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REVIEW ARTICLES/BRIEF REVIEWS

# Quadratus lumborum block for postoperative analgesia: a systematic review and meta-analysis

# Bloc du muscle du carré des lombes (*quadratus lomburum*) pour l'analgésie postopératoire : revue systématique et méta-analyse

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## Abstract

**Purpose** *The goal of the present systematic review is to determine the efficacy of the quadratus lumborum block (QLB) in providing postoperative analgesia for abdominal wall and hip surgeries when compared with placebo or other analgesic techniques.*

**Methods** *Electronic databases (Medline, Embase, Cochrane Central, and Scopus) were searched for keywords and controlled vocabulary terms related to QLB from their inception to November 2019. The included studies compared ultrasound-guided single-injection QLB to placebo and other analgesic techniques in adult patients.*

**Results** *Forty-two randomized-controlled trials provided the data for this systematic review. Eight studies were assessed as high risk of bias in at least one domain. The included studies had significant heterogeneity with regard to the type of surgery, comparator groups, and outcomes measured; therefore, a limited quantitative analysis was undertaken for the comparison of QLB vs no block or placebo in patients undergoing Cesarean delivery only. For Cesarean delivery, the QLB reduced the opioid use by 24.1 (95% confidence interval, 17.3 to 30.9) mg oral morphine equivalents in the first postoperative 24 hr compared with no block or placebo with no difference in pain scores at rest. For other surgical procedures, the pain scores and opioid use were lower in the QLB group when compared with placebo or no regional anesthesia technique. When compared with other regional anesthetic techniques, the analgesic benefit of QLB was marginal.*

**Conclusion** *Quadratus lumborum block provided analgesic benefits compared with placebo for use in the abdominal wall and hip surgery, with only marginal benefits compared with other regional analgesic techniques. The identified studies used different variants of QLB in many different surgery types. These findings and conclusions, therefore, should be considered preliminary.*

**Trial registration** *PROSPERO (CRD42018095965); registered 6 June 2018.*

## Résumé

**Objectif** *L'objectif de cette revue systématique était de déterminer l'efficacité d'un bloc du muscle du carré des lombes pour l'analgésie postopératoire après une chirurgie impliquant la paroi abdominale ou les hanches, comparativement à un placebo ou à d'autres techniques analgésiques.*

**Méthode** *Nous avons réalisé des recherches dans les bases de données électroniques (Medline, Embase, Cochrane Central, et Scopus) pour trouver les mots-clés et les termes de vocabulaire contrôlé liés au bloc du carré des lombes depuis la création des bases de données jusqu'au mois de novembre 2019. Les études incluses comparaient une injection échoguidée unique pour réaliser un bloc du carré des lombes à un placebo et à d'autres techniques analgésiques chez des patients adultes.*

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**Résultats** *Quarante-deux études randomisées contrôlées ont fourni des données pour cette revue systématique. Huit études démontraient un risque élevé de biais dans au moins un domaine. Les études incluses présentaient une hétérogénéité importante en matière de type de chirurgie, de groupes comparés, et de résultats mesurés; une analyse quantitative limitée a par conséquent été entreprise pour comparer l'utilisation d'un bloc du muscle carré des lombes vs aucun bloc ou un placebo chez des patientes subissant un accouchement par césarienne. Lors d'un accouchement par césarienne, le bloc du carré des lombes a réduit la consommation d'opioïdes de 24,1 (intervalle de confiance 95 %, 17,3 à 30,9) mg en équivalent de morphine orale au cours des premières 24 h postopératoires par rapport à un accouchement par césarienne sans bloc ou avec placebo, et aucune différence n'a été observée dans les scores de douleur au repos. En ce qui a trait aux autres interventions chirurgicales, les scores de douleur et la consommation d'opioïdes étaient plus bas dans le groupe bloc du carré des lombes par rapport aux groupes placebo / aucune technique d'anesthésie régionale. Comparativement à d'autres techniques d'anesthésie régionale, les bienfaits analgésiques d'un bloc du carré des lombes étaient marginaux.*

**Conclusion** *Le bloc du carré des lombes a procuré des bienfaits analgésiques par rapport à un placebo lorsqu'il était utilisé en cas de chirurgie impliquant la paroi abdominale ou la hanche, mais ses bienfaits étaient marginaux comparativement aux autres techniques d'analgésie régionale. Les études identifiées utilisaient différentes variantes du bloc du carré des lombes dans de nombreux types différents de chirurgie. Il convient donc de considérer comme préliminaires ces observations et conclusions.*

**Enregistrement de l'étude** *PROSPERO (CRD42018095965); enregistrée le 6 juin 2018.*

**Keywords** Analgesia · abdominal muscles · nerve block

There are many analgesic techniques for the prevention and treatment of pain after abdominal wall and lower extremity surgery. Neuraxial techniques, such as epidural analgesia, have been used for many years and remain the most commonly used analgesic techniques in abdominal wall surgery.[1] Nevertheless, because of factors such as coagulopathy, sepsis, hypovolemia, neurologic disease, and complication risk, not all patients are candidates for neuraxial analgesia.[2]

With the introduction of ultrasound-guided regional anesthesia in recent years, regional analgesia (RA) techniques have become a feasible alternative to neuraxial analgesia. Ultrasound guidance allows precise deposition of local anesthetic (LA), resulting in faster onset, decreased LA dosing, fewer complications, and higher success rates compared with traditional landmark RA techniques.[3] Blanco, in 2007, described an ultrasound-guided quadratus lumborum block (QLB).[4] The QLB appears to resemble a posterior approach to the transversus abdominis plane (TAP) that appears to produce more prolonged and possibly visceral analgesia compared with the anterior TAP block.[5,6] Subsequently, a variety of anatomic approaches to the QLB have been described in the literature, but essentially, the QLB involves infiltration of LA adjacent to the quadratus lumborum muscle.

There has been a surge of new evidence regarding the various QLB anatomic approaches/techniques and their effectiveness in preventing pain during abdominal wall and hip surgeries. In a review, Elsharkawy *et al*. summarized the anatomical concepts, mechanisms, and techniques of the QLB.[7] They provide a detailed overview of the relevant anatomy and technical performance of each type of QLB but do not comment on the available evidence for efficacy. This systematic review aims to perform a comprehensive analysis of the available randomized-controlled trials to determine the efficacy of the QLB in providing postoperative analgesia for abdominal wall and hip surgeries compared with placebo or other analgesic techniques in adult patients.

## Methods

This systematic review was registered with the international prospective register of systematic reviews (PROSPERO registration number: 2018 CRD42018095965) and is reported as per the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines.[8] An experienced librarian (L.B.) designed an electronic search strategy combining keywords and controlled vocabulary terms (where available) related to QLB and transversalis fascia plane block. The search was initially run in March 2017 and updated in November 2019 during the review process. The strategy included searches of MEDLINE (Ovid), Embase (Elsevier), Cochrane Central (Wiley), Scopus (Elsevier), and ClinicalTrials.gov. The searches included full reports and abstracts in English from the inception of the databases to November 2019. The full search strategy in all databases is reported in eAppendix 1 (Electronic Supplementary Material [ESM]).

Search results were screened to include randomized-controlled trials (RCTs) comparing ultrasound-guided single-injection QLB to placebo, systemic analgesia, or other RA techniques in adult patients. Two independent

reviewers (E.K. and S.R.) initially screened the articles based on title and abstract to exclude irrelevant articles using the RefWorks reference manager (ProQuest LLC, MI, USA). The filtered full-text articles were then reviewed. A study was included if both reviewers agreed that the study met the eligibility criteria. Disagreements were resolved by consensus with the third reviewer (V.U.). Data were extracted independently by each reviewer (E.K. and S.R.) using a standardized digital form (eAppendix 2; ESM). Items were assessed for study characteristics, risk of bias, and study outcomes.

