



International Journal of Medical Anesthesiology

E-ISSN: 2664-3774

P-ISSN: 2664-3766

www.anesthesiologypaper.com

IJMA 2024; 7(3): 48-51

Received: 16-05-2024

Accepted: 24-06-2024

Mai Abd EL-Haleem Kamal Nida

Anesthesiology, Surgical Intensive Care and Pain Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt

Mohammad Ali Mohammad Abdullah

Anesthesiology, Surgical Intensive Care and Pain Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt

Ahmed Ali EL Daba

Anesthesiology, Surgical Intensive Care and Pain Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt

Mohamed Shebl Abdelghany

Anesthesiology, Surgical Intensive Care and Pain Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt

Corresponding Author:

Mai Abd EL-Haleem Kamal Nida

Anesthesiology, Surgical Intensive Care and Pain Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt

Post-operative analgesia with focus on ultrasound-guided transmuscular quadratus lumborum block after total hip arthroplasty

Mai Abd EL-Haleem Kamal Nida, Mohammad Ali Mohammad Abdullah, Ahmed Ali EL Daba and Mohamed Shebl Abdelghany

DOI: <https://doi.org/10.33545/26643766.2024.v7.i3a.486>

Abstract

A significant number of patients who undergo total hip arthroplasty (THA) commonly encounter intense acute pain during the initial postoperative phase. Optimal management of pain following surgery can facilitate prompt engagement in rehabilitation and enhance patient satisfaction. Alternatively, if not handled, patients may experience persistent discomfort and impairment, leading to a diminished quality of life. The utilization of transmuscular quadratus lumborum block (TQLB) resulted in enhanced post-operative analgesics for hip and proximal femoral operations, as compared to the usual intravenous analgesics. Individuals who received QLB during primary THA surgery under general or spinal anesthesia experienced a reduction in post-operative opioid need and post-operative pain score.

Keywords: Ultrasound-guided, transmuscular quadratus lumborum block, total hip arthroplasty, pain management, regional anesthesia, hip replacement surgery

Introduction

Total hip arthroplasty (THA) is a frequently performed and very efficient surgical intervention that improves the quality of life and functional abilities of individuals. It is also a cost-efficient intervention [1]. Nevertheless, despite these benefits, THA can be linked to substantial post-operative pain. Postoperative pain following THA might have a negative impact on the early recovery of individuals following surgeries. In addition, pain can have a detrimental effect on the ability to move after surgery, which increases the likelihood of developing venous thromboembolic illness. Furthermore, pain can also hinder the process of rehabilitation. Consequently, these effects of pain can extend the time it takes for patients to recover and can escalate both the duration of their hospital stay and the associated expenses. Consequently, it is crucial to prioritize sufficient pain management following THA to enhance patient satisfaction and decrease the physiological effects of pain [2]. The use of US-guided Quadratus lumborum block (QLB) has gained popularity in regional anaesthesia for abdomino-pelvic procedures in both pediatric and adult patients due to its wide range of uses and efficacy. Clinical studies have demonstrated that it possesses opioid-sparing properties and provides extended pain alleviation after surgery [3-6].

Types of QLB

Since the first description, the block has undergone numerous adjustments and currently, four variations of the block are conducted. These variations differ based on the anatomical location of the needle tip insertion in respect to the quadratus lumborum muscle (QLM) and the spot where the medication is applied. The usage of ultrasound guidance has simplified the identification of the QLM. The following are the several types of QLB: QLB 1, also known as lateral QLB; QLB 2, also known as posterior QLB; QLB 3, also known as anterior/transmuscular QLB; and QLB 4, also known as intramuscular QLB [7]. (Figure 1)

- **Lateral QLB (QLB 1):** The procedure involves administering local anesthesia to the lateral side of the QLM where it comes into touch with the transversalis fascia. This is done at the point where the transversus abdominis muscle (TAM) transitions into its aponeurosis [8-10]. (Figure 1)

