti O, Gambardella R. Preoperative cryotherapy use in anterior cruciate ligament reconstruction. *The Journal of Knee Surgery*. 2014;27:479-484.
 11. Elvir-Lazo OL, White PF. The role of multimodal analgesia in pain management after ambulatory surgery. *Current Opinion in Anaesthesiology*. 2010;23:697-703.
 12. Ng L, Cashman J. The management of acute pain. *Medicine*. 2018;46:780-785.
 13. Radvansky BM, Shah K, Parikh A, Sifonios AN, Le V, Eloy JD. Role of *ketamine* in acute postoperative pain management: A narrative review. *Biomedical Research International*. 2015;2015:749837.
 14. Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, *et al.* Guidelines for perioperative care in elective colorectal surgery: Enhanced recovery after surgery (ERAS) society recommendations: 2018. *World Journal of Surgery*. 2019;43:659-695.
 15. Davey MS, Hurley ET, Anil U, Moses A, Thompson K, Alaia M, *et al.* Pain management strategies after anterior cruciate ligament reconstruction: A systematic review with network meta-analysis. *Arthroscopy*. 2021;37:1290-1300.e6.
 16. Tomić M, Pecikoza U, Micov A, Vučković S, Stepanović-Petrović R. Antiepileptic drugs as analgesics/adjuvants in inflammatory pain: Current preclinical evidence. *Pharmacology & Therapeutics*. 2018;192:42-64.
 17. Borys M, Domagała M, Wencław K, Jarczyńska-Domagała J, Czuczwar M. Continuous *femoral* nerve block is more effective than continuous adductor canal block for treating pain after total knee arthroplasty: A randomized, double-blind, controlled trial. *Medicine (Baltimore)*; c2019. p. 98.
 18. Macrinici GI, Murphy C, Christman L, Drescher M, Hughes B, Macrinici V, *et al.* Prospective, double-blind, randomized study to evaluate single-injection adductor canal nerve block versus *femoral* nerve block: Postoperative functional outcomes after total knee arthroplasty. *Regional Anesthesia and Pain Medicine*. 2017;42:10-16.
 19. Enneking KF, Chan V, Greger J, Hadžić A, Lang SA, Horlocker TT. Lower-extremity peripheral nerve blockade: Essentials of our current understanding. *Regional Anesthesia and Pain Medicine*. 2005;30:4-35.
 20. Bailey L, Griffin J, Elliott M, Wu J, Papavasiliou T, Harner C, *et al.* Adductor canal nerve versus *femoral* nerve blockade for pain control and quadriceps function following anterior cruciate ligament reconstruction with patellar tendon autograft: A prospective randomized trial. *Arthroscopy*. 2019;35:921-929.
 21. Abdallah FW, Mejia J, Prasad GA, Moga R, Chahal J, Theodoropoulos J, *et al.* Opioid- and motor-sparing with proximal, mid-, and distal locations for adductor canal block in anterior cruciate ligament reconstruction: A randomized clinical trial. *Anesthesiology*. 2019;131:619-629.
 22. Runge C, Bjørn S, Jensen JM, Nielsen ND, Vase M, Holm C, *et al.* The analgesic effect of a *popliteal* plexus blockade after total knee arthroplasty: A feasibility study. *Acta Anaesthesiologica Scandinavica* c2018.
 23. Goffin P, Lecoq JP, Ninane V, Brichant JF, Sala-Blanch X, Gautier PE, *et al.* Interfascial spread of injectate after adductor canal injection in fresh human cadavers. *Anesthesia and Analgesia*. 2016;123:501-503.
 24. Runge C, Moriggl B, Børglum J, Bendtsen TF. The spread of ultrasound-guided injectate from the adductor canal to the genicular branch of the posterior obturator nerve and the *popliteal* plexus: A cadaveric study. *Regional Anesthesia and Pain Medicine*. 2017;42:725-730.
 25. Gautier PE, Hadzic A, Lecoq JP, Brichant JF, Kuroda MM, Vandepitte C. Distribution of injectate and sensory-motor blockade after adductor canal block. *Anesthesia and Analgesia*. 2016;122:279-282.

How to Cite This Article

Behery GM, Shaban SEI, Abdullah MAM, Fattoh NH. Analgesia patients scheduled for elective arthroscopic anterior cruciate ligament reconstruction with focus on popliteal plexus block and adductor canal block. *International Journal of Medical Anesthesiology*. 2024;7(3):52-54.

Creative Commons (CC) License

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 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.