Review Article

Erector spinae plane block in Caesarean sections: A scoping review

ABSTRACT

Background: Pain management for Caesarean section focuses on multimodal analgesia with a growing interest in the use of regional techniques. Currently, there is no gold standard peripheral regional analgesia technique for Caesarean section. The Erector Spinae Plane Block is a relatively new fascial plane block that may be used to provide analgesia for numerous surgical procedures of the trunk. In recent years it is the fascial plane block that has accumulated the most enthusiasm and debate. Its use in Caesarean section has grown over the past three years.

Objective: To determine the scope of literature published on ESPB in Caesarean sections and to identify deficits in the literature to guide future research.

Methodology: This study was conducted using Arksey and O'Malley's framework for scoping reviews. This included a search of four databases searching for articles published between 2016 and 2022. Studies involving patients receiving ESPB as part of an analgesic strategy after a Caesarean section were included.

Findings: Sixteen articles were included for final review. The most common primary outcomes measured were postoperative pain scores and analgesia consumption. Six ESPB studies recorded a statistically significant reduction in pain scores while three studies described a statistically significant reduction in postoperative analgesia consumption.

Conclusion: The use of ESPB for Caesarean section is gaining momentum however insufficient evidence currently exists to support its widespread use. Further research is required to evaluate the potential benefits of ESPB in specific patient cohorts and in terms of its efficacy about multidimensional patient-centric outcomes.

Key words: Caesarean section, erector spinae plane block, fascial plane block, obstetric anaesthesia, regional anaesthesia

Introduction

Global Caesarean section rates are increasing due to a number of factors including maternal and foetal comorbidities. The World Health Organisation estimates that there will be 38 million Caesarean births per year by 2030.[1] When compared to vaginal deliveries, Caesarean sections are associated with increased pain, delayed mobilisation, and increased length of hospital stay.[2] Furthermore, inadequate pain control in the early post-operative period is associated both with maternal dissatisfaction and the development of chronic pain.[3]

Although the incidence of chronic pain after Caesarean section is low relative to other surgeries, the associated

Access this article online	
Website: https://journals.lww.com/sjan	Quick Response Code
DOI: 10.4103/sja.sja_523_24	

How to cite this article: Brosnan K, Moore M, Ní Eochagáin A. Erector spinae plane block in Caesarean sections: A scoping review. Saudi J Anaesth 2025;19:77-85.

Kieran Brosnan[1], Mary Moore[1], Aisling Ní Eochagáin[1,2]

[1]Department of Anaesthesiology, Rotunda Hospital, Dublin, Ireland, [2]Department of Anaesthesiology, Mater Misericordiae University Hospital, Dublin, Ireland

Address for correspondence: Dr. Kieran Brosnan, Department of Anaesthesiology, Rotunda Hospital, Dublin, Ireland.
E-mail: kierandbrosnan@gmail.com

Submitted: 15-Aug-2024, **Accepted:** 19-Aug-2024, **Published:** 01-Jan-2025

public health burden is likely to increase given the increasing worldwide Caesarean section rates.[4]

Post-Caesarean section pain management consists of multi-modal, multi-route analgesia with opioids remaining a cornerstone of the regimen.[5] Neuraxial and systemic opioid administration can improve intraoperative quality of anaesthesia and postoperative analgesia, however, there is also debate as to their potential to increase incidence of undesirable effects such as nausea, vomiting, pruritus, maternal respiratory depression, delayed initiation of breastfeeding and impairment of mother–infant bonding.[6,7] Opioid-sparing techniques are of particular interest in obstetric patients as they have the potential to provide adequate post-operative analgesia while mitigating the adverse effects associated with opioid analgesia.

Over the past 10 years, local anaesthetic agents have been trialed to varying success as wound infiltration, peripheral nerve blockade and fascial plane blocks.[8] One such fascial plane block which is gaining in popularity is the erector spinae plane block (ESPB). ESPB was first described by Forero *et al*.[9] in 2016, where they found that administration of local anaesthetic deep to the erector spinae muscles resulted in an extensive sensory block over the ipsilateral thorax.[9] This block has since garnered significant interest and has been shown to reduce opioid requirements and improve pain scores for many different surgeries including spine surgery, laparoscopic cholecystectomy, and abdominal hysterectomy.[10-12] More recently ESPB has been used to provide analgesia for Caesarean section.[13] We chose to undertake a scoping review to investigate this evolving field. In doing so we aimed to provide a picture of current practice and how this is evolving.