- **Posterior QLB (QLB 2):** This involves applying medicine to the QLM posterior side, specifically between the QLM and the TLF medial lamina, it acts as a barrier between the QLM and the latissimus dorsi muscle and the paraspinal muscles (erector spinae muscles). This is located laterally from the attachment of the aponeurosis of IOM [18], within the area known as the lumbar interfascial triangle [6]. (Figure 1)
- **Anterior (transmuscular) QLB (QLB 3):** This statement suggests the administration of medication at the anterior aspect of the QLM, specifically at the point where it attaches to the L4 vertebra' transverse process. The dispersion of the local anesthesia (LA) between the psoas major muscle (PMM) and the QLM can be visualized using ultrasonography [11, 12]. This technique presupposes that throughout an ultrasound, one is observing the "Shamrock sign," which refers to the transverse process of L4 vertebrae appearing as a stem, with the PMM as the anterior leaf, the ESM as the posterior leaf, and the QLM as the lateral leaf. A different variant of the anterior QL technique, known as the subcostal technique for anterior QL block, involves shifting the site of injection more cephalad (slightly beneath the 12th rib). This technique was shown to

result in dye staining between the T6-7 and L1-2 vertebrae in a study conducted on a cadaver [13]. A loss of sensation was found between the T6-7 and L1-2 levels after the injection of the subcostal anterior QL block, which is congruent with the results of a study conducted on cadavers. The injection of LA in a cranial direction behind the transversalis fascia is likely to enter the thoracic paravertebral region via a communication pathway located behind the arcuate ligaments [13]. (Figure 1)

- The Paraspinous Sagittal Shift QL block is another variation of the transmuscular QLB (TQLB). It was postulated that this method would facilitate superior diffusion of LA to the lumbar nerve roots. This procedure entails administering a local anesthetic injecting between the PM and QL muscles, behind the anterior TLF, at the L4 level using a craniocaudal technique [14].
- **Intramuscular QLB (QLB 4):** Involves the administration of drugs directly into the muscle. Murouchi asserts that a LA must be administered between the TLF' anterior layers for QLB 1 and 3. The intramuscular technique used doesn't result in the diffusion of LA into the interfascial area [15]. (Figure 1).

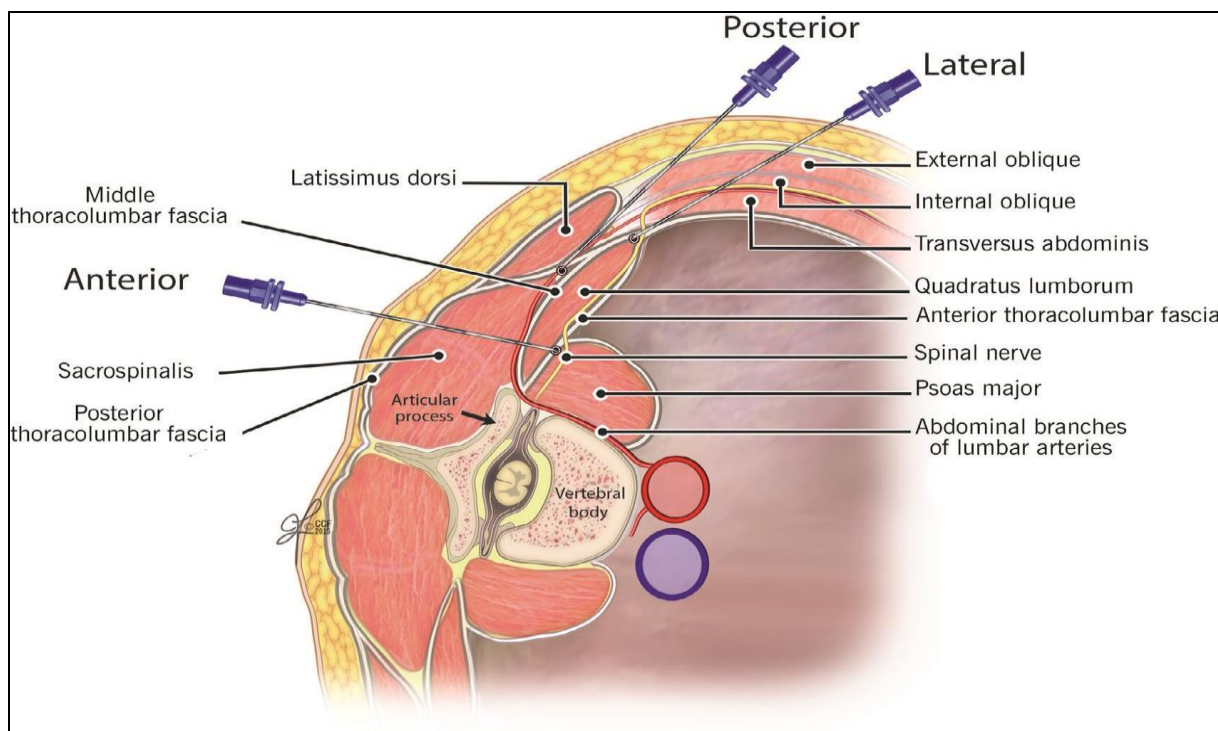


Fig 1: Nomenclature and trajectory of needle for all three approaches to quadratus lumborum block (QLB1, QLB2, and QLB3) [16]