Extracted data included author name, publication year, journal, study design, number of participants, country, age, type of surgical intervention/location of the incision, anatomic approach used for block performance, timing of the block, use of adjuvant medications, and volume/concentration/type of LA.

Primary outcomes included 24-hr postoperative pain scores (at rest and with activity) and 24-hr postoperative opioid consumption. Secondary outcomes included the time to first request for opioids, postoperative nausea, vomiting, pruritus, respiratory depression, and sedation. The difference between the statistical and clinical effect size of an outcome was assessed using widely accepted definitions for aminimal clinically important difference.[9,10]

Risk of bias was assessed using a modified Cochrane risk of bias tool that includes the following six domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and selective reporting.[11] The domain "blinding of participants and personnel" was judged "low" risk of bias if both participants and person performing the block were blinded, unclear risk of bias if the person performing the block was unblinded or the blinding was not clearly stated, and high risk of bias if the participants were unblinded to group allocation. Where there were inadequate details of trial characteristics to complete the quality assessment, we contacted the trial authors to obtain further information.

Data pooling was considered if the studies were clinically homogeneous regarding population, intervention (the type of block), and control used. The meta-analysis was performed post-hoc when an adequate number of sufficiently homogeneous studies were found after data extraction, using Review Manager software (version 5.2). Aggregate-level data were used for meta-analysis. Data were pooled using the random-effects model. Continuous outcomes measured on the same scale were synthesized using mean difference and reported as a mean difference with 95% confidence interval (CI). Different opioids were converted to oral morphine equivalent (OME) for comparison between the studies. Similarly, dichotomous outcomes were reported as risk ratios with 95% CI.

## Results

### Description of the studies

#### *Results of the literature search*

There were 1,141 citations identified by the initial database search. Figure 1 shows the PRISMA flowchart. After deleting duplicates, 42 RCTs (32 full reports and ten abstracts) provided the data for this systematic review. The included studies were completed between 2012 and 2019. The Table 1 lists the population, intervention, and control characteristics of the trials included.

#### *Risk of bias*

Figure 2 shows the risk of bias in all domains for each study included. The risk of bias was unclear in most domains for all ten abstracts.[12–21] Of the 42 included studies, eight were assessed as high risk of bias in at least one domain.[13,22–28] Six studies were assessed as low risk of bias in all domains.[29–34] The remaining 28 studies had an unclear risk of bias in at least one domain. Reasons for the risk of bias judgement for each study can be found in eAppendix 3 (ESM). The authors of two studies disclosed receiving compensation/honorarium from a RA device/drug company that was not directly related to the study.[22,34]

#### *Technical performance*

All QLBs in the included studies were performed using an ultrasound-guided single-injection technique by an experienced anesthesiologist. The QLBs were performed bilaterally for all abdominal surgeries and unilaterally for all hip and urologic procedures.

Three main anatomical variations of the QLB are described in the literature, depending on the location of the LA deposition (Fig. 3). The nomenclature for QLB in the literature is inconsistent. For the purpose of this review, we will use the anatomical terminology lateral, posterior, and anterior QLB. Lateral QLB, also known as "QLB-1" is a technique similar to "transversalis fascia plane block," which involves the deposition of LA at the anterolateral border of the quadratus lumborum muscle. Posterior QLB, also known as "QLB-2", involves LA injection at the posterior aspect of the quadratus lumborum muscle. Anterior QLB, also known as "transmuscular QLB" or "QLB-3", involves the deposition of LA between the

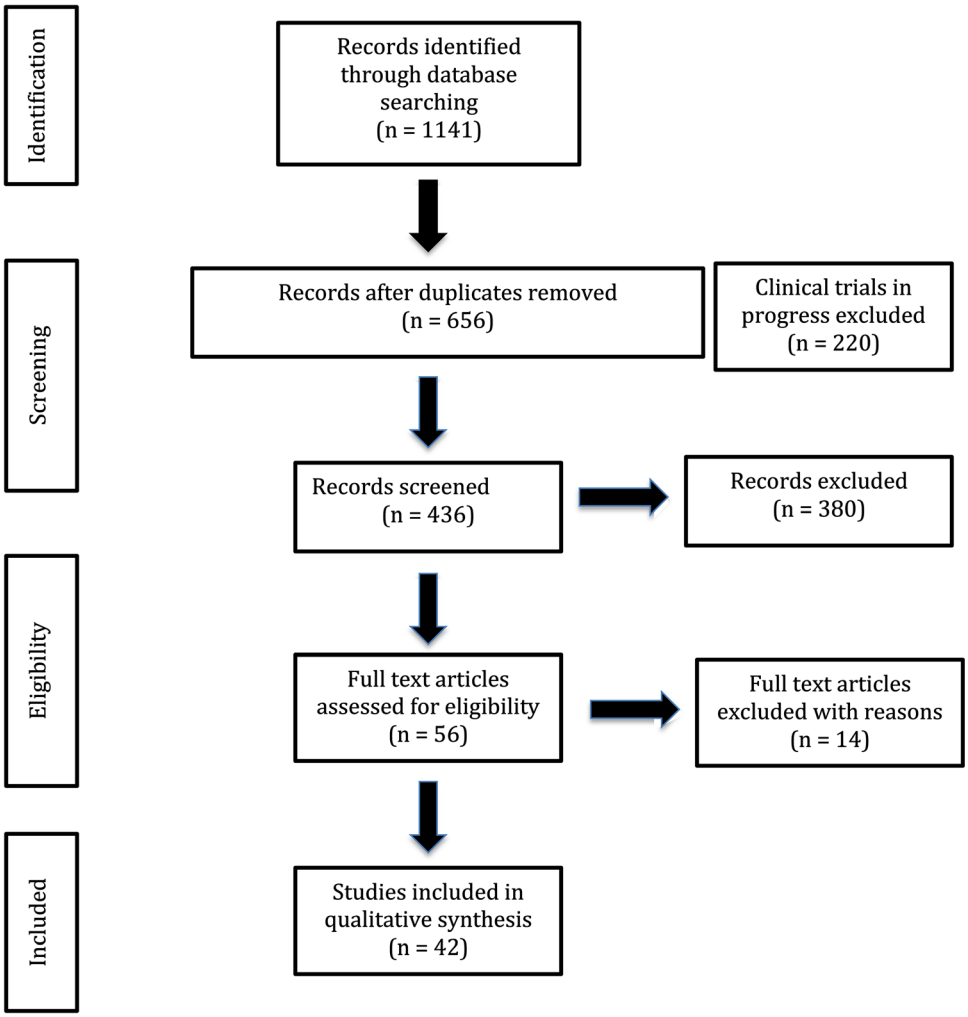



**Fig. 1** PRISMA flow diagram showing literature search results of the randomized controlled trials included in the analysis.

anterior border of the quadratus lumborum muscle and the anterior thoracoabdominal fascia.