Objectives

In this paper, we broadly determine the scope of literature published on ESPB in Caesarean sections. The general purpose of conducting scoping reviews is to identify and map the available evidence on a topic.[14] They are particularly useful for examining emerging evidence in fields that are rapidly changing. With the increase in publications on ESPB for Caesarean section over the past 3 years, we felt that a scoping review would be best placed to allow us to determine the broad scope of literature. The objectives of this review were, firstly, to collate a database of the available literature on erector spinae plane block in Caesarean sections. The second was to examine the types of studies which have been performed, from randomised control trials to case reports, to establish as realistic a picture as possible of current clinical practice. Third was to identify gaps and deficits in the published literature, which may guide future research. Fourth was to inform the approach to a systematic review, which would appraise all available high-quality evidence and pool the results, further expanding the evidence base to inform practice, policy, and further research.

Methods

The methodological framework for conducting scoping studies, as described by Arksey and O'Malley, was used to perform this review.[14] Five of the six stages are described below. The sixth stage involves stakeholder input to complement the literature review. The publication of this review aligns with this stage, and we invite readers to correspond with suggested additional references and provide insights beyond those in the literature.

Stage 1: Identifying the research question

Broad research questions were developed to capture the breadth of use of the erector spinae plane block (ESPB) in Caesarean sections. This was an iterative process guided by all authors, resulting in the following three research questions:

(i) How and when are ESPB used in Caesarean sections?
(ii) What patient outcomes are measured to assess the efficacy of ESPB?
(iii) What effect are ESPB having on patient outcomes?

Stage 2: Identifying relevant studies

We performed a search of four databases (MEDLINE, Embase, Scopus, EBSCO) on September 23, 2022, using the search terms 'Erector spinae plane block AND Cesarean OR Caesarean'. MeSH was also applied to the above terms. We limited our search to articles published after 01 January 2016, as the erector spinae plane block was first described in 2016.[15] The same search terms were also used to perform a Google Scholar search and the first 100 articles were included. Reference from included studies were also searched to identify any additional relevant publications. Search results were uploaded and shared between authors using Covidence Review Manager®. Further details of the literature search are described in the Results section.

We assembled a research team with expertise in knowledge synthesis methodology, information science, and obstetric anaesthesia to conduct this scoping review. All authors have prior experience in conducting systematic or scoping reviews. The details of the literature search are in Supplementary Appendix 1.

Stage 3: Study selection

Initial database search identified a total of 2,274 articles, an additional 100 articles were included following a search of Google Scholar. 16 studies were selected for final review [Figure 1]. To select studies for inclusion, an iterative three-stage process was used, which involved title and abstract screening, review of abstracts, and full-text review. These

steps were performed independently by KDB and MM, with subsequent collaboration of screening and review results. To facilitate collaboration, all authors met four times during the process. The first meeting focused on creating a shared understanding of the criteria, the three subsequent meetings involved a comparison of selected articles and a discussion of any discrepancies. ANE facilitated any coding disagreements and made a final decision on whether to include or exclude a paper. Article relevance was judged by the following criteria:

(i) Original investigations in a clinical setting
(ii) Published in English
(iii) Presenting unique data (original data presented in the study)
(iv) Describing the use of ESPB for patients undergoing Caesarean section

Studies involving the use of ESPB as part of the analgesic management in the peri-operative Caesarean section period were included. We included studies published in English between 2016 and 2022 in this review. All original papers were included, including case reports, case series, clinical trials, and conference publications. Studies were excluded if the full text was not available, or the article described a protocol of an ongoing study. We also excluded all manikin studies, cadaver studies, systematic reviews, scoping reviews, and narrative reviews.

Stage 4: Charting the data

For each study, we extracted the study ID, title, lead author, journal of publication, country in which the study was conducted, year of publication, aim of the study, study design, type of anaesthesia used, indication for block, complications of block, inclusion and exclusion criteria, total number of participants, primary intervention, comparator intervention, block technique, medications used, primary outcome, secondary outcome, pain scores, Per Oral morphine equivalent dosing and authors conclusions.

KDB and ANE independently reviewed and extracted data from three articles. The results were compared, and a data extraction tool was designed based on the pilot results. Using the data extraction tool KDB and MM independently extracted data from all included articles and met three times to discuss any discrepancies. ANE reviewed the independently extracted data and undertook the final consensus stage to condense the data into a tabulated form for each study. The final table was compiled following a collaborative discussion among all authors.

Stage 5: Collating, summarising, and reporting results

In keeping with a scoping review methodology, we adopted a narrative approach to summarising and reporting the data. Using our three research questions as guidance, an analytic

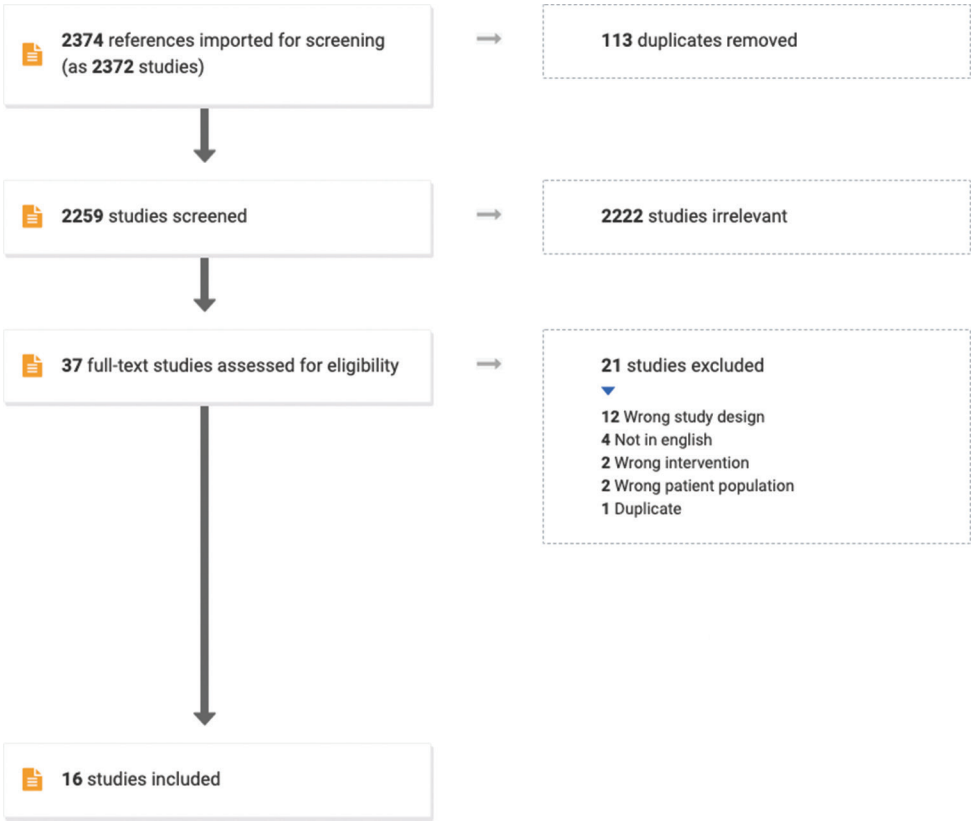

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram

framework was used to summarise the breadth of the literature. All studies underwent qualitative analysis by KDB and MM. The aim of the study, outcomes, block technique, study population, and study results were then collated and summarised. To describe the authors' aims and conclusions, we conducted a thematic analysis. Guided by each category, we provided a narrative synthesis to frame our findings and to help guide future research.

Results

We included 16 studies [Table 1]. In terms of study design, 11 of the papers described randomized controlled trials (RCTs).[16-26] The remaining papers included two case series,[27,28] and three case reports.[29-31] The median number of patients included in the randomized controlled trials was 60, [70, (50-80), 40-140], [mean, (IQR), Range]. A cumulative total of 785 patients were included in this review.

Of the studies included, 11 of the papers were published in anaesthesia journals,[19-21,23-31] with the remaining 5 papers published in pain journals[16,18] or medical journals.[17,22,29] Studies were undertaken in a range of countries; 4 of the studies were carried out in Egypt,[16,18,22,26] 4 in India,[17,21,23,24] 3 in Turkey,[19,25,28] 2 in Italy,[27,31] and 1 in each of China, Canada, and Morocco.[18,20,29,30]

Although 6 years was used as part of the inclusion criteria all the studies included were published between the years 2019 and 2022, with two papers published in 2019,[16,27,29] four published in 2020,[17,22,24,30] four published in 2021,[19,25,30,31] and six published in 2022.[17,20,21,22,23,26]

Specific research questions

How and when are ESPB used in Caesarean sections?

In all but one of the 16 studies included, the ESPB was carried out electively to provide postoperative analgesia following Caesarean section. Only one of the studies, a case report, demonstrated the effective use of ESPB as a rescue analgesia technique.[30]

12 of the studies described ESPB being performed in theatre postoperatively, immediately following the Caesarean section.[12,16,17,19,22-29] The remaining 4 described undertaking ESPB in the post anaesthetic care unit (PACU),[30,31] pre-induction of anaesthesia,[20] and in one case the timing of ESPB was not stated.[21]

All but one of the papers described the use of ESPB in conjunction with spinal anaesthesia for elective Caesarean section. One of the randomised controlled trials described the use of ESPB in conjunction with general anaesthesia (GA) for elective Caesarean section.[20] Their patient cohort consisted of pregnant women for whom spinal anaesthesia was contraindicated.