Several case reports have documented the utilization of various methods of QLB as a pain management strategy for laparotomies [17], persistent pain [18], pediatric patients [19, 20], post-caesarean section [3, 21] and individuals undergoing lower extremity procedures [12, 22-24]. Parras and Blanco conducted a comparative analysis of the analgesic effects of QLB, transverse abdominis plane (TAP) block, and femoral block for individuals undergoing surgery to treat neck femur fractures. They found that QLB had a greater analgesic impact comparing to the femoral and TAP blocks [25]. In addition, the clinical investigation conducted by Tulgar *et al.* [26] discovered that TQLB and lumbar erector spinae plane block enhanced the quality of post-operative pain

relief after proximal femoral and hip operations, as compared to normal iv analgesics. A recent clinical trial conducted by Kukreja *et al.* [27] demonstrated that the application of an anterior QLB for individuals undergoing primary THA resulted in enhanced post-operative pain relief and decreased utilization of narcotic analgesics. In a study, it was found that individuals who undergone preoperative posterior QLB saw a substantial decrease in post-operative opioid demand and post-operative pain score when undergoing primary THA during general or spinal anesthesia [28]. Moreover, Green *et al.* [29] assessed the efficacy of TQLB among individuals following hip operations.

In 2007, Blanco initially documented that the QL block was a highly efficient technique for managing postoperative pain^[30]. The dissemination of LA differs according on the approach used. Prior case reports have demonstrated that both QL1 and QL3 can effectively alleviate pain for individuals after THA^[12, 23, 31]. Furthermore, a study conducted by Parras and Blanco demonstrated that QL1 was more effective in relieving pain compared to femoral nerve block in individuals suffering from femoral neck fractures^[25]. Nevertheless, the optimal method of using QL block for pain relief after THA has not yet been established. A study conducted on cadavers shown that following a QL3 block, the injected substance consistently dispersed to the L1, L2, and L3 nerve roots, that are crucial elements of the lumbar plexus^[32]. Thus, the QL3 block can offer pain relief that extends to the dermatomes below L2 or L3 and is an efficient approach for managing pain in hip surgery. Nevertheless, there is still ongoing debate regarding the mechanism by which the QL3 block provides postoperative pain relief. In a work conducted by Dam *et al.*^[33], it was found that the injection used in the QL3 block procedure can expand into the thoracic paravertebral spaces and the intercostal regions. This allows the injectate to encompass the thoracic sympathetic trunk and the somatic nerves by passing through the thoracolumbar fascia. Nevertheless, other examinations on cadavers have demonstrated that the substance being injected did not disperse into the thoracic paravertebral region following the QL3 block^[32, 34]. Furthermore, these research investigations have consistently shown that the inhibition of QL3 can extend to the area surrounding the upper divisions of the lumbar plexus. While there is debate on whether the LA travels into the thoracic paravertebral area following the QL3 blockade, it is evident that the QL3 technique can effectively block a portion of the lumbar plexus, hence contributing to postoperative pain relief. Additionally, the QL3 block is less intrusive, more secure, and simpler to execute compared to a lumbar plexus block, which necessitates injecting into the PM near the lumbar plexus roots^[35].

The paraspinous sagittal shift QL block is a specific sort of TQLB procedure that is performed at the level of the lumbar 4 (L4) transverse process, with the needle inserted in a sagittal direction. This method has the potential to improve the LA distribution to the nerve roots in the lumbar region. The sensory distribution of the blockage in the four individuals examined was shown to encompass the region spanning from the thoracic (T)11-12 to the lumbar L4-5 dermatomes. The dispersion of the injected substance was verified by lumbosacral spine antero-posterior fluoroscopy imaging after administering a combination of local anesthetic and contrast material between the QLM and PMM in two instances^[36].

