Systematic Reviews and Meta-Analysis

Ultrasound-guided transversalis fascia plane block for postoperative analgesia: A systematic review and meta-analysis

Address for correspondence:
Dr. Abhijit Nair, Department of Anaesthesiology, Ibra Hospital, Ministry of Health-Oman, P.O. Box 275, Ibra-414, Sultanate of Oman.
E-mail: abhijitnair@rediffmail.com

Submitted: 17-Jan-2023
Revised: 17-Feb-2023
Accepted: 04-Mar-2023
Published: 10-Apr-2023

Access this article online
Website: www.ijaweb.org
DOI: 10.4103/ija.ija_43_23
Quick response code

Abhijit Nair, Ujjwalraj Dudhedia[1], Manamohan Rangaiah[2], Nitin Borkar[3]
Department of Anaesthesiology, Ibra Hospital, Ministry of Health-Oman, Ibra-414, Sultanate of Oman, [1]Department of Anaesthesiology and Pain Management, DR. L.H. Hiranandani Hospital, Powai Mumbai, Maharashtra State, India, [2]Department of Anaesthetics and Pain Management, Walsall Manor Hospital, Moat Rd., Walsall WS2 9PS, United Kingdom, [3]Department of Pediatric Surgery, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

ABSTRACT

Ultrasound-guided transversalis fascia plane block (TFPB) has been used for providing postoperative analgesia after various lower abdominal surgeