

New Kid on the Block: A Systematic Review of the Quadratus Lumborum Block in Plastic and Reconstructive Surgery

Jacqueline M.H. Ihnat, BS
Brogan G.A. Evans, MD
K. Lynn Zhao, MD
Catherine T. Yu, BS
HariPriya S. Ayyala, MD

Background: Although the transversus abdominal plane (TAP) block is commonly used in abdominal surgery as part of enhanced recovery after surgery pathways, the quadratus lumborum (QL) block has been hypothesized as an effective alternative to the TAP block in some areas. This review evaluates the current literature, as it relates to the QL block in plastic and reconstructive surgery.

Methods: A systematic review using PubMed searched for all original, peer-reviewed articles, including the term “quadratus lumborum block.” In total, 509 articles were identified for review by two independent reviewers. Original articles evaluating the use of a QL block in any plastic surgery operation were included. Articles evaluating pediatric patients, animal trials, and the use of a QL block in any nonplastic surgery operation were excluded.

Results: Three articles met inclusion criteria. One trial demonstrated decreased subjective pain scores and total opioid use, whereas the second found no statistically significant difference. A case study described the use of a QL block for unilateral breast reconstruction with minimal opiate use and reduced pain scores postoperatively. Limitations include the limited number of studies and the heterogeneity in study type and design, making analysis difficult.

Conclusions: Despite its demonstrated efficacy in other surgical subspecialties, there are limited data evaluating the use of the QL block in plastic and reconstructive surgery. Additional research is needed to evaluate the role of the QL block in plastic surgery and how it compares to the more widely utilized TAP block. (*Plast Reconstr Surg Glob Open* 2024; 12:e5863; doi: [10.1097/GOX.0000000000005863](https://doi.org/10.1097/GOX.0000000000005863); Published online 4 June 2024.)

INTRODUCTION

Enhanced recovery after surgery (ERAS) pathways have demonstrated improved postoperative pain control, decreased hospital length of stay, and reduced total hospital costs.¹⁻³ Through an emphasis on multimodal pain control and regional blocks, ERAS pathways work to minimize postoperative opioid requirements and to ameliorate adverse effects such as constipation, nausea, vomiting, and other factors that prolong recovery.⁴⁻⁶

Although the transversus abdominal plane (TAP) block remains one of the most widely used regional blocks in abdominal surgery ERAS pathways, studies

have recently begun to explore the efficacy of the quadratus lumborum (QL) block in abdominal procedures in obstetrics and gynecologic, urology, and general surgery.⁷⁻¹⁸ The QL block has been hypothesized as an effective alternative to the TAP block in abdominal-based breast reconstruction, with some studies finding improved pain control with the QL block.^{19,20} Yet, no consensus has been reached regarding the superiority of either block.^{21,22}

The TAP block involves injection of local anesthetic between the transversus abdominus and internal oblique muscles to target the intercostal, subcostal, iliohypogastric, and ilioinguinal nerves.²³ The QL block is categorized into four different types, each related to where the block is administered relative to the QL muscle.^{7,24} Both blocks provide effective cutaneous anesthetization to the anterior and lateral abdominal walls, with the addition of visceral pain control by the QL block. The TAP block can be given preoperatively or intraoperatively under ultrasound guidance or tactile feedback from

From the Division of Plastic and Reconstructive Surgery, Department of Surgery, Yale School of Medicine, New Haven, Conn.

Received for publication February 6, 2024; accepted April 2, 2024.

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DOI: [10.1097/GOX.0000000000005863](https://doi.org/10.1097/GOX.0000000000005863)

Disclosure statements are at the end of this article, following the correspondence information.

fascial punctures by the operating surgeon, whereas the QL block requires administration by a provider with advanced training.^{20-23,25}

Previous studies have evaluated the efficacy of QL blocks on pain control and opioid use across numerous abdominal procedures and surgical specialties; however, there are limited data evaluating the utility of QL blocks in the field of plastic and reconstructive surgery. The purpose of this review is to summarize the current literature regarding the use of QL blocks in plastic surgery and highlight areas for future investigation.

