

Abdominal Wall and Paraspinal Fascial Plane Blocks for Analgesia After Cesarean Delivery: Where Do They Belong?

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ABSTRACT

Cesarean delivery is among the most frequently performed operations worldwide, and the analgesic strategy that follows it has to satisfy an unusual set of constraints: the patient must be alert, mobile, and able to care for a newborn within hours, while systemic opioid exposure is transmitted in small quantities through breast milk. Intrathecal morphine, administered as part of the spinal anesthetic, remains the reference technique and is recommended as first-line by procedure-specific guidance. The place of peripheral nerve blocks is therefore best framed not as competition with intrathecal morphine but as an answer to the situations in which it is unavailable, contraindicated, poorly tolerated, or has already worn off. This review examines the three block families used for this purpose. The transversus abdominis plane block provides reliable somatic analgesia of the lower abdominal wall but no visceral coverage, and randomized comparisons consistently show it to be inferior to intrathecal morphine for analgesia while producing fewer opioid-related side effects. The quadratus lumborum block, particularly in its posterior and transmuscular variants, may achieve a degree of paravertebral spread and consequently some visceral coverage, and meta-analyses suggest a modest advantage over the transversus abdominis plane block at the price of greater technical demand. The erector spinae plane block is the most recently introduced and the least mature in its evidence base, with trials reporting efficacy comparable to the transversus abdominis plane block and, in a few small studies, approaching that of intrathecal morphine. We summarize the anatomical rationale, the randomized and meta-analytic evidence, and the practical implications for obstetric anesthesia services.

Keywords: cesarean delivery; transversus abdominis plane block; quadratus lumborum block; erector spinae plane block; intrathecal morphine; postoperative analgesia

INTRODUCTION

Pain after cesarean delivery has two components. Somatic pain arises from the Pfannenstiel incision and the abdominal wall, and is dermatomally confined to roughly T10 to L1. Visceral pain arises from the uterus and peritoneum, is conveyed by afferents accompanying sympathetic fibres to higher thoracic segments, and is responsible for much of the cramping discomfort that patients report in the first day, aggravated by uterotonic administration and breastfeeding. Any regional technique must be judged against both components, and the failure of abdominal wall blocks to address the second is the single most important limitation of the whole category.

The PROSPECT working group's guideline for elective cesarean section places intrathecal morphine, combined with paracetamol and a non-steroidal anti-inflammatory drug, as the first-line recommendation, and reserves fascial plane blocks for patients in whom neuraxial morphine has not been given or is contraindicated [1]. That recommendation frames everything that follows.

THE TRANSVERSUS ABDOMINIS PLANE BLOCK

The transversus abdominis plane block deposits local anesthetic between the internal oblique and transversus abdominis muscles, where the anterior rami of the lower thoracic and upper lumbar spinal nerves

travel before entering the rectus sheath. Its anatomy, its several described approaches — lateral, posterior, subcostal and oblique subcostal — and the corresponding differences in spread have been reviewed in detail by Tran and colleagues [2]. For a Pfannenstiel incision the lateral or posterior approach is usual, and the block reliably covers T10–L1 somatic afferents while providing no visceral analgesia at all.

The randomized evidence is correspondingly clear. Meta-analyses comparing the block with intrathecal morphine consistently show intrathecal morphine to give lower pain scores and lower opioid consumption in the first 24 hours, while the transversus abdominis plane block is associated with significantly less pruritus, nausea and vomiting [3–5]. This is the essential trade-off, and it explains the guideline position: the block is not a superior technique but an acceptable substitute when neuraxial morphine cannot be used, and it can also be a useful rescue when analgesia deteriorates on the first postoperative day. Adding a transversus abdominis plane block to intrathecal morphine has, in general, produced little additional benefit in unselected patients, although one randomized trial in women with severe pre-eclampsia — a group in which non-steroidal anti-inflammatory drugs are often withheld — reported a meaningful advantage [6]. Attempts to extend the block's duration with liposomal bupivacaine have produced mixed results in multicentre randomized trials [7].

THE QUADRATUS LUMBORUM BLOCK

The quadratus lumborum block was introduced in the expectation that injectate deposited around the quadratus lumborum muscle, in the plane of the thoracolumbar fascia, could track cephalad into the thoracic paravertebral space and thereby achieve a degree of visceral as well as somatic coverage. Several variants are described — lateral, posterior, transmuscular or anterior, and intramuscular — and they differ in the reliability of that cephalad spread as well as in technical difficulty and proximity to the kidney and peritoneum.

The evidence base is now substantial. Multiple systematic reviews and meta-analyses restricted to cesarean delivery report reduced opioid consumption and lower pain scores compared with placebo, with effect sizes that are modest but consistent [8–11]. A comprehensive analysis published in *Anesthesiology* found the block to provide clinically meaningful analgesic benefit after cesarean delivery under spinal anesthesia, while noting that the magnitude of benefit was smaller in patients who had also received intrathecal morphine [10]. A broader review of the block across surgical populations reached a similar conclusion and drew attention to the wide heterogeneity of approach and volume across trials [12]. Randomized comparisons of the quadratus lumborum block with the transversus abdominis plane block have generally favoured the former, with longer analgesic duration attributed to the paravertebral component of spread [13], and a meta-analysis restricted to non-emergency cesarean delivery reached the same conclusion [14]. Individual randomized trials of both the posterior and the anterior approaches, including continuous catheter techniques, have confirmed opioid-sparing effects [15–17].