Of the 16 papers included, 14 stated that the ESPB was performed under ultrasound guidance. The in-plane technique was described in nine of the studies,[16-18,20,22,23,29-31] out-of-plane technique was described in three of the studies,[25-27] and the remaining four did not comment on the specific ultrasound technique used.[19,21,24,28] Bilateral ESPB was described in all studies. One case report demonstrated the use of bilateral ESP catheters for postoperative analgesia.[31] The remaining 15 studies involved the use of single-shot ESPB.

The choice and volume of local anaesthetic agents and use of adjunctive drugs varied. Bupivacaine was used in eight of the studies,[16-18,21,24-30] while ropivacaine was used in seven studies.[17,20,21,23,24,27,31] One paper described the use of a combination of bupivacaine and lidocaine for single-shot ESPB.[25] In papers that described the use of bupivacaine, seven of them reported the use of 0.25% bupivacaine. The volume varied from 15 mls bilaterally,[26,30] to 20 mls bilaterally,[16,19,22,29] while one study described 25 – 30 mls bilaterally.[28] In those papers reporting the use of ropivacaine for ESPB, three reported using 20 mls of 0.25% ropivacaine bilaterally,[20,21,27] two papers reported using 20 mls of 0.375% ropivacaine bilaterally,[23,31] and one paper described using 20 mls of 0.2% ropivacaine bilaterally,[17] and one reported their dosing was 0.2 mls/kg of 0.2% ropivacaine.[24] One paper described the use of a combination of 10 mls 0.5% bupivacaine along with 5 mls 2% lidocaine and 5 mls of saline making a total of 20 mls of solution which was injected as a single shot bilaterally.[25]

The use of adjunctive drugs along with local anaesthetic was reported in five of the papers. Dexamethasone (2–4 mg) was used in four studies,[19,23,27,30] and epinephrine was used as an adjunct with 0.25% bupivacaine in one study.[29]

Randomized controlled trials comprised 11 of the 16 studies. In these studies, ESPB was the primary intervention which was compared to a range of control comparators including transverse abdominis block (TAP block) in three of the studies,[16,17,24] and quadratus lumborum block (QLB) in two of the studies.[21,22] The remainder of the papers compared ESPB to spinal anaesthesia/general anaesthesia alone or in combination with another analgesia.

What patient outcomes are measured to assess the efficacy of ESPB?

The most common primary outcomes measured were post-operative pain scores and postoperative analgesia

Table 1: Summary of studies included in this review

Study ID	Study design	Number of patients	Primary Intervention	Comparator	Primary Outcome	Authors Conclusions
Boules *et al*. 2020	Randomised controlled trial	60	ESP block	Bilateral TAP block	Time to rescue analgesia	ESP block has longer analgesic action and is associated with less tramadol consumption
Salaheldin *et al*. 2022	Case series	4	ESP block	N/A	Post-operative pain score	ESP block is an effective alternative block for Caesarean section
Elkotory *et al*. 2022	Randomised controlled trial	50	QL block	ESP block	Post-operative pain score and morphine consumption	QL and ESP blocks provide an effective modality for the control of post-op pain associated with Caesarean section.
Joshi *et al*. 2022	Randomised controlled trial	112	ESP block	QLB block	Tramadol consumption in the first 48 h	ESP block leads to an analgesic efficacy similar to bilateral transmuscular QLB in patients undergoing Caesarean section
Dostbil *et al*. 2021	Randomised controlled trial	50	bilateral T9 ESP block	Spinal anaesthetic	Total fentanyl consumption in 24 hrs VAS scores Time to first analgesic request	ESP block provided adequate postoperative analgesia and significantly decreased postoperative fentanyl consumption in patients having Caesarean section. ESP block delays the first analgesic requirement
Langoo *et al*. 2022	Randomised controlled trial	60	Bilateral ESP block	Bilateral TAP block	Time to rescue analgesia	ESP block prolongs the time to rescue analgesia and reduces diclofenac use compared to TAP block.
Aygun *et al*. 2022	Randomised controlled trial	80	bilateral T11 ESP block	Spinal anaesthesia without ESPB	Opioid consumption via PCA within the 1st 24 h	ESP block significantly decreased the first 24h analgesia requirement.
Delfino *et al*. 2021	Case report	1	Bilateral ESP block + catheter + LA infusion administration	N/A	Maintenance of analgesia intermittent administration of ropivacaine via bilateral ESP Catheters post-LSCS under spinal	Further studies are required to determine the efficacy and adverse effects of continuous bilateral ESP block compared with other continuous blocks.
Santonastaso *et al*.	Randomised controlled trial	40	Bilateral ESP block	Morphine PCA	Post-operative pain scores	ESPB appears to be safe and significantly reduces pain and postoperative morphine consumption with limited trivial side effects
Bakshi *et al*. 2022	Randomised controlled trial	60	T9 ESP block	Quadratum Lumborum block	Time to rescue analgesia	Both blocks are efficacious and comparable in providing postoperative analgesia as a part of multimodal analgesia after LSCS done under SAB
Chen *et al*. 2022	Randomised controlled trial	60	ESP block with general anesthetic	General anaesthetic without block	PCA bolus requirements and Bruggemann comfort scale scores	ESP block improves postoperative analgesia and comfort and results in shorter recovery times
Aygun *et al*. 2022	Case series	6	Bilateral ESP block T10-11		Time to rescue analgesia	ESP block is effective, safe and feasible
Hamed *et al*. 2020	Randomised controlled trial	140	ESP block	Spinal anaesthesia & Sham block	Post operative pain score	ESP block has a successful postoperative analgesic effect and may limit opioid consumption in parturients undergoing elective Caesarean delivery
Rincón *et al*. 2020	Case report	1	ESP block		Post operative analgesia requirement	ESP block is feasible in this patient population, is well tolerated and can result in excellent postoperative analgesia associated with high patient satisfaction.
Elkoundi *et al*. 2021	Case report	1	T10 bilateral ESP block	Spinal anaesthesia + multimodal analgesia	Post-operative pain score	ESP block may be suited as a rescue analgesic technique in the setting of Caesarean section for those women who have severe breakthrough pain after offset of spinal anaesthesia.
Malawat *et al*. 2020	Randomised controlled trial	60	Bilateral T9 ESP block	Bilateral TAP blocks	Time to rescue analgesia	Th ESP block is a novel, predictable, secure, and safe option for post Caesarean section pain. Based on its duration of action and effectiveness against the TAP block, ESP block provides a clinical advantage in patients with substantial pain.