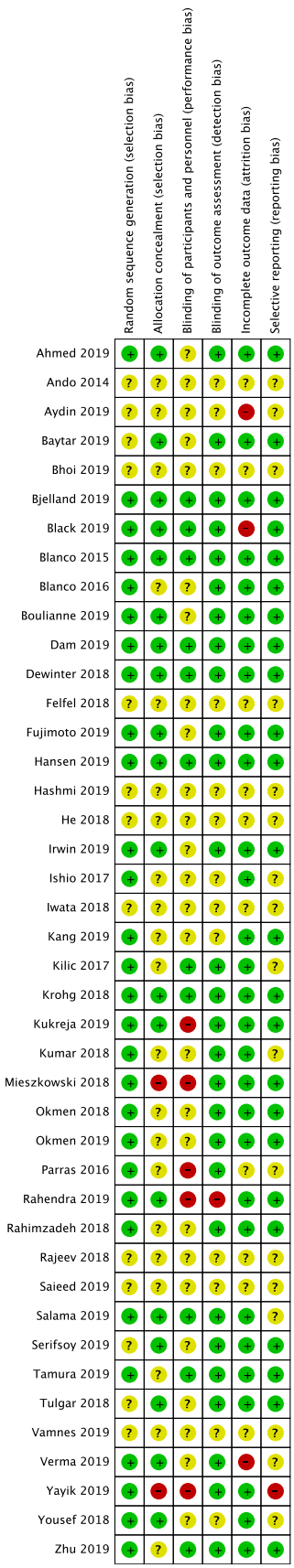
The type, concentration, and volume of LA injected varied by individual trials. The dosing regimen is summarized in the eTable (ESM). Regarding dose, nine of the trials used a weight-based dosing regimen of either 0.2–0.3 $mg{\cdot}kg^{-1}$ of bupivacaine[30,35–38] or 0.2–0.4 $mg{\cdot}kg^{-1}$ of ropivacaine.[27,34,39,40] Thirty-one trials used a predetermined LA volume between 15 and 30 mL per injection.[12–18,21–26,28,29,31–33,41–53] The dosage regimen or the type of LA was not stated in two of the abstracts.[19,20] With respect to LA type, 19 trials used ropivacaine (0.2–0.75%)[12,14,17,18,22,24,27,29,31–34,39–41,46,49,50,53] and 15 used bupivacaine (0.125–0.5%).[13,15,16,21,23,26,30,35–38,42,44,45,51] Three trials used an admixture of LA (bupivacaine with lidocaine),[28,43,52] and three trials used levobupivacaine.[25,47,48]

*Type of surgery*

All studies involved adult patients undergoing various abdominal or hip procedures. The Table 1 lists the types of surgeries. The included studies used QLB for the following surgical procedures: Cesarean delivery (14 studies),[13,15,24,27,30,33–35,39,42,43,48,50,53] gynecological surgery (four studies),[12,44,47,49] abdominal general surgery (11 studies),[14,17,20,21,29,32,37,38,41,45,46] orthopedic surgery (six studies),[16,18,22,23,25,52] and urological procedures (seven studies).[19,26,28,31,36,40,51]

*Comparators*

All trials compared a specific QLB with either placebo or another analgesic technique. Two trials directly compared different anatomic approaches of QLB.[45,53] The comparators used were placebo,[13,17,22,29–31,33,34,36,37,39,40,46,48,50] no block,[18,19,23,24,28,43,47,49,51,52] other RA techniques (TAP block,[12,14,20,21,27,35,38,41,42,44] femoral nerve block,[25] fascia iliaca block,[16] erector spinae [ESP]




◀**Fig. 2** Evaluation of risk of bias (ROB) items for each included study. Green=low risk of bias; red=high risk of bias; yellow = unclear risk of bias.

block,[52] epidural analgesia,[26] and intrathecal morphine [ITM]),[15,39,50,53] and systemic analgesia techniques (lidocaine infusion[32] and paracetamol infusion[20]).

*Outcomes studied*

The Table 1 shows the outcomes investigated by each RCT. All included studies, with the exception of four studies,[12,14,15,40] reported pain scores at varying time intervals. The reported time interval ranged from arrival to the postanesthesia care unit (PACU) to 48 hr after surgery. All included studies except three[12,20,42] reported opioid consumption at various time intervals ranging from arrival to the PACU to 72 hr after surgery. Twenty-eight studies reported the incidence of nausea and vomiting.[15,17,18,22,24,28–35,37–40,42–44,46–53] Fifteen studies measured time to first analgesic request.[23,24,27,29,31–33,38,41,42,44,45,49–51] Fourteen studies assessed "postoperative pruritus,"[15,18,22,24,28–30,35,37,39,48,50,51,53] ten assessed "time to ambulation,"[20,25,29,31,33,34,40,45,50,53] nine looked at "patient satisfaction,"[14,17,23,25,28,29,38,42,50] six reported on "length of hospital stay,"[20,23,31,32,46,47] five assessed "motor weakness in lower limbs,"[28,37,40,51,53] and three reported on the "quality of recovery."[14,47,48] One study looked solely at intraoperative hemodynamic changes.[21]

*Data analysis*

The studies included in this systematic review had significant heterogeneity with regard to the type of surgery, comparator groups, and outcomes measured. Therefore, the planned quantitative synthesis (meta-analysis) was only conducted for QLB *vs* placebo or no block for patients undergoing Cesarean delivery. The main outcomes of each study are summarized in the Table 1.

The pooled data for Cesarean delivery

There were seven studies comparing QLB (any type) with placebo or no QLB that were felt to be clinically homogeneous enough for results to be pooled for Cesarean delivery outcomes (Fig. 4).[9,24,30,33,43,48,50] The pooled estimates from four studies (two posterior, one anterior, and one lateral QLB) showed that opioid use was reduced by 24.1 mg (95% CI, 17.3 to 30.9) OME in the first postoperative 24 hr in the QLB group compared with

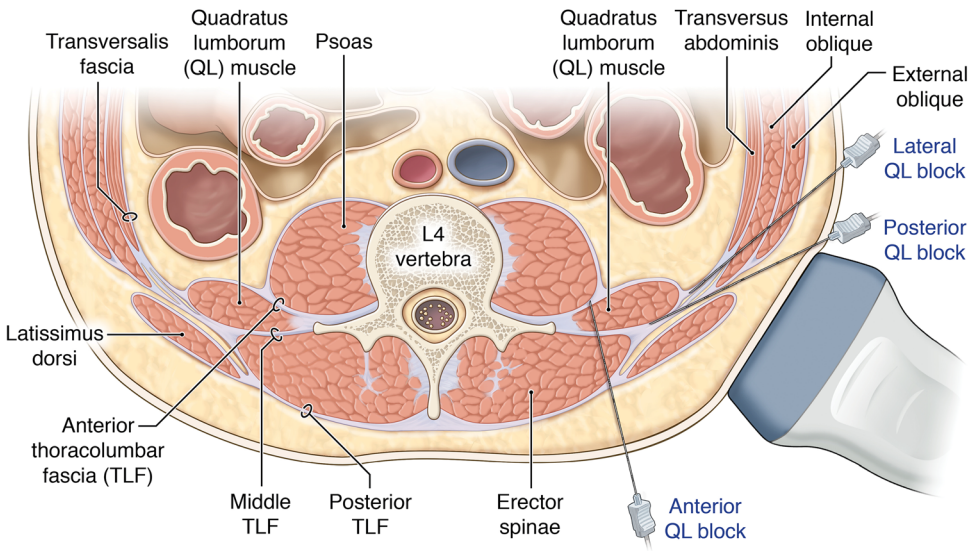



**Fig. 3** An illustration showing three common approaches to quadratus lumborum block (right) with important anatomical correlations at L4 vertebral level. The left side of the figures shows the three-layered model of the thoracolumbar fascia (TLF).

placebo or no block. Similarly, pooling of estimates from three different studies (each using different QLB types) showed the time to first analgesic request was 8.1 hr longer (95% CI, 2.3 to 14.0) in the QLB group compared with the placebo or no block group. Nevertheless, no statistical differences were observed in 24-hr pain scores at rest or with the incidence of nausea and vomiting between the QLB and no QLB groups (Fig. 4). There were not enough studies assessing pain scores with activity to allow data pooling.

## Lateral QLB

Eleven studies used a lateral approach to QLB. Nine studies involved abdominal surgeries[12,13,24,32,34,41–44] and two studies involved hip surgeries.[22,25] Four studies were assessed as high risk of bias in at least one domain.[13,22,24,25] Two studies were assessed as low risk of bias in all domains.[32,34] The remaining five had an unclear risk of bias in at least one domain.