References

1. Apfelbaum J, Ashburn M, Connis R. Practice guidelines for acute pain management in the perioperative setting: An updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology*. 2012;116:248-273.
2. Larsen K, Hansen TB, Thomsen PB, Christiansen T, Søballe K. Cost-effectiveness of accelerated perioperative care and rehabilitation after total hip and knee arthroplasty. *J Bone Joint Surg*. 2009;91:761-772.
3. Krohg A, Ullensvang K, Rosseland LA, Langesæter E, Sauter AR. The analgesic effect of ultrasound-guided quadratus lumborum block after cesarean delivery: a randomized clinical trial. *Anesth Analg*. 2018;126:559-565.
4. Mieszkowski MM, Mayzner-Zawadzka E, Tuyakov B, Mieszkowska M, Żukowski M, Waśniewski T, *et al.* Evaluation of the effectiveness of the quadratus lumborum block type I using ropivacaine in postoperative analgesia after a cesarean section: A controlled clinical study. *Ginekologia Polska*. 2018;89:89-96.
5. Parras T, Blanco R. Randomised trial comparing the transversus abdominis plane block posterior approach or quadratus lumborum block type I with femoral block for postoperative analgesia in femoral neck fracture, both ultrasound-guided. *The Spanish Journal of Anesthesiology and Resuscitation*. 2016;63:141-148.
6. Blanco R, Ansari T, Riad W, Shetty N. Quadratus lumborum block versus transversus abdominis plane block for postoperative pain after cesarean delivery: a randomized controlled trial. *Reg Anesth Pain Med*. 2016;41:757-762.
7. Akerman M, Pejčić N, Veličković I. A review of the quadratus lumborum block and ERAS. *Front Med*. 2018;5:1-7.
8. Blanco R, Ansari T, Girgis E. Quadratus lumborum block for postoperative pain after caesarean section: a randomised controlled trial. *Eur J Anaesthesiol*. 2015;32:812-818.
9. Ueshima H, Otake H, Lin J-A. Ultrasound-guided quadratus lumborum block: an updated review of anatomy and techniques. *BioMed Research International*. 2017;2017:1-7.
10. Chin KJ, McDonnell JG, Carvalho B, Sharkey A, Pawa A, Gadsden J. Essentials of our current understanding: abdominal wall blocks. *Reg Anesth Pain Med*. 2017;42:133-183.
11. Børglum J, Moriggl B, Jensen K, Lønnqvist P-A, Christensen AF, Sauter A, *et al.* Ultrasound-guided transmuscular quadratus lumborum blockade. *British J of Anaesth*. 2013;111:6-12.
12. La Colla L, Uskova A, Ben-David B. Single-shot quadratus lumborum block for postoperative analgesia after minimally invasive hip arthroplasty: a new alternative to continuous lumbar plexus block? *Reg Anesth Pain Med*. 2017;42:125-126.
13. Elsharkawy H, Ahuja S, DeGrande S, Maheshwari K, Chan V. Subcostal approach to anterior quadratus lumborum block for pain control following open urological procedures. *J Anesth*. 2019;33:148-154.
14. Alabd AS, Moustafa MA, Ahmed AM. Paraspinous Sagittal Shift (PSSS): a novel approach for transmuscular quadratus lumborum block for hip surgery analgesia—four cases report. *Braz J Anesthesiol*. 2020;70:178-183.
15. Murouchi T. Reply to Dr El-Boghdadly *et al.* *Reg Anesth Pain Med*. 2016;41:549-.
16. Elsharkawy H. Quadratus lumborum blocks. In: Gray AT, editor. *Atlas of Ultrasound-Guided Regional Anesthesia*. 3rd ed: Elsevier; c2019. p. 277-285.
17. Kadam VR. Ultrasound-guided quadratus lumborum block as a postoperative analgesic technique for laparotomy. *J Anaesthesiol Clin Pharmacol*.