consumption. Other primary outcomes measured included the duration of analgesia post-ESPB and time to 1st rescue analgesia.

Postoperative pain was measured as a primary outcome in seven of the articles.[18-20,22,26,27,30] This was measured for various durations up to a maximum of 48 h. Time intervals

at which pain measurements were taken also varied. All the papers included pain scores as either a primary or secondary outcome. Eight of the studies report using a visual analogue scale (VAS) for pain assessment.[16-20,22,24,26] A numeric rating scale (NRS) was used in six of the studies.[21,23,25,27,30,31] One study recorded post-operative pain using a verbal assessment,[29] and one study reported using the Bruggemann Comfort Scale as well as a VAS.[20]

Time to 1st rescue analgesia was reported as a primary outcome in five of the papers,[19,23,24,28,30] while the duration of analgesia was described as the primary outcome in two.[16,17] Postoperative analgesia consumption was described as the primary outcome in seven of the studies.[19,20-22,24,25,30] Postoperative analgesia protocols varied among studies. Intravenous morphine,[22,25,26,28] and tramadol[16,18,21,23] were used most commonly. However, intravenous fentanyl[19,20] and diclofenac[17,24] were also used in different institutions.

A range of other secondary outcomes were also recorded as part of the studies. These included overall patient satisfaction, the incidence of post-operative nausea and vomiting, intra/post-operative heart rate and mean arterial pressure, intraoperative anaesthesia consumption, and any other side effects or complications.

What effects are ESPB having on patient outcomes?

None of the papers declared any immediate complications as a result of carrying out an ESP block. The procedure was well tolerated and did not cause any major deleterious effects in the 785 patients included in this review.

Six studies recorded a statistically significant reduction in pain scores compared to the control.[16,17,19,20,21,26] However, this appeared inconsistent and variable across time intervals. Of the studies that recorded patient satisfaction as a secondary outcome (n = 8), seven were randomised controlled trials and one was a case report. Three of these compared ESPB with QLB,[21-23] and two with a TAP block.[16,17] The other two randomized controlled trials compared ESPB with standard intrathecal morphine,[18] and morphine patient-controlled analgesia PCA.[26] In all cases, the majority of patients expressed satisfaction with ESPB as postoperative analgesia. However, in only two papers was this recorded as statistically significant.[16,26]

Postoperative analgesia consumption was recorded as either a primary or secondary outcome in 11 of the papers.[16-25,28] In five of the studies, the reduction in post-operative analgesia consumption was found to be statistically significant compared to the control.[16,17,19,20,24] Three of these studies which found statistical significance were RCTs comparing ESPB to TAP blocks, in patients who underwent spinal anaesthesia.[16,17,24] The remaining two compared ESP to general or spinal anaesthesia without a block.[19,20]

Discussion

This is the first scoping review of ESPB for the Caesarean section. Our scoping review outlines the evidence for the use of EPSB over the past 6 years for Caesarean sections. Although local anaesthetic administration has been shown to result in a mean reduction in morphine consumption in the first 24 h post Caesarean section, a gold standard route of administration has yet to be established.[8] Effective injection sites include Caesarean wound injection, peripheral nerve blocks, and fascial plane blocks.[8] However, a lack of evidence precludes conclusion on which injection site is best.