### *Cesarean delivery*

Five RCTs studied lateral QLB for lower segment Cesarean delivery. Four of these compared lateral QLB with placebo or no block[13,24,34,43] and one compared lateral QLB with TAP block.[42] When compared with placebo or no block, the lateral QLB group consistently showed lower opioid requirements in the first 24 hr after surgery. Two studies showed no difference in pain scores[13,34] whereas two studies showed a reduction in pain scores at rest during the early postoperative period.[24,43] No study reported a significant difference in the incidence of nausea and vomiting between the groups.[24,34,43] One study comparing lateral QLB with TAP block found no significant difference in pain scores, nausea/vomiting, or time to first analgesic request between the two groups.[42] Importantly, no studies compared lateral QLB to ITM or examined the benefit of adding lateral QLB to a multimodal analgesic regimen that included ITM.

### *Non-obstetric abdominal surgery*

Three studies compared lateral QLB with the TAP block. One of these studies looked solely at intraoperative hemodynamic changes and found no difference between the groups.[12] Kumar *et al.* reported a statistical but not clinically meaningful reduction in opioid consumption and 24-hr pain scores. Yousef *et al.* showed a lower mean (standard deviation [SD]) 24 hr intravenous morphine use [10.0 (3.8) *vs* 14.5 (3.4) mg] and visual analogue scale (VAS) pain scores [1.9 (0.3) *vs* 3.2 (0.4)] in the QLB group for total abdominal hysterectomy.[44] The latter two studies showed a significantly longer time to first analgesic request in the QLB group.[41,44] One study comparing lateral QLB with intravenous lidocaine for laparoscopic colorectal surgery did not find a significant difference between groups regarding analgesia, nausea/vomiting, time to first analgesic request, recovery of intestinal function, and length of stay.[32]

### *Hip/orthopedic surgery*

One RCT compared the transversalis fascia plane (TFP) block (anatomically similar to lateral QLB) with a placebo for iliac crest bone graft.[22] The TFP block group had less

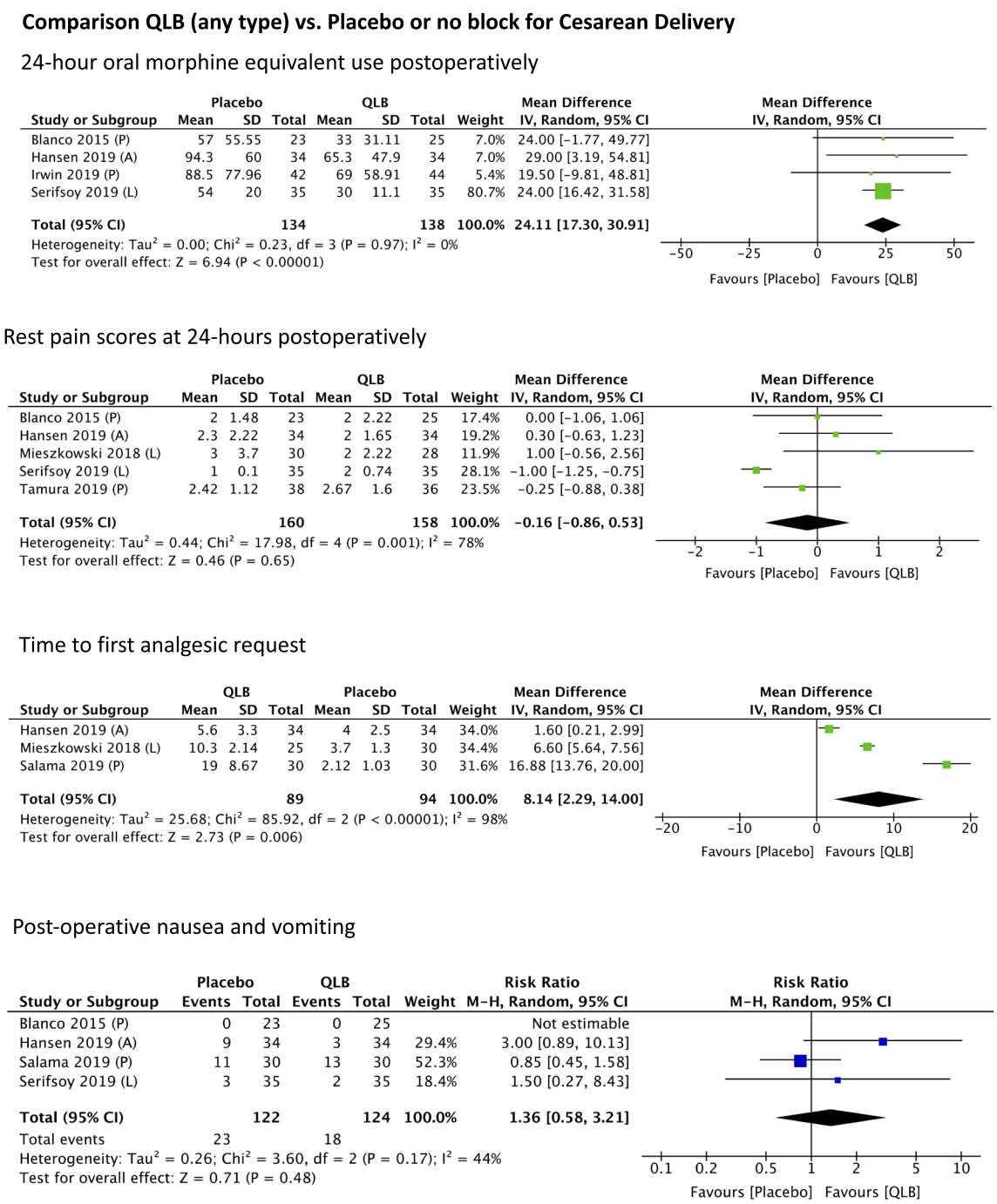



**Fig. 4** Forest plot for the comparison QLB (any type) *vs* placebo or no block for Cesarean delivery. (A) = anterior QLB, (P) = posterior QLB, and (L) = lateral QLB. QLB = quadratus lumborum block.

opioid consumption at eight hours, with no difference at 24, 48, and 72 hr. Similarly, the pain scores were comparable at all time points measured. A second study compared lateral QLB with a femoral nerve block for hip hemiarthroplasty and found a reduction in mean (SD) opioid consumption [9.7 (7.0) *vs* 17.0 (11.2) mg intravenous morphine equivalent (IME)] but a clinically insignificant reduction in pain scores at 24 hr.[25]

### Posterior QLB

Twelve studies used the posterior approach to QLB. Six of them used it for Cesarean delivery.[27,30,35,39,48,50] Four studies used it for general surgical procedures,[29,37,38,46] and two for gynecological procedures.[47,49] One study was assessed as a high risk of bias.[27] Two studies were assessed

as low risk of bias in all domains.[29,30] The remaining nine had an unclear risk of bias in at least one domain.

*Cesarean delivery*

Of the six studies in the Cesarean delivery population, four studies compared posterior QLB with placebo or no block for patients who did not receive ITM. Two studies found lower opioid use and reduced pain scores with activity in the early postoperative period in the QLB group.[30,50] The other two studies found no difference in opioid use or pain scores between groups.[39,48] None of the studies observed a difference in the incidence of nausea and vomiting between the posterior QLB and placebo groups.

Two studies compared posterior QLB with TAP block and found lower median [interquartile range (IQR)] opioid use postoperatively in the QLB group (6.0 [4.8–16.0] *vs* 16.5 [8.0–33.3] mg IME).[27,35] While Blanco *et al*. did not find a difference in pain scores, Verma *et al.* found significantly lower mean (SD) 72-hr postoperative VAS activity pain scores in the QLB group compared with the TAP block [20 (8.5) *vs* 35(5.1)].

