



Application of Genicular Nerves Block Combined with iPACK Block in Postoperative Analgesia of Total Knee Arthroplasty

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Received date: 28 February 2023; **Accepted date:** 13 March 2023; **Published date:** 18 March 2023

Citation: Zeng Y, Xu Y. Application of Genicular Nerves Block Combined with iPACK Block in Postoperative Analgesia of Total Knee Arthroplasty. *Asp Biomed Clin Case Rep.* 2023 Mar 18;6(1):47-49.

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Abstract

The incidence of moderate to severe pain after total knee arthroplasty (TKA) ranges from 30-60% [1]. In the context of enhanced recovery after surgery, multimodal analgesia with peripheral nerve block as the core has become the main method of postoperative analgesia after TKA, and good analgesia is conducive to the early recovery of patients. Genicular nerve block (GNB) provides good analgesia anterior to the knee, while infiltration between the popliteal artery and capsule of the knee (iPACK) block provides good analgesia posterior to the knee [2]. We report a case of genicular nerve block combined with iPACK block for postoperative analgesia after total knee arthroplasty.

Keywords

Total Knee Arthroplasty, Genicular Nerves Block, Infiltration Between the Popliteal Artery and Capsule of Knee, Analgesia, Case Report

Case Presentation

A 62-year-old female was scheduled for left total knee arthroplasty under general anesthesia. In the operating room, standard electrocardiogram, oxygen saturation (SpO₂), and blood pressure monitoring were performed before administering general anesthesia. The patient received intravenous anesthetic drugs, including midazolam (2 mg), propofol (2 mg/kg), sufentanil (0.3 µg/kg), and cisatracurium (0.2 mg/kg). Mechanical ventilation was performed using either a laryngeal mask or endotracheal intubation. Sevoflurane was also administered through inhalation, and remifentanil was administered as needed for analgesia during surgery. Genicular nerve block (GNB) was performed at three positions on the left knee joint:

superior medial, superior lateral, inferior medial, inferior lateral, and recurrent tibial nerves of the knee joint. Under ultrasound guidance and strict sterile conditions, we injected 4 ml of 0.33% ropivacaine and 1 mg of dexamethasone at each location (**Fig-1**). iPACK block was performed with abduction and external rotation of the patient's lower limbs in the supine position. With the femoral condyle as the anchor point, the probe was moved proximally to find the femoral shaft and popliteal artery. The nerve block needle was inserted into the gap between the popliteal artery and posterior capsule of the knee joint, and we injected 30 ml of 0.33% ropivacaine and 5 mg of dexamethasone (**Fig-2**). Flurbiprofen 50 mg was injected intravenously 20 minutes before the end of surgery to prevent

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postoperative pain, and tropisetron 5 mg was injected to prevent postoperative nausea and vomiting. After the patient was awake, the tracheal tube was removed, and the patient was sent to the postanesthesia care unit.

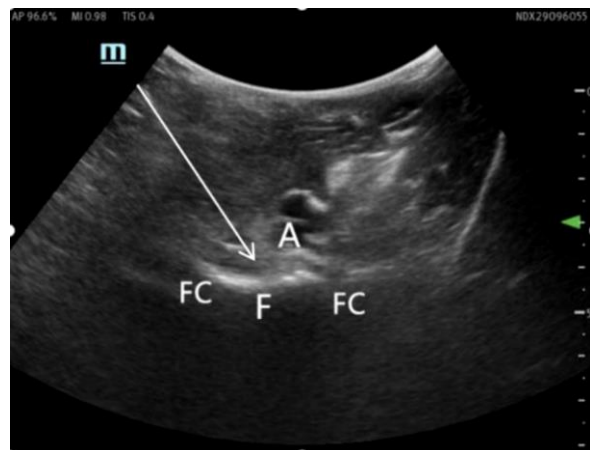


Fig-2: Ultrasound-Guided Infiltration Between the Popliteal Artery and Capsule of the Posterior Knee Block

A: Artery; F: Femur; FC: Femoral Condyle; White Line: Needle Insertion Point

The patient's resting numerical rating scale (NRS) was 1 at 6 hours after TKA. At this time, she was able to fully extend the knee and perform knee flexion activities in the hospital bed with a pain score of 3. The NRS was 1 for the rest group and 4 for the activity group at 12 and 24 hours after surgery.