The ESPB is a relatively new interfascial paraspinal plane block, which is gaining popularity and is currently used as part of enhanced recovery after-surgery programs for many different surgeries.[32,33] In this review, we have presented the evidence available for its use in Caesarean sections. We have demonstrated that the popularity of ESPB use in Caesarean sections is increasing, with an increasing number of annual publications since 2019. As the performance of this versatile block increases, the familiarity and ease of performance will also increase. Indeed it is included in the RAUK "Plan A" blocks designed for widespread adoption by all anaesthetists.[34]

The relevant sonoanatomy and easily recognisable landmarks of the transverse process and erector spinae muscles allow for the consistent technical performance of the ESPB, which is at least comparable with alternative regional blocks.[34] In addition to being a technically easy block to perform, this block is also relatively safe. This is supported by the fact that no early adverse events were reported in any of the articles included in this review.

This review highlights significant variability in the performance of ESPB for Caesarean section. This included the timing of the block, the ultrasound technique, and the local anaesthetic and adjuncts used. Assessment of the effects of the ESPB and patient outcomes measured also varied. All papers included pain scores in the assessment of outcomes, with 8 papers using a visual analogue scale (VAS) and six papers using a numeric rating scale (NRS). Pain is a complex subjective multi-dimensional experience. It is important to acknowledge that both the VAS and NRS are imperfect scales without psychometric evaluation which overlook the individual components of recovery and are prone to overrating.[35] Alternatives to these one-dimensional assessment tools include more patient-centric scores such as the Clinically

Aligned Pain Assessment (CAPA) and Obstetric Quality of Recovery-11 (ObsQoR-11), which help translate the patient experience into more than a number.[36,37] Unfortunately, none of the included papers used such comprehensive assessment tools.

We have shown in this scoping review that there is currently insufficient evidence to support the use of ESPB instead of, or in conjunction with other regional anaesthetic techniques. However, research in this area is growing, and further studies, particularly those focused on patient-centric outcomes, may reveal benefits to the use of ESPB particularly in patients who cannot undergo spinal anaesthesia. There is a paucity of studies comparing the ESPB to other regional techniques that have been shown to be effective in reducing post-operative analgesic requirements.[8] This includes comparison of ESPB to ilio-inguinal, ilio-inguinal–iliohypogastric block, and transversalis fascia block. Given these factors, it was not possible to draw firm conclusions from the available data on the efficacy of ESPB in Caesarean section. Thus, a scoping review methodology is best placed to illustrate current evidence and to identify areas for future research.

Limitations to our study include the possibility of publication bias, as articles published in languages other than English were not included. However, English is the most common language of published medical literature. Furthermore, our inclusion criteria specified the review of case reports, case series, and trials. Potentially relevant papers may have been excluded including post-hoc analysis of RCTs.

Our scoping review was conducted to summarise the currently available evidence for ESPB in Caesarean sections. This paper will assist in performing a systematic review and highlight areas of future research.