Two studies compared posterior QLB with ITM.[39,50] Salama found a significantly lower 48-hr mean (SD) intravenous morphine use [18 (9.6) *vs* 42.8 (10.4) mg], pain scores at rest and with activity, and nausea/vomiting in the QLB group. Tamura *et al*. found lower rest and activity VAS pain scores and opioid use in the ITM group compared with the QLB group for up to six hours after surgery, but no significant difference thereafter. Nevertheless, the incidence of moderate to severe pruritus was significantly higher in the ITM group. Finally, two studies did not observe any analgesic benefit of adding posterior QLB to an analgesic regimen that included ITM.[39,48]

*Non-obstetric abdominal surgery*

Of the six studies in the non-obstetric population, five compared posterior QLB to placebo for non-obstetric abdominal surgeries. Three of them did not find any postoperative analgesic benefit of posterior QLB compared with placebo[29,46,47] whereas two other studies found lower postoperative opioid use and lower 24-hr pain scores (at rest and with activity) for the QLB group.[37,49] Ishio *et al*. reported a significant difference in the time to first analgesic request and the incidence of nausea and vomiting between the groups. One study compared posterior QLB with TAP block and found no difference in any observed outcomes.[38]

Anterior QLB

Thirteen studies used an anterior approach to QLB. Two studies used this method for Cesarean delivery.[15,33] Six studies used the anterior approach for urological surgery, two for laparoscopic surgical procedures, and three for orthopedic hip surgery. Overall, three of these included studies were assessed as high risk of bias at least in one domain.[23,26,28] Two studies were assessed as low risk of bias in all domains.[31,33] The remaining studies had an unclear risk of bias in at least one domain.

*Cesarean delivery*

Hansen *et al*. compared anterior QLB with placebo in patients undergoing Cesarean delivery.[33] They found lower mean (SD) 24-hr opioid use [65.3 (47.9) *vs* 94.3 (60.0) mg OME], and lower early postoperative numerical rating pain scores in the QLB group. Nevertheless, postoperative nausea/vomiting (PONV) or time to ambulation was not significantly different between the groups. Felfel compared anterior QLB with ITM and found no difference in 24-hr morphine consumption between the groups.[15] However, there were fewer side effects, such as nausea, vomiting, and pruritis in the QLB group.

*Non-obstetric abdominal surgery*

Of the two studies for the general surgery population, Vamnes *et al.* compared anterior QLB to placebo for laparoscopic cholecystectomy and found no significant difference in analgesia between the groups. Bhoi *et al*. compared anterior QLB with TAP block for laparoscopic inguinal hernia repair and found lower 24-hr opioid consumption, higher dermatomal coverage, and longer block duration in the QLB group.[14]

Three studies compared anterior QLB with placebo or no block for percutaneous nephrolithotomy and found improved analgesia consistently.[31,36,51] Similarly, Zhu compared anterior QLB with placebo for laparoscopic nephrectomy and found lower opioid use, shorter time to mobilization, less PONV, and less time to recovery of intestinal function in the QLB group.[40] Yayik *et al.* found that anterior QLB improved intraoperative analgesia during extracorporeal shock wave lithotripsy and success of lithotripsy when compared with no block. Finally, Rahendra *et al*. compared anterior QLB to continuous epidural for donor nephrectomy and did not find any analgesic benefit.

*Hip/orthopedic surgery*

Kukreja *et al*., in a recent RCT, showed lower OME consumption at 24 hr (mean difference, 17.1 mg; 95% CI, 5.0 to 29.1) and 48 hr (mean difference, 36.1 mg; 95% CI, 9.4 to 62.9) in the QLB group compared with no block for total hip arthroplasty. The pain scores were lower at 24 hr (mean difference, 1.8 points; 95% CI, 0.6 to 2.9). Nevertheless, no significant difference in pain scores was observed at 12 hr or 48 hr. The QLB group had higher patient satisfaction scores. The study did not report any data on opioid-related side effects. Hashmi *et al*. compared anterior QLB with fascia iliaca block and did not find any difference in analgesic outcomes. Similarly, Tulgar *et al*. did not find any difference in analgesic outcomes when anterior QLB was compared with the lumbar ESP block.

Comparison of anatomic approaches of QLB

Ahmed *et al.* compared posterior QLB with anterior QLB for patients undergoing unilateral inguinal hernia repair. They found no clinically relevant difference in 24-hr morphine consumption in the anterior compared with the posterior QLB group, but a longer mean (SD) time to first analgesic request in the anterior compared with the posterior QLB group [20.1 (6.2) *vs* 12.0 (8.4) hr]. Similarly, the pain scores were lower in the anterior QLB group at 12 hr but not at 24 hr after surgery.

Kang *et al.* compared a combined technique of both anterior and posterior QLBs with either anterior or posterior QLB alone for Cesarean delivery. They found that pain scores (at rest and with activity) and morphine consumption were lower in the combined technique group compared with either the anterior or posterior technique alone.

Dermatomal spread with QLB

Four studies assessed the dermatomal blockage of QLB. Black *et al*. observed a consistent involvement of L1 with TFP block (lateral QLB). Nevertheless, spread to T12 or above was observed in less than 30% of patients. Parras *et al.* observed that lateral QLB analgesia covers the dermatomes from T10 to L1. Bhoi *et al.* found higher dermatomal coverage with anterior QLB (T8) compared with the TAP block (T9).

Adverse events

Okmen *et al*. reported two cases of quadricep weakness in 30 patients who received posterior QLB for laparoscopic cholecystectomy.[37] Similarly, Kang *et al.* reported two cases of lower limb weakness in 24 patients who received anterior QLB for Cesarean delivery. No studies using lateral QLB reported lower limb weakness.

Dewinter *et al.* detected a higher incidence of subjective LA systemic toxicity symptoms (metallic taste) in the QLB group compared with lidocaine infusion and placebo.[32] Nevertheless, serum ropivacaine levels in these patients were not within the toxic range on arrival to the PACU, and there were no serious adverse events. The remaining studies included in this review did not report any adverse events.

## Discussion

Summary of evidence

The QLB is a relatively novel RA technique; as such, there is a paucity of evidence to guide clinical use. Although the 42 RCTs summarized in this review are heterogeneous, some consistent findings were observed and can be used to guide clinical practice.

For Cesarean delivery, QLB (any type) is consistently superior to no block or placebo in terms of opioid consumption when ITM is not used. It significantly prolongs the time to first analgesic request with little effect on pain scores at rest. Preliminary evidence suggests that the QLB, when compared with ITM for Cesarean delivery, may provide similar analgesia with a better side effect profile in the background of multimodal analgesia. Finally, there may be no significant benefit of QLB added to a multimodal analgesic regimen that includes ITM. Most studies in the Cesarean population used posterior QLB. There was a lack of evidence comparing lateral or anterior QLB with standard comparators such as ITM.

For non-obstetric abdominal surgeries, the anterior QLB reduced the opioid use postoperatively and enabled early mobilization compared with placebo. The evidence for an analgesic benefit of posterior QLB was mixed for non-obstetric abdominal surgery. The QLB (any type) was generally associated with a longer time to first analgesic request compared with the TAP block and reduced the opioid requirement marginally. One study found no significant difference between the lateral QLB and intravenous lidocaine infusion for non-obstetric abdominal surgery.

For hip surgery, a few studies found a modest reduction in opioid use after anterior or lateral QLB compared with after no QLB, with little difference in postoperative pain scores. No significant difference in analgesia was found between anterior QLB and other active interventions such as fascia iliaca block and lumbar ESP block.