Two caveats deserve emphasis. The first is that the technique is more demanding than the transversus abdominis plane block, requires a deeper needle trajectory, and consumes more time — considerations that matter on a busy obstetric list. The second is that the reported advantage over the transversus abdominis plane block is inconsistent across trials, and a recent meta-analysis comparing the quadratus lumborum block with other regional techniques for cesarean delivery did not establish a consistent hierarchy among them [18]. Interest in the block's effect on persistent pain after cesarean delivery is growing, with one meta-analysis suggesting a possible benefit [19].

THE ERECTOR SPINAE PLANE BLOCK

The erector spinae plane block, first described for thoracic neuropathic pain [20], deposits local anesthetic deep to the erector spinae muscle at a transverse process, from which it can spread into the paravertebral and intercostal spaces. Applied at the low thoracic level, typically T9, it has been proposed as a means of

covering both somatic and visceral afferents relevant to cesarean delivery with a single, relatively superficial and technically forgiving injection.

The randomized evidence has accumulated rapidly. Direct comparisons with the transversus abdominis plane block have most often shown either equivalence or a modest advantage for the erector spinae plane block in 24-hour opioid consumption [21–24], and a meta-analysis restricted to cesarean delivery reached the same conclusion [25]. A second meta-analysis directly comparing the two blocks found lower pain scores with the erector spinae plane block at several time points [26]. Comparisons with the transmuscular quadratus lumborum block have suggested non-inferiority [27].

The more consequential question is how the block compares with intrathecal morphine. Two randomized trials have addressed this directly, one reporting comparable analgesic efficacy [28] and a more recent study examining whether the block can replace intrathecal morphine in terms of opioid consumption [29]. These are small single-centre studies and should not yet be taken to overturn the guideline hierarchy, but together they define the question that the next generation of adequately powered multicentre trials must answer. The block also has a role when spinal anesthesia is not used at all: a randomized trial in women having cesarean delivery under general anesthesia found a clear analgesic benefit [30]. Turkish investigators have contributed several of the relevant randomized trials in this area [31].

PRACTICAL CONSIDERATIONS AND SAFETY

Three practical points govern the use of these blocks in obstetric practice. First, the total dose of local anesthetic must be calculated for the patient's weight, since bilateral blocks with large volumes are the standard technique and pregnancy is associated with increased sensitivity to local anesthetic toxicity; the use of dilute solutions and adherence to a maximum permitted dose is essential. Second, the analgesic effect of a single-shot block is measured in hours while the pain of cesarean delivery is measured in days, which makes scheduled multimodal analgesia — paracetamol and a non-steroidal anti-inflammatory drug unless contraindicated — the foundation on which any block is added rather than a supplement to it [1]. Third, the choice among the three techniques should reflect local expertise as much as the published effect sizes: a well-performed transversus abdominis plane block is superior to a poorly performed quadratus lumborum block, and the differences between the blocks in the meta-analytic literature are smaller than the differences between operators.

Narrative syntheses of peripheral nerve blockade for cesarean delivery converge on the same practical algorithm [32,33]: give intrathecal morphine when it is available and not contraindicated; add scheduled non-opioid analgesia in all patients; and reserve a fascial plane block for the patient who has not received neuraxial morphine, who has a contraindication to it, who is at particular risk from opioids, or whose analgesia has failed on the first postoperative day.

CONCLUSION

Fascial plane blocks have a secure but circumscribed place in analgesia after cesarean delivery. The transversus abdominis plane block is the simplest and best characterized, and remains an appropriate default when intrathecal morphine has not been given. The quadratus lumborum block offers a modest additional benefit, plausibly through paravertebral spread, at the cost of greater technical demand. The erector spinae plane block is promising and easy to perform, and the comparisons with intrathecal morphine now appearing deserve replication in adequately powered multicentre trials. What none of these techniques changes is the fundamental structure of post-cesarean analgesia, which rests on scheduled non-opioid medication and on neuraxial morphine where it can be given.

AUTHOR CONTRIBUTIONS

The author confirms sole responsibility for the following: study conception, literature search and appraisal, interpretation of the evidence, and manuscript preparation and revision.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

ETHICS STATEMENT

This article is a narrative review of previously published literature. It does not report any study involving human participants or animals performed by the author, and therefore ethics committee approval and informed consent were not required.

ARTIFICIAL INTELLIGENCE DISCLOSURE

Artificial intelligence tools were used to assist with literature retrieval and language editing. All scientific content, interpretation, and conclusions are the responsibility of the author, who has reviewed and verified the final manuscript.

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