Twelve hours after surgery, the patient was able to walk with the support of a walking aid. The patient was discharged 3 days after surgery, and the length of hospital stay was 5 days. During this period, no adverse events such as nausea, vomiting, falls, and so on occurred. The patient was highly satisfied with the analgesic effect of this operation.

Discussion

GNB is used for the treatment of persistent pain after osteoarthritis and total knee arthroplasty [3,4] to reduce chronic postoperative pain. GNB selectively blocks the articular branch of the anterior capsule of

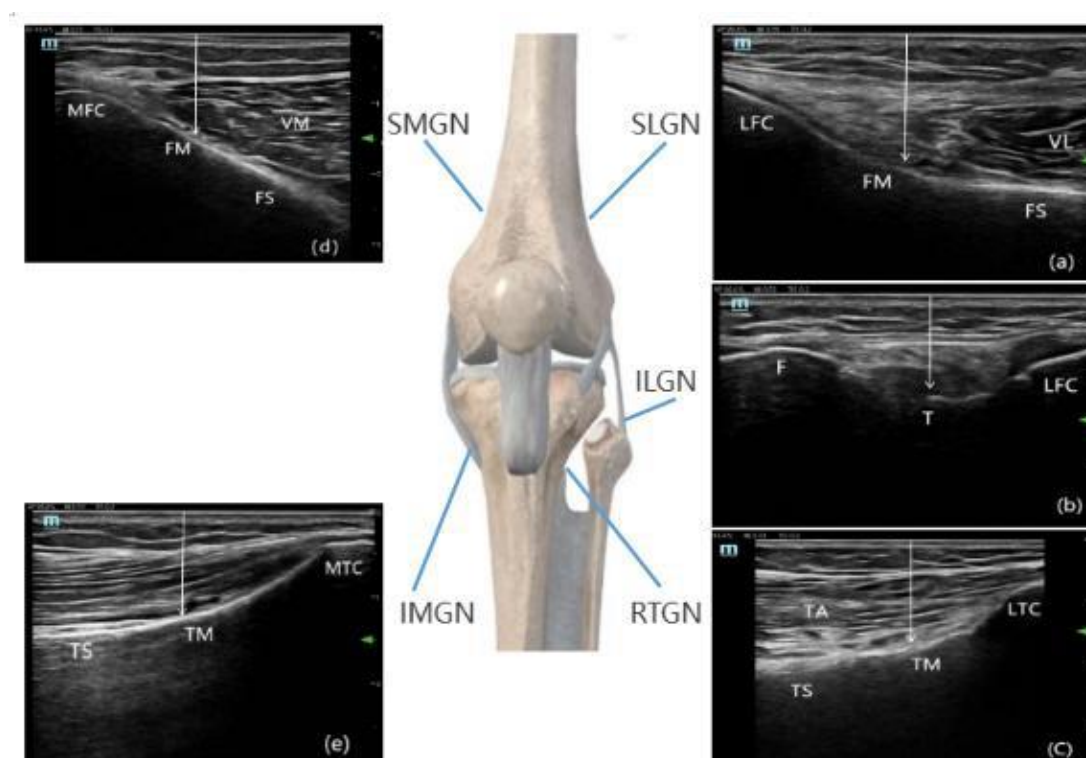


Fig-1: Ultrasound-Guided Genicular Nerves Block

(a) Target point for SLGN (Superior Lateral Genicular Nerve); (b) Target point for ILGN (Inferior Lateral Genicular Nerve); (c) Target point for RTGN (recurrent tibial genicular nerve); (d) Target point for SMGN (Superior Medial Genicular Nerve); (e) Target point for IMGN (Inferior Medial Genicular Nerve); White line: Needle Insertion Point; F: Fibula; FM: Femoral Metaphysis; FS: Femoral Shaft; LFC: Lateral Femoral Condyle; LTC: Lateral Tibial Condyle; MFC: Medial Femoral Condyle; MTC: Medial Tibial Condyle; T: Tibia; TA: Tibialis Anterior; TM: Tibial Metaphysis; TS: Tibial Shaft; VL: Vastus Lateralis; VM: Vastus Medialis.