Although few studies have compared the different types of QLBs, one study showed that the anterior QLB had

**Table 1** Characteristics and key outcomes of included randomized-controlled trials

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| **Lateral QLB/TFP** | | | | | | |
| Ando 2014[12] (abstract) | 150 | Laparoscopic gynecologic surgery | TAP block | Not assessed. | Not assessed. | There was no significant difference in intraoperative hemodynamic changes between the groups. |
| Aydin 2019[13] (abstract) | 20 | Cesarean delivery | Placebo | There was reduced postop opioid consumption at 0, 4, 8, and 24 hr in the QLB group. | VAS scores not statistically significant. | Not stated. |
| Black 2019[22] | 50 | Iliac crest bone graft harvest | Placebo | There was less perioperative opioid consumption at 8 hr in the QLB group (median 2.5 *vs* 13.0 mg IME). There was no difference in consumption at 24, 48, and 72 hr. | The QLB group had lower NRS scores at PACU admission and PACU discharge (median 0 *vs* 4.0 out of 10). There was no difference in NRS scores at 24 and 48 hr. | There was a higher incidence of PONV in the QLB group. There was no difference in all other adverse effects for the two groups. |
| Dewinter 2018[32] | 125 | Laparoscopic colorectal surgery | Lidocaine infusion and placebo | There was no significant difference in 24-hr opioid consumption between the groups. | There were no significant difference in NRS scores between the groups at any time point. | There was no significant difference between the groups in PONV, the time to first analgesic request, the recovery of intestinal function or length of stay. |
| Krohg 2018[34] | 40 | Cesarean delivery | Placebo | There was lower opioid consumption at 12 and 24 hr postop in the QLB group (graphic presentation by the authors). | There was no clinically significant difference in 12 and 24 hr rest and activity pain scores. | There was no significant difference in nausea, sedation, or time to ambulation |
| Kumar 2018[41] | 70 | Lower abdominal surgery | TAP block | Lower total mean (SD) morphine consumption at 24 hr postop was found in the QLB group [3.2 (0.8) *vs* 5.6 (1.6) mg]. | There were lower mean (SD) NRS scores at 1, 2, 4, 6, 8, 10, 12 hr postop in the QLB group [2.8 (1.2) *vs* 3.4 (0.9)].<br>No significant differences were found in pain scores at 24 hr postop. | There was a longer mean (SD) time to first analgesia request in the QLB group [7.5 (1.0) *vs* 4.0 (1.6) hr]. |
| Mieszkowski 2018[24] | 58 | Cesarean delivery | No block | A lower median (range) IME use at 48 hr was found in the QLB group [15 (458) *vs* 30 (1253)] mg. | Lower VAS scores were found at 0, 2, 4, 8, 12, 16, 20, 24, 30, 36, 42, and 48 hr postop in the QLB group. Median [IQR] 24-hr pain scores at rest were lower for the QLB group (2 [0–3] *vs* 3 [1–6]). | A significantly longer median time was reported to the first analgesia request in the QLB group (10.5 hr *vs* 3.4 hr). There was no significant difference found for PONV, pruritus, or sedation. |

**Table 1** continued

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| Parras 2016[25] | 97 | Hip hemiarthroplasty | Femoral nerve block | A lower mean (SD) IME consumption at 24 hr postop was found in the QLB group [9.7 (7.0) *vs* 17.0 (11.2)] mg. | There were lower VAS scores at 6, 12, 18, and 24 hr postop in the QLB group. | There was no significant difference in motor/sensory block or patient satisfaction. |
| Rahimzadeh 2018[42] | 56 | Cesarean delivery | TAP block | Not assessed. | There was no significant difference in VAS scores reported between the groups at any time point. | No significant difference in the time to first analgesic request. There was no significant difference in PONV or patient satisfaction. |
| Serifsoy 2020[43] | 70 | Cesarean delivery | No block | Lower opioid consumption was reported in the first 24 hr (10 *vs* 18 mg OME). | NRS scores were lower at 1, 3, and 12 hr at rest and activity in the QLB group (2 *vs* 3 NRS). There was no difference at 24 hr. | No difference was reported for PONV. |
| Yousef 2018[44] | 60 | Total abdominal hysterectomy | TAP block | There was lower mean (SD) *iv* morphine consumption at 24 hr postop in the QLB group [10 (3.8) *vs* 14.5 (3.4)] mg. | There were lower mean (SD) VAS scores at 24 hr postop in the QLB group [1.9 (0.3) *vs* 3.2 (0.4)]. | There was a significantly longer mean (SD) time to the first analgesia request in the QLB group [15.1 (2.1) *vs* 8.3 (4.0)] hr. |
| | | | | Fewer patients requested analgesia in the QLB group (8 *vs* 23). | | No significant differences were reported for complications/side effects (PONV). |
| **Posterior QLB** | | | | | | |
| Baytar 2019[38] | 107 | Laparoscopic cholecystectomy | TAP block | No difference in opioid consumption was reported intraoperatively or 24 hr postop. | There were no differences reported in pain scores at 0, 6, 12, and 24 hr. | There was no difference in time to first analgesic request, hemodynamics, side effects, or patient/surgeon satisfaction. |
| Bjelland 2019[29] | 45 | Abdominoplasty | Placebo | No differences reported. | No differences reported. | No differences reported. |
| Blanco 2015[30] | 48 | Cesarean delivery | Placebo | Lower median [IQR] *iv* morphine consumption was reported up to 12 hr postop in the QLB group (8.0 [2.5–10.5] vs. 14.0 [9.0–25.0] mg). There were no significant differences reported at 4, 24, and 48 hr postop. | Lower VAS scores were found at 4, 6, 12, and 48 hr (at rest) and 4, 6, 12, 24 and 48 hr (with activity) in the QLB group. The median [IQR] 24-hr VAS with pain at activity were 2 [0–3] *vs* 4 [2–5]. The resting scores at 24 hr postop were not different. | There was no significant difference in PONV, pruritus, sedation, or hemodynamics. |

**Table 1** continued

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| Blanco 2016[35] | 76 | Cesarean delivery | TAP block | Lower opioid consumption was reported at 12, 24, and 48 hr postop in the QLB group. At 24 hr the median [IQR] *iv* morphine use was 6.0 [4.8–16.0] *vs* 16.5 [8.0–33.3]. | The area under the curve for total pain relief at rest and activity were similar between groups. | There was no significant difference reported for nausea, pruritus, sedation, or hemodynamics. |
| Boulianne 2019[46] | 62 | Colorectal resection | Sham subcutaneous needle puncture | No differences were reported at 24 hr. | No differences were reported in pain scores. | There was no difference reported in time to intestinal transit, PONV, or length of hospitalization. |
| Fujimoto 2019[47] | 56 | Major gynecological laparoscopic surgery | No block | A lower intraoperative opioid consumption was found in the QLB group. There was no reported difference at 0, 2, 6, and 24 hr postop. | No difference was reported in pain scores at 2, 6, and 24 hr. | There was no difference in QoR-40 scores, antiemetic use, or length of hospital stay. |
| Irwin 2019[48] | 86 | Cesarean delivery | Sham (no subcutaneous needle puncture) | There was no difference found in opioid consumption at 6, 12, 24, and 48 hr. | No difference in pain scores were reported beyond 6 hr. | There was no difference in the incidence of PONV, pruritus at 24 and 48 hr or QoR-40 scores. |
| Ishio 2017[49] | 70 | Laparoscopic gynecologic surgery | No block | Lesser mean (SD) number of additional analgesics were required in the QLB group [1.1 (0.8) *vs* 2.4 (0.5) requests]. | Significantly lower mean (SD) 24-hr NRS scores were found at rest [1.5 (1.8) *vs* 4.4 (2.1)] and with activity [2.9 (1.9) *vs* 6.3 (2.1)] in the QLB group. | The differences in time to first analgesic request were not clinically relevant.<br>Lower nausea scores were found at 0 and 24 hr postop in the QLB group. |
| Okmen 2018[37] | 59 | Laparoscopic cholecystectomy | Placebo | Lower opioid consumption was found at 6, 12, and 24 hr postop in the QLB group. Mean tramadol use was reported as 0 mg *vs* 10 mg. | Lower VAS scores were reported at 2, 6, 12, and 24 hr postop at rest and with activity in the QLB group (the mean 24-hr pain score at rest and with activity was 1 *vs* 3). | No significant difference was reported in side effects (PONV) and rescue analgesia.<br>Two patients in the QLB group experienced weakness in the knee. |