METHODS

A systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis 2020 guidelines was conducted on August 27, 2023 using the database PubMed to search for all articles, including “quadratus lumborum block.”²⁶ In total, 509 articles were identified for initial screening (reviewer B.E.). Inclusion criteria for this study included any original article that evaluated the use of a QL block in any plastic surgery operation. Exclusion criteria for this review comprised studies that evaluated pediatric patient populations, animal trials, and the use of a QL block in any non-plastic surgery operation.

In total, five articles were selected for manual review by two independent reviewers (B.E. and J.I.). One article was excluded from our systematic review, as it was an editorial comment on a randomized controlled trial (RCT). A second article was excluded from our review, as it discussed the use of a QL block for mastectomy without mention of immediate breast reconstruction or the involvement of a plastic surgeon. In total, two RCTs and one case report met our inclusion criteria and were included in this systematic

Takeaways

Question: What is the current literature regarding the use of quadratus lumborum blocks in the field of plastic and reconstructive surgery?

Findings: Three studies have been performed, with two reporting reduced subjective pain scores and total opioid use and a third reporting no significant difference.

Meaning: Although limited studies suggest its efficacy, additional research is needed to evaluate the role of the quadratus lumborum block in plastic surgery procedures.

review (Fig. 1). Two reviewers (BE and JI) manually and collaboratively collected study type, number of patients, surgery type, QL block use, control group, and primary and secondary outcomes data from each of the included studies (Table 1).

RESULTS

Two RCTs and one case report have been conducted evaluating the use of QL blocks in plastic and reconstructive surgery. In a 2021 triple-blinded RCT, Meouchy et al²⁸ evaluated the efficacy of a lateral (type I) QL block in patients who underwent cosmetic abdominoplasty. In this study, 40 patients were randomized into either a QL block or control group, in which patients received 0.2 ml per kg of 0.2% ropivacaine (n = 20), or 0.2 ml per kg of 0.9% normal saline (n = 20). Subjective pain scores and opioid use were evaluated in the postanesthesia recovery unit (<2h postoperatively), and up to 48 hours postoperatively. During initial recovery (<2h postoperatively), pain scores and total morphine use demonstrated no statistically significant difference between the QL block and

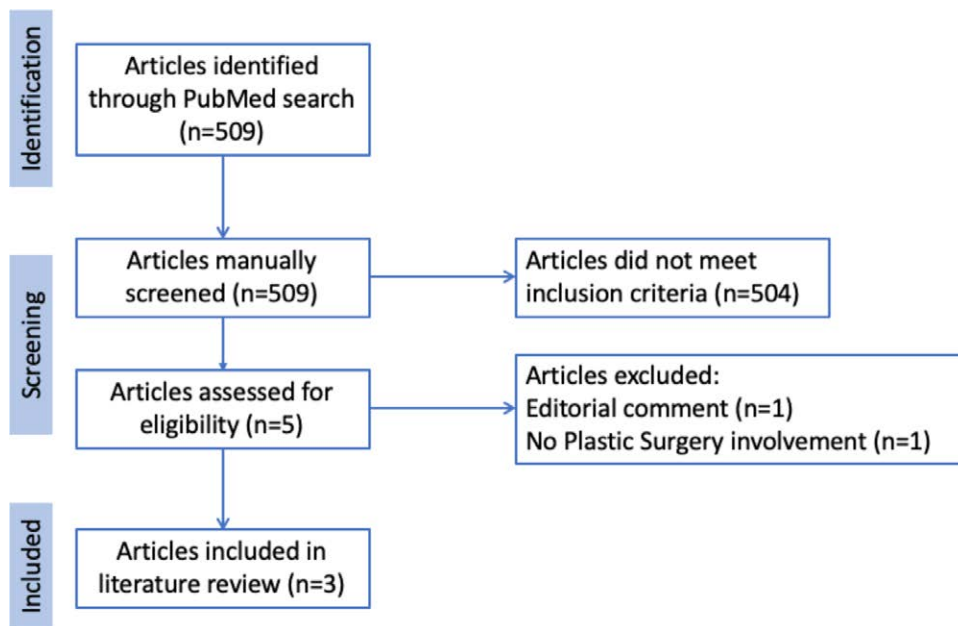


Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analysis flow chart of articles included. The flow chart also shows the process of article identification, screening, and final inclusion.