Conclusion

ESPB is gaining in popularity as a regional analgesic technique for patients undergoing Caesarean section. Outcome metrics for the success of these techniques vary widely and more frequently use unidimensional measures more than patient-centric metrics. Further research is required to evaluate the potential benefits of ESPB for Caesarean section in particular patient cohorts and in terms of its efficacy about multidimensional patient-centric outcomes.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of Caesarean section rates: Global and regional estimates. BMJ Glob Health 2021;6:e005671.
2. Dunn EA, O'Herlihy C. Comparison of maternal satisfaction following vaginal delivery after caesarean section and caesarean section after previous vaginal delivery. Eur J Obstet Gynecol Reprod Biol 2005;121:56-60.
3. Yurashevich M, Carvalho B, Butwick AJ, Ando K, Flood PD. Determinants of women's dissatisfaction with anaesthesia care in labour and delivery. Anaesthesia 2019;74:1112-20.
4. Nikolajsen L, Sorensen HC, Jensen TS, Kehlet H. Chronic pain following Caesarean section. Acta Anaesthesiol Scand 2004;48:111-6.
5. Roofthooft E, Joshi GP, Rawal N, Van de Velde M; PROSPECT Working Group* of the European Society of Regional Anaesthesia and Pain Therapy and supported by the Obstetric Anaesthetists' Association. PROSPECT guideline for elective caesarean section: Updated systematic review and procedure-specific postoperative pain management recommendations. Anaesthesia 2021;76:665-80.
6. Dahl JB, Jeppesen IS, Jorgensen H, Wetterslev J, Moiniche S. Intraoperative and postoperative analgesic efficacy and adverse effects of intrathecal opioids in patients undergoing cesarean section with spinal anesthesia: A qualitative and quantitative systematic review of randomized controlled trials. Anesthesiology 1999;91:1919-27.
7. Seki H, Shiga T, Mihara T, Hoshijima H, Hosokawa Y, Hyuga S, *et al*. Effects of intrathecal opioids on cesarean section: A systematic review and Bayesian network meta-analysis of randomized controlled trials. J Anesth 2021;35:911-27.
8. Singh NP, Monks D, Makkar JK, Palanisamy A, Sultan P, Singh PM. Efficacy of regional blocks or local anaesthetic infiltration for analgesia after caesarean delivery: A network meta-analysis of randomised controlled trials. Anaesthesia 2022;77:463-74.
9. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: A novel analgesic technique in thoracic neuropathic pain. Reg Anesth Pain Med 2016;41:621-7.
10. Finnerty D, Ni Eochagain A, Ahmed M, Poynton A, Butler JS, Buggy DJ. A randomised trial of bilateral erector spinae plane block vs. no block for thoracolumbar decompressive spinal surgery. Anaesthesia 2021;76:1499-503.
11. Tulgar S, Kapakli MS, Senturk O, Selvi O, Serifsoy TE, Ozer Z. Evaluation of ultrasound-guided erector spinae plane block for postoperative analgesia in laparoscopic cholecystectomy: A prospective, randomized, controlled clinical trial. J Clin Anesth 2018;49:101-6.
12. Hamed MA, Goda AS, Basiony MM, Fargaly OS, Abdelhady MA. Erector spinae plane block for postoperative analgesia in patients undergoing total abdominal hysterectomy: A randomized controlled study original study. J Pain Res 2019;12:1393-8.
13. Rincon C, Moreno DA, Moore A. Erector spinae plane block for post-cesarean delivery analgesia. Int J Obstet Anesth 2020;41:120-2.
14. Arksey H OML. Scoping studies: Towards a methodological framework. Int J Soc Res Methodol 2005;8:19-32.
15. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: A novel analgesic technique in thoracic neuropathic pain. Reg Anesth Pain Med 2016;41:621-7.
16. Boules ML, Goda AS, Abdelhady MA, Abu El-Nour Abd El-Azeem SA, Hamed MA. Comparison of analgesic effect between erector spinae plane block and transversus abdominis plane block after elective cesarean section: A prospective randomized single-blind controlled study. J Pain Res 2020;13:1073-80.
17. S Langoo, S Jan, R Ghulam. Ultrasound guided erector spinae plane block versus transversus abdominis plane block for postoperative analgesia in patients undergoing cesarean section: A randomized controlled study. European Journal of Molecular and Clinical Medicine 2022;9:1303-12.