**Table 1** continued

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| Salama 2020[50] | 90 | Cesarean delivery | Placebo and intrathecal morphine | There was lower mean (SD) *iv* morphine consumption found during the first 48 hr in the QLB group *vs* the placebo and intrathecal morphine group [18.2 (9.6) *vs* 61.0 (12.9) *vs* 42.8 (10.4)] mg respectively. | Lower NRS scores were reported during the first 48 hr in the QLB group *vs* placebo and intrathecal morphine. | The time to first analgesic request was longer in the QLB group compared with ITM or placebo. There was less PONV at 12 hr in the QLB group *vs* intrathecal morphine, less pruritus at 6 hr in the QLB group *vs* intrathecal morphine group, and improved patient satisfaction in the QLB group reported. There was no difference in time to ambulation between the groups. |
| Tamura 2019[39] | 146 | Cesarean delivery | Spinal morphine and saline | Less opioid consumption was found in the intrathecal morphine group. There was no difference in consumption found in the QLB *vs* placebo group at 6 hr, and no difference at 24 hr in all groups. | Lower rest and activity VAS pain scores were found in the ITM group compared with the QLB group for up to the first 6 hr postop, but no significant difference thereafter. | No difference was reported in PONV. A higher incidence of moderate to severe pruritus was found in the ITM group. |
| Verma 2019[27] | 60 | Cesarean delivery | TAP block | Lower 72 hr opioid consumption was found in the QLB group. | Lower 72-hr mean (SD) VAS pain scores were reported in the QLB group [20 (8.5) *vs* 35 (5.1)]. | There was no difference reported in oxygen saturation, HR, and MAP. A longer time to the first analgesic request was reported for the QLB group (68 *vs* 13 hr). |
| **Anterior QLB** | | | | | | |
| Bhoi 2019[14] (abstract) | 40 | Laparoscopic inguinal hernia repair | TAP block | Lower opioid consumption was found in the QLB group at 24 hr but not at 3 months [mean (SD) fentanyl 552 (230) *vs* 735 (264) μg]. | Not stated. | Higher dermatomal coverage, longer block duration, and fewer PCA demands in the QLB group at 24 hr; longer performance time in the QLB group. No difference in chronic pain or QoR-40 at 24 hr and 3 months. |
| Dam 2019[31] | 51 | Percutaneous nephrolithotomy | Placebo | Lower 24-hr mean (SD) OME consumption was reported in the QLB group [54.0 (36.7) *vs* 126.2 (85.5) mg]. There was a significantly longer time to first analgesic request in the QLB group. | Early (6-hr) NRS pain scores were significantly lower in the QLB group. | The QLB group had earlier ambulation and decreased length of hospital stay. No difference was found in the incidence of PONV. |

**Table 1** continued

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| Felfel 2018[15] (abstract) | 120 | Cesarean delivery | Spinal morphine | There was no significant difference in 24-hr opioid consumption found between the groups. There was a lower morphine dose per hour in the spinal morphine group reported at 4, 5, 8, 10, and 11 hr postop. | Not stated. | Fewer side effects such as PONV and itching were reported in the QLB group (effect size was not available). |
| Hansen 2019[33] | 72 | Cesarean delivery | Placebo | Lower opioid consumption was found at 6 and 24 hr. Lower mean (SD) OME at 24 hr 65.3 (48) mg *vs* 94.3 (60) mg, was observed for the QLB group. | Lower NRS scores in the first 6 hr postop. | The difference in time to first analgesic request was not clinically relevant. No difference in PONV or time to ambulation was observed. |
| Hashmi 2019[16] (abstract) | 48 | Hip replacement | Fascia iliaca block | No difference in opioid consumption was found. | There was no difference in pain scores reported. | No difference was reported in the motor block. |
| Kilic 2017[36] | 44 | Percutaneous nephrolithotomy | Placebo | Lower opioid consumption at 4, 8, 12, and 24 hr postop was found in the QLB group but not at 48 hr. Mean (SD) morphine use was lower for the QLB group [10.2 (2.8) *vs* 28.5 (5.7)]. | Lower VAS scores were found at 8, 12, and 24 hr postop in the QLB group [Mean (SD) 24 hr VAS scores were 1.0 (0.8) *vs* 3.5 (1.0)]. No significant difference was reported at 4 and 48 hr postop. | Not assessed |
| Kukreja 2019[23] | 71 | Total hip replacement | No block | Lower mean (SD) OME consumption was found over the first 48 hr [54.6 (8.2) *vs* 90.8 (10.7) mg]. | Lower mean (SD) VAS scores were reported at 24 hr [2.3 (0.4) *vs* 4.0 (0.4) mg]. There was no difference found at 12 hr and 48 hr. | Patient satisfaction was higher in the QLB group, but no difference reported in length of hospital stay or time to first opioid request. |
| Okmen 2020[51] | 60 | Percutaneous nephrolithotomy | No block | Lower opioid consumption was reported at 4, 6, 12, and 24 hr [24-hr mean (SD) morphine use was 6.7 (3.5) vs 11.9 (4.1) mg]. | Lower VAS scores were reported at 2, 6, 12, and 24 hr [mean (SD) 24-hr VAS pain scores were 0.8 (0.9) *vs* 2.9 (0.9) mg]. | No difference was found in PONV, pruritus, bradycardia, hypotension, additional analgesia requirement or block complication (leg weakness). |
| Rahendra 2019[26] | 62 | Laparoscopic donor nephrectomy | Continuous epidural infusion | There was no difference in opioid consumption reported. | There was no difference in pain scores. | No difference was reported for interleukin-6 and C-reactive protein. |

**Table 1** continued

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| Tulgar 2018[52] | 60 | Hip/proximal femur surgery | Lumbar ESP block and<br>no block | Lower opioid (tramadol) consumption was found at 12 and 24 hr in the QLB and L-ESPB groups when compared with no block. There was no significant difference in opioid consumption between the QLB and L-ESPB groups. | Lower NRS scores reported at 1, 3, and 6 hr postop in the QLB and L-ESPB groups when compared with no block. No significant difference was reported in NRS scores at 0.5, 9, 12, 15, 21, and 24 hr. | There were a lower number of patients requiring rescue analgesia in both block groups when compared with no block. |
| Vamnes 2019[17] (abstract) | 75 | Laparoscopic cholecystectomy | Placebo | No difference in opioid consumption was reported. | There was no difference in pain scores. | There were no significant differences in nausea or patient satisfaction. |
| Yayik 2019[28] | 40 | Extracorporeal shock wave lithotripsy | No block | Lower opioid consumption was found in the QLB group during the procedure (fentanyl 0 *vs* 50 μg). | Lower VAS scores were found in the QLB group at 5, 10, 15 and 20 min (2 *vs* 6 means for the 20-min pain scores). | Higher surgical procedural success rates and patient satisfaction were reported in the QLB group. No side effects or complications were reported with the use of QLB. |
| Zhu 2019[40] | 58 | Laparoscopic nephrectomy | Placebo | Lower opioid consumption was found in the QLB group at 24 hr [mean (SD) sufentanil use 34.1 (9.9) *vs* 42.1 (11.6)] μg]. | Not assessed | Less time to mobilization, less PONV, and less time to recovery of intestinal function in the QLB group. |
| **Unknown QLB type** | | | | | | |
| He 2018[18] (abstract) | 60 | Total hip arthroplasty | No block | There were decreased rates of rescue analgesia reported in the QLB group. | Lower pain scores were found at rest at 3, 6, 12, 24, 36 and 48 hr postop in the QLB group (2 *vs* 3.3 mean 24 hr NRS).<br>Lower pain scores were reported with activity at 24, 36 and 48 hr postop in the QLB group (2.7 *vs* 6 mean 24 hr NRS). | A lower incidence of PONV and pruritus was found in the QLB group. |
| Iwata 2019[19] (abstract) | 32 | Laparoscopic nephrectomy | No block | No difference was reported. | No difference was reported. | Not stated. |
| Rajeev 2018[20] (abstract) | 120 | Inguinal hernioplasty | TAP block and paracetamol infusion | Not stated. | There was no significant difference reported in 24 hr NRS scores between the QLB and TAP groups (4.4 *vs* 4.2). Lower NRS scores in both block groups compared with IV paracetamol (5.9). | Earlier ambulation and discharge time was found with both block groups compared with the IV paracetamol group. |