Table 1. Studies Evaluating QL Blocks in Plastic Surgery

Author (Year)	Study Type	No. Patients	Surgery Type	QL Block	Control Group	Primary Outcomes	Improvement with QL Block (<i>P</i>)
Bjelland ²⁷	RCT	50	Abdominoplasty	20 mL 3.75 mg/mL ropivacaine	Normal saline	Postoperative total morphine equivalent consumption	No (<i>P</i> = 0.44)
Meouchy ²⁸	RCT	40	Abdominoplasty	0.2 mL/kg 0.2% ropivacaine	Normal saline	Post-anesthesia care unit morphine consumption Postoperative tramadol consumption and frequency	No (<i>P</i> = 0.052) Yes (<i>P</i> = 0.0031, <i>P</i> = 0.0031)
Spence ²⁹	Case Study	1	TRAM flap for breast reconstruction	20 mL 1.5% mepivacaine	N/A	Decreased sensation from T7 to L1	

control groups despite an observed lower total morphine use in the QL block group (3.4 mg) compared with the control group (6.6 mg). Following the initial postoperative recovery period, a statistically significant reduction in pain was observed in the QL block group compared with the control group at all time points within the 48 hours postoperative period ($P < 0.05$). Similarly, overall frequency and total oral tramadol use at 48 hours postoperatively was significantly lower in the QL block group (42.5 mg) compared with the control group (190 mg; $P = 0.0031$ and $P = 0.0031$, respectively).²⁸ Overall patient satisfaction with quality of recovery was also observed to be higher in QL block group compared with the control group at 5 days ($P < 0.0001$).

Bjelland et al²⁷ similarly evaluated the efficacy of QL blocks on postoperative analgesia in 50 patients with massive weight loss following bariatric surgery undergoing standard full abdominoplasty. In this triple-blinded RCT, patients were equally divided into a QL block ($n = 25$) and control group ($n = 25$), in which either 20 mL of ropivacaine or 20 mL of normal saline were administered bilaterally as a posterior (type II) QL block. Primary endpoint for this study was total oral morphine equivalent use at 24 hours postoperatively, with secondary evaluations analyzing subjective pain scores at 12, 24, and 48 hours postoperatively. Total oral morphine equivalent consumed at 24 hours postoperatively was not found to be statically significant between the QL block group (26 mg, SD = 25 mg) and the control group (33 mg, SD = 33 mg, $P = 0.44$). Similarly, subjective pain scores at 12, 24, and 48 hours postoperatively were not found to be statically significant between the QL block group and the control group ($P > 0.3$ for all time points).

In 2016, Spence et al²⁹ published a case report of a patient who received a QL block before undergoing unilateral breast reconstruction with a pedicled transverse rectus abdominis myocutaneous flap and required minimal rescue analgesic postoperatively. In this case report, a posterior (type II) QL block was administered before induction with 20 mL of mepivacaine 1.5% infiltrated bilaterally. The catheters were maintained in place, and an additional bolus of 15 mL of ropivacaine 0.25% was given intraoperatively. In the postrecovery area, a continuous bolus of 10 mL per hour of ropivacaine 0.2% was initiated and maintained until catheter removal on postoperative day 2. The authors reported minimal intraoperative opioid use as a supplement to their standard fentanyl dosage

for induction and extubation. In the first 24 hours postoperatively, the patient required 0.8 mg of hydromorphone, and upon removal of the block catheters on postoperative day 2, pain was adequately controlled with 15 mg of oxycodone and 0.6 mg of hydromorphone. On postoperative day 3, the patient required no intravenous opioids and was discharged to home with oral pain medication. Numerical pain scores were reported as 0–3 for the patient's entire hospitalization.