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the knee, and it has been reported to result in lower pain scores at 24 hours after surgery and greatly reduced use of local anesthetic solutions than local infiltration analgesia [5,6]. Although the genicular nerves block is injected at five points, its position is superficial, and the bony landmarks are obvious, so the operation is simple, and the time required is short (about 6 minutes). John Tran et al. [7] showed that the joint branches innervating the posterior capsule of the knee joint come from the posterior obturator branch, tibial nerve, sciatic nerve, and common peroneal nerve, and iPACK is the popliteal plexus that blocks these nerve branches.

GNB combined with iPACK can provide anterior and posterior analgesia of the knee joint, and both of them do not affect the muscle strength of the lower limbs, prolong the duration of postoperative analgesia, and promote the early rehabilitation exercise of patients undergoing TKA.

Further randomized controlled trials are needed to compare the analgesic effects of GNB, adductor canal block, and femoral triangle block combined with iPACK block for total knee arthroplasty. The optimal dose and concentration of local anesthetics should be further explored.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

References

[1] Rice DA, Kluger MT, McNair PJ, Lewis GN, Somogyi AA, Borotkanics R, Barratt DT, Walker M. Persistent postoperative pain after total knee arthroplasty: a

prospective cohort study of potential risk factors. *Br J Anaesth.* 2018 Oct;121(4):804-12. [PMID: 30236242]

[2] Chan E, Howle R, Onwochei D, Desai N. Infiltration between the popliteal artery and the capsule of the knee (iPACK) block in knee surgery: a narrative review. *Reg Anesth Pain Med.* 2021 Sep;46(9):784-805. [PMID: 33990439]

[3] Stake S, Agarwal AR, Coombs S, Cohen JS, Golladay GJ, Campbell JC, Thakkar SC. Total Knee Arthroplasty After Genicular Nerve Radiofrequency Ablation: Reduction in Prolonged Opioid Use Without Increased Postsurgical Complications. *J Am Acad Orthop Surg Glob Res Rev.* 2022 Aug 12;6(8):e22.00125. [PMID: 35960987]

[4] Cheppalli N, Bhandarkar AW, Sambandham S, Oloyede SF. Safety and Efficacy of Genicular Nerve Radiofrequency Ablation for Management of Painful Total Knee Replacement: A Systematic Review. *Cureus.* 2021 Nov 11;13(11):e19489. [PMID: 34912630]

[5] Pietrantonio P, Cuñat T, Nuevo-Gayoso M, Martín N, Tió M, Basora M, Sastre S, Sala-Blanch X. Ultrasound-guided genicular nerves block: an analgesic alternative to local infiltration analgesia for total knee arthroplasty: A noninferiority, matched cohort study. *Eur J Anaesthesiol.* 2021 Aug 1;38(Suppl 2):S130-37. [PMID: 34038916]

[6] Cuñat T, Mejía J, Tatjer I, Comino O, Nuevo-Gayoso M, Martín N, Tió M, Basora M, Sala-Blanch X. Ultrasound-guided genicular nerves block vs. local infiltration analgesia for total knee arthroplasty: a randomised controlled non-inferiority trial. *Anaesthesia.* 2023 Feb;78(2):188-96. [PMID: 36351436]

[7] Tran J, Peng PWH, Gofeld M, Chan V, Agur AMR. Anatomical study of the innervation of posterior knee joint capsule: implication for image-guided intervention. *Reg Anesth Pain Med.* 2019 Feb;44(2):234-38. [PMID: 30700618]



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Manuscript no: 2582-0370-6-47
Asp Biomed Clin Case Rep

Volume: 6 Issue: 1

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