**Table 1** continued

| Author Year | N | Surgery | Control | Opioid consumption | Pain scores | Other outcomes |
|---|---|---|---|---|---|---|
| Saieed 2019[21] (abstract) | 56 | Inguinal hernia repair | TAP block | Lower postop morphine consumption was reported in the QLB group. | Lower VAS at 3, 5, 6, 7, 12, 18, 20, and 24 hr. | Not stated. |
| **Comparing different types of QLB** | | | | | | |
| Ahmed 2019[45] | 40 | Unilateral inguinal hernia repair | Anterior QLB *vs* posterior QLB | The difference in opioid consumption was not clinically relevant between the anterior *vs* posterior QLB. | Lower median (range) VAS scores were reported in the anterior QLB group at 12 hr [2 (2–4) *vs* 4 (2–6)] but not 24 hr. | Longer block duration was reported in the anterior QLB group (20 hr *vs* 12 hr).<br>No difference in duration of technique or success rate were found. |
| Kang 2019[53] | 94 | Cesarean delivery | Posterior QLB (QLB 1) *vs* anterior QLB (QLB 2) *vs* combined anterior plus posterior QLB (QLB 3) *vs* single injection epidural | Lower opioid consumption in the QLB 2+3 groups compared with the QLB2 and the QLB3 groups alone. Lower opioid consumption was reported in the epidural group compared with all the QLB groups at 48 hr<br>[Q2 (6.10) *vs* Q3 (5.7) *vs* Q2+3 (2.7) *vs* epidural (1.3 mg) IME]. | Lower VAS scores in the QLB2+3 group compared with the QLB 3 and the QLB 2 groups. Lower VAS scores were reported in the epidural group compared with all the QLB groups<br>[Q2 (36.1 mm) *vs* Q3 (24.6 mm) *vs* Q2+3 (13.5 mm) *vs* Epidural (3.0 mm)]. | No difference was seen for PONV, pruritus, urinary retention, lower limb weakness, or other complications. |

HR = heart rate; IME = intravenous morphine equivalent; IQR = interquartile range; IV = intravenous; MAP = mean arterial pressure; NRS = numerical rating score; OME = oral morphine equivalent; PACU = postanesthesia care unit; PCA = patient-controlled analgesia; PONV = postoperative nausea and vomiting; Postop = postoperatively; QLB = quadratus lumborum block; QoR-40 = quality of recovery measurement tool; TAP = transversus abdominus plane; TFP = transversalis fascia plane block; VAS = visual analogue score (0–10 scale).

marginally better results compared with posterior QLB.[45] Another study showed a combined technique of anterior and posterior QLBs was superior to either an anterior or posterior technique alone in terms of opioid consumption.[53]

## Strength of evidence

Although only RCTs were included in this review, ten of the 42 studies were abstracts. Assessing the risk of bias of the abstracts was challenging. Furthermore, eight studies were judged as high risk of bias, which weakens the certainty of evidence. Finally, since the block is relatively new, the risk of publication bias cannot be ruled out.

Most studies reported opioid use, and fewer studies reported opioid-related side effects, quality of recovery, and patient satisfaction measures. Five different studies assessed motor weakness; two studies reported the incidence of lower limb weakness with QLB. None of the studies using lateral QLB reported lower limb weakness. Future QLB studies should include standardized patient-reported outcome measures and experiences.

## Relevance to patients, healthcare providers, and policymakers

Intrathecal morphine is commonly used for patients undergoing Cesarean delivery. The main advantage of ITM is its ease of administration as it can be coadministered with spinal anesthesia. The disadvantage of ITM is the adverse effects such as nausea, vomiting, and pruritis. If QLB is firmly shown to provide noninferior analgesia to ITM, then it could be a viable alternative. Some barriers to the use of QLB are the training,

equipment, and extra time needed to perform. This is something that should be considered by policymakers.

Although initial studies show little benefit of adding QLB to multimodal analgesia that includes ITM, any efforts to improve postoperative analgesia are welcome, considering it reduces the risk of maternal complications by promoting mobilization. Most studies in the Cesarean population have used the posterior approach with marginal benefits. The anterior approach is less convenient as it requires a lateral position while the patient is still under the effect of spinal anesthesia. Future studies should consider investigating the lateral approach to QLB for Cesarean delivery.

Regarding the use of QLB for nonobstetric abdominal surgery, anterior QLB appears to be effective from an analgesic point of view when compared with no block. The analgesic effects of posterior QLB were less consistent compared with other approaches. Further, there is little difference between lateral QLB and intravenous lidocaine. A comparison of anterior or lateral QLB with lower resource interventions such as intravenous lidocaine may be of interest to both patients and healthcare providers.

The initial evidence for QLB for hip surgery is underwhelming, as other active interventions appear to be equally effective. Stakeholders should consider resource implications and patient discomfort for each of these interventions before making an informed choice.

A major limitation of this review is the heterogeneity in the methodology of the studies examined. The QLB block has three different approaches: anterior, lateral, and posterior. The RCTs included in this review use a variety of approaches for the comparison group. The control groups of the included studies are also variable (placebo, no block, other RA techniques, ITM, or lidocaine infusion). The primary outcomes of each study varied slightly, but the majority of studies measured pain scores and/or opioid consumption at various time points in the first 48 postoperative hours. Fewer studies have evaluated other patient-centred outcomes such as quality of recovery, and none of the studies have conducted an economic evaluation of the QLB.

Although each QLB technique involves the deposition of an LA around the quadratus lumborum muscle, each technique could have differing benefits or efficacy. Two studies included in this review compared one type of QLB to another for lower abdominal surgeries; limited evidence from these studies suggests that the anterior approach may be better than the posterior approach, and a combination of anterior and posterior approaches may be better than either approach on its own for postoperative analgesia. Numerous included studies use a placebo or no block as the control group. For future studies, investigators should continue to perform a direct comparison of different types of QLBs. Further studies comparing QLB to placebo are unnecessary and unlikely to change current practice.

As the breadth of evidence increases, particularly studies with standardized endpoints or outcome measures, homogeneous results can be pooled and analyzed to inform clinicians about the efficacy of QLB. There are 220 RCTs registered on clinicaltrials.gov, and we await these results, particularly those associated with each type of QLB.

## Conclusion

In summary, the QLB is a new fascial plane block with heterogeneous results regarding efficacy. As such, this evidence synthesis and review provides novel information that shows the analgesic benefit of QLB when compared with placebo for use in abdominal wall and hip surgery. When compared with active comparators, such as the TAP block or ESP block, the analgesic benefits of QLB are more limited. The preliminary results show that QLB alone may be similar to ITM for Cesarean delivery in terms of analgesic outcomes, with a better side effect profile. The addition of QLB to a multimodal analgesic regimen that included ITM provided no clinical benefit. More RCTs need to be completed and reviewed to better characterize the risks and benefits associated with the QLB, particularly as it relates to the different anatomic approaches. Future studies should include standardized patient-reported outcome measures and experiences.

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