DISCUSSION

Plastic surgeons operate on all aspects of the trunk, including procedures superficial to the abdominal cavity and more invasive procedures that include the abdominal cavity. As the implementation of ERAS pathways becomes more prevalent within the field of plastic surgery, regional blocks are becoming standard of care as part of a multimodal postoperative pain regimen for abdominally based surgery, with the TAP block most commonly cited as an example.^{30,31}

The TAP block targets the intercostal, subcostal, iliohypogastric, and ilioinguinal nerves, providing anesthesia to the anterior and lateral abdominal wall, most commonly in a T9-L1 distribution. It has been shown to effectively decrease opioid use after abdominoplasty, which often involves nerves throughout the T7–T12 dermatomes, with minimal visceral involvement.^{32,33} However, although the TAP block may be sufficient for procedures that do not involve entering the main abdominal compartment, it may be suboptimal for more complex reconstructions.

Alternatively, QL blocks are injected deep to the transversalis fascia, providing both somatic and visceral analgesia, likely due to paravertebral and epidural spread. The lateral approach, or type 1, injects local anesthetic lateral to the QL muscle, where it connects to the transversalis fascia. Type 2 is a posterior approach, which infiltrates posterior to the QL muscle. Type 3 is an anterior or transmuscular approach, which targets the plane between the psoas major and QL muscle, and type 4 is an intramuscular injection directly into the QL muscle.^{24,34} The type 1 block has been described to cover a T12-L1 dermatome, making it an effective block for surgery below the umbilicus. Type 2 and 3 QL blocks cover a wider dermatomal distribution, from T7-L1, making them useful in procedures that involve the abdomen above the umbilicus.²³

Currently, the literature lacks studies comparing types of QL blocks against each other for any abdominal procedure, leaving the choice of QL block type used up to the physician administering the block. Overall, the QL block's ability to provide better visceral pain control with comparable cutaneous coverage to the TAP block makes it a promising adjuvant to pain control in abdominal-based surgery that involve the intraabdominal compartment, such as concurrent hysterectomy at the time of DIEP flap reconstruction or abdominal wall reconstruction following hernia repair or extirpation.^{23,24,35}

Additionally, multiple surgical specialties have explored the use of the QL block in abdominal surgery since its initial description by Blanco et al.³⁶ In the obstetrics and gynecology literature, numerous studies have demonstrated efficacy of the QL block in reducing postoperative opioid requirements and subjective pain scores in cesarean delivery and uterine surgery when compared with normal saline controls.^{8,14,15} Similarly, urologic and general surgery data largely support the use of QL blocks for intraabdominal surgery, demonstrating earlier time to ambulation, decreased postoperative nausea and vomiting, and decreased postoperative opioid use and pain scores.^{9-13,16-18}

Despite the demonstrated benefits of the QL block in abdominal-based surgery, literature exploring the use of the QL block in plastic surgery currently lags behind that of other specialties. To date, only two RCTs and one case report evaluate the use of the QL block in plastic surgery. Meouchy et al²⁸ designed a triple-blinded study in which the QL block was compared with a normal saline control for cosmetic abdominoplasty. This study excluded any local anesthetic in the tumescent that may confound postoperative analgesic use and standardized a postoperative pain regimen for patients. A lateral (type I) QL block was administered under ultrasound guidance and visualized to be in the appropriate plane. While this study demonstrated decreased opioid use and postoperative pain scores at 48 hours, limiting factors include the relatively small sample size, single institution trial, and the use of multiple surgeons and anesthesiologists for the studied procedures. Ultimately, although the approach to abdominoplasty and QL block administration was standardized, overall experience and provider technique may have played a role in postoperative pain control. Differences in the surgeon's ability to minimize trauma to the anterior rectus sheath during surgical dissection as well as in the number of attempts required to ensure that the block was in the appropriate plane by the anesthesiologist may have affected overall postoperative pain.