18. Hamed MA, Yassin HM, Botros JM, Abdelhady MA. Analgesic efficacy of erector spinae plane block compared with intrathecal morphine after elective cesarean section: A prospective randomized controlled study. J Pain Res 2020;13:597.
19. Dostbil A, Ince I, Altinpulluk EY, *et al*. Analgesic effect of erector spinae plane block after cesarean section: A randomized controlled trial. Niger J Clin Pract 2023;26:153-61.
20. Chen Q, Xu Q, Song Y, Wei K, Lei X-F. Analgesic effect of ultrasound-guided erector spinae plane block (ESPB) in general anesthesia for cesarean section: A randomized controlled trial. BMC Anesthesiol 2022;22:1-6.
21. Joshi R, Jeevan R, Selvaraju VA, *et al*. B323 Comparison of ultrasound-guided erector spinae plane block and quadratus lumborum block for postoperative analgesia after caesarean section: a prospective randomised study. BMJ Publishing Group Ltd 2022.
22. Elkotory ME, Amer GF, El Badawy MA. Comparative study between ultrasound guided quadratus lumborum plane block versus ultrasound guided erector spinae plane block for postoperative pain relief in patients undergoing elective caesarean section. Al-Azhar International Medical Journal. 2022;3:55-9.
23. Bakshi A, Srivastawa S, Jadon A, Mohsin K, Sinha N, Chakraborty S. Comparison of the analgesic efficacy of ultrasound-guided transmuscular quadratus lumborum block versus thoracic erector spinae block for postoperative analgesia in caesarean section parturients under spinal anaesthesia—A randomised study. Indian J Anaesth 2022;66(Suppl 4):S213.
24. Malawat A, Verma K, Jethava D, Jethava DD. Erector spinae plane block and transversus abdominis plane block for postoperative analgesia in cesarean section: A prospective randomized comparative study. J Anaesthesiol Clin Pharmacol 2020;36:201.
25. Aygun H, Ozturk NK, Ugur M, Aydin Y, Celik GI, Thomas DT, *et al*. Evaluation of ultrasound-guided bilateral low thoracic erector spinae plane block for postoperative analgesia in cesarean delivery patients: A prospective, randomized, controlled clinical trial. Braz J Anesthesiol 2022;72:444-9.
26. Santonastaso DP, de Chiara A, Addis A, Mastronardi C, Pini R, Agnoletti V. Ultrasound guided erector spinae plane block for post-operative pain control after caesarean section. J Clin Anesth 2019;58:45-6.
27. Salaheldin M, Badawy M. Ultrasound-guided erector spinae plane block for postoperative pain management after cesarean delivery. Ultrasound 2022:45.
28. Aygun H, Thomas DT, Tulgar S. Comment to Santonastaso *et al*.'J Clin Anesth 2019; 58: 45-46'and report of erector spinae plane block series in caesarean delivery patients. J Clin Anesth 2019;60:4-5.
29. Rincón C, Moreno D, Moore A. Erector spinae plane block for post-cesarean delivery analgesia. Int J Obstet Anesth 2020;41:120-2.
30. Elkoundi A, Zemmouri A, Najout H, Bensghir M. Erector spinae plane block for rescue analgesia following caesarean delivery. Anaesthesiology Intensive Ther 2021;53:277-8.
31. Delfino E, Netto R, Zanon D. Pain control after cesarean delivery: A new proposal for a continuous locoregional technique. Int J Obstet Anesth 2021;48:103196.
32. Greenbaum A, Wilcox H, Teng CH, Petersen T, Billstrand M, Campbell R, *et al*. Use of erector spinae fascial plane blocks in enhanced recovery for open abdominal surgery. J Surg Res 2021;268:673-80.
33. Macaire P, Ho N, Nguyen T, Nguyen B, Vu V, Quach C, *et al*. Ultrasound-guided continuous thoracic erector spinae plane block within an enhanced recovery program is associated with decreased opioid consumption and improved patient postoperative rehabilitation after open cardiac surgery-A patient-matched, controlled before-and-after study. J Cardiothorac Vasc Anesth 2019;33:1659-67.
34. Bowness JS, Pawa A, Turbitt L, Bellew B, Bedforth N, Burckett-St Laurent D, *et al*. International consensus on anatomical structures to identify on ultrasound for the performance of basic blocks in ultrasound-guided regional anesthesia. Reg Anesth Pain Med 2022;47:106-12.
35. Stark PA, Myles PS, Burke JA. Development and psychometric evaluation of a postoperative quality of recovery score: The QoR-15. Anesthesiology 2013;118:1332-40.
36. Gordon DB. Acute pain assessment tools: Let us move beyond simple pain ratings. Curr Opin Anaesthesiol 2015;28:565-9.
37. Ciechanowicz S, Setty T, Robson E, Sathasivam C, Chazapis M, Dick J, *et al*. Development and evaluation of an obstetric quality-of-recovery score (ObsQoR-11) after elective Caesarean delivery. Br J Anaesth 2019;122:69-78.

Supplementary Appendix 1

September 23rd 2022– Database search

- Google Scholar - Erector spinae plane block AND Cesarean OR Caesarean – first 100 results 2016-present
- Medline - Erector spinae plane block AND Cesarean OR Caesarean – 19
- EBSCO - Erector spinae plane block AND Cesarean OR Caesarean – 2193
- Embase - Erector spinae plane block AND Cesarean OR Caesarean – 21
- Scopus - Erector spinae plane block AND Cesarean OR Caesarean – 32

Total – 2374

- 2374 uploaded to Covidence Review Manager®
- 2259 remain after removal of duplicates
- 2259 reviewed in total after review of references

September 25th – started initial abstract and title review

- Undertaken by both reviewers separately and then collaborative discussion

Inclusion Criteria

- Papers in English
- Caesarean section AND erector spinae block
- All study types (RCT, case reports etc)
- 2012- present

Exclude

- Manikin studies
- Cadaver studies
- Systematic review
- Scoping review
- Narrative review
- Articles not in English

October 2nd

Reference review – No additional papers included for additional abstract screening