- 2013;29:550-552.
18. Carvalho R, Segura E, Loureiro MD, Assunção JP. Quadratus lumborum block in chronic pain after abdominal hernia repair: case report. *Rev Bras Anesthesiol.* 2017;67:107-109.
 19. Chakraborty A, Goswami J, Patro V. Ultrasound-guided continuous quadratus lumborum block for postoperative analgesia in a pediatric patient. *A A Case Rep.* 2015;4:34-36.
 20. Visoiu M, Yakovleva N. Continuous postoperative analgesia via quadratus lumborum block - an alternative to transversus abdominis plane block. *Paediatr Anaesth.* 2013;23:959-961.
 21. Blanco R, Ansari T, Girgis E. Quadratus lumborum block for postoperative pain after caesarean section: A randomised controlled trial. *Eur J Anaesthesiol.* 2015;32:812-818.
 22. Hockett MM, Hembrador S, Lee A. Continuous quadratus lumborum block for postoperative pain in total hip arthroplasty: A case report. *A A Case Rep.* 2016;7:129-131.
 23. La Colla L, Ben-David B, Merman R. Quadratus lumborum block as an alternative to lumbar plexus block for hip surgery: A report of 2 cases. *A A Case Rep.* 2017;8:4-6.
 24. Tulgar S, Ermis MN, Ozer Z. Combination of lumbar erector spinae plane block and transmuscular quadratus lumborum block for surgical anaesthesia in hemiarthroplasty for femoral neck fracture. *Indian J Anaesth.* 2018;62:802-805.
 25. Parras T, Blanco R. Randomised trial comparing the transversus abdominis plane block posterior approach or quadratus lumborum block type I with femoral block for postoperative analgesia in femoral neck fracture, both ultrasound-guided. *Rev Esp Anesthesiol Reanim.* 2016;63:141-148.
 26. Tulgar S, Kose HC, Selvi O, Senturk O, Thomas DT, Ermis MN, *et al.* Comparison of ultrasound-guided lumbar erector spinae plane block and transmuscular quadratus lumborum block for postoperative analgesia in hip and proximal femur surgery: A prospective randomized feasibility study. *Anesth Essays Res.* 2018;12:825-831.
 27. Kukreja P, MacBeth L, Sturdivant A, Morgan CJ, Ghanem E, Kalagara H, *et al.* Anterior quadratus lumborum block analgesia for total hip arthroplasty: a randomized, controlled study. *Reg Anesth Pain Med.* c2019.
 28. Kukreja P, MacBeth L, Potter W, Buddemeyer K, DeBell H, Elsharkawy H, *et al.* Posterior quadratus lumborum block for primary total hip arthroplasty analgesia: a comparative study. *Einstein (Sao Paulo).* 2019;17.
 29. Stuart Green M, Ryan Hoffman C, Iqbal U, Olabisi Ives O, Hurd B. Transmuscular quadratus lumborum block reduces length of stay in patients receiving total hip arthroplasty. *Anesth Pain Med.* 2018;8.
 30. Blanco R. Tap block under ultrasound guidance: the description of a no pops technique. *Regional Anesthesia & Pain Medicine.* 2007;32:130.
 31. Ueshima H, Yoshiyama S, Otake H. Retracted: The ultrasound-guided continuous transmuscular quadratus lumborum block is an effective analgesia for total hip arthroplasty. *J Clin Anesth.* 2016;31:35.
 32. Carline L, McLeod GA, Lamb C. A cadaver study comparing spread of dye and nerve involvement after three different quadratus lumborum blocks. *Br J Anaesth.* 2016;117:387-394.
 33. Dam M, Moriggl B, Hansen CK, Hoermann R, Bendtsen TF, Børglum J. The pathway of injectate spread with the transmuscular quadratus lumborum block: A cadaver study. *Anesth Analg.* 2017;125:303-312.
 34. Adhikary SD, El-Boghdadly K, Nasrallah Z, Sarwani N, Nixon AM, Chin KJ. A radiologic and anatomic assessment of injectate spread following transmuscular quadratus lumborum block in cadavers. *Anaesthesia.* 2017;72:73-79.
 35. Mannion S, Barrett J, Kelly D, Murphy DB, Shorten GD. A description of the spread of injectate after psoas compartment block using magnetic resonance imaging. *Reg Anesth Pain Med.* 2005;30:567-571.
 36. Alabd AS, Moustafa MA, Ahmed AM. Paraspinal Sagittal Shift (PSSS): a novel approach for transmuscular quadratus lumborum block for hip surgery analgesia—four cases report. *Brazilian Journal of Anesthesiology (English Edition).* 2020;70:178-183.

How to Cite This Article

EL-Haleem MAKN, Abdullah MAM, EL Daba AA, Abdelghany MS. Post-operative analgesia with focus on ultrasound-guided transmuscular quadratus lumborum block after total hip arthroplasty. *International Journal of Medical Anesthesiology.* 2024;7(3):48-51.

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