In contrast, Bjelland et al²⁷ published a triple-blinded, single-surgeon, RCT evaluating the use of a type II QL block in postbariatric abdominoplasty. In this study, the authors demonstrated no statistical difference in the QL block group compared with the normal saline control. There are numerous confounding variables in this study design that may have prevented statistical significance from being reached despite an observed decrease in total opioid use and subjective pain scores in the QL block group. During the 100 blocks administered, the authors

reports eight suboptimal views on ultrasonography, and two suboptimal infiltrations and two instances where 3 mL of injection was not infiltrated into the appropriate plane. Although it is not reported if these events occurred in the QL block or control group, if an inadequate block administration occurred more frequently in the QL block cohort, this may have contributed to decreased postoperative pain control for these patients. Additionally, while intraoperative and postoperative pain control was standardized for both groups, patients in both groups received tumescent with lidocaine and 20 mL of bupivacaine at the site of abdominal plication in the form of a rectus sheath block. The use of adjuvant local anesthetic in the tumescent and rectus sheath confounds the data, as these effectively act as additional regional blocks with much more variability in distribution than the ultrasound-guided QL block. In an editorial comment by Raeder in 2019,³⁷ Raeder emphasized that there is a notable decrease in opioid use postoperatively in the QL block group compared with the control, and that the large SD compared with the mean emphasizes the wide distribution of their data. Raeder went on to discuss that the use of their multimodal pain regimen and small sample size may have ultimately prevented the study from reaching statistical significance; however, it is both unethical and unsafe to withhold pain medication from the control group to determine a true causative effect of the QL block on postoperative pain.

In the case report evaluating the use of a continuous QL block for unilateral breast reconstruction with a pedicled transverse rectus abdominis myocutaneous, Spence et al²⁹ demonstrated adequate postoperative pain control with minimal opioid use. The authors report complete anesthetization of the T7-L1 dermatomes, which would provide excellent pain control at the abdominal donor site. However, it is unclear if the patient underwent immediate or delayed breast reconstruction. In a delayed reconstruction, pain at the reconstructed breast can be assumed to be less, given that a mastectomy was not performed at the time of reconstruction. Overall, this may confound the results of this article, as the QL block does not anesthetize the chest wall and immediate reconstruction would likely require additional postoperative analgesics.

Limitations to this study include the paucity of data exploring the use of the QL block in plastic surgery, and the heterogeneity in study type and design, limiting any conclusions that can be made. It is evident that additional studies are needed to evaluate not only the efficacy of QL blocks in plastic surgery procedures, but also its efficacy compared with the TAP block as a critical first step in expanding its use. The authors are currently in the pilot phase of an RCT evaluating these blocks in abdominally based autologous breast reconstruction. We hypothesize that the need for specialized training and a formal QL block procedure likely contribute to greater perioperative time and cost compared with the surgeon administered TAP block. Therefore, future studies should aim to evaluate not just the efficacy of the QL block compared with the TAP block, but also the burden of each block type on perioperative cost and time.

CONCLUSIONS

Reducing postoperative opioid use while maintaining appropriate pain control is critical to improving quality of recovery and minimizing adverse effects after surgery. There is a growing body of literature demonstrating the QL block to be a powerful regional block for postoperative pain control and quality of recovery in abdominal-based surgery in a variety of surgical specialties. Although traditional ERAS pathways use TAP blocks in these procedures, there is limited evidence exploring the use of the QL block in abdominal-based plastic surgery. Additional research is needed to evaluate the efficacy of the QL block in plastic surgery, and its cost effectiveness, perioperative efficiency, and overall effect compared with the TAP block. Advances in regional block use in ERAS pathways could have a significant impact on postoperative pain control and overall quality of recovery for plastic surgery procedures.

Haripriya Ayyala, MD

Division of Plastic and Reconstructive Surgery
Yale School of Medicine
330 Cedar St, BB330
New Haven CT, 06510
E-mail: haripriya.ayyala@yale.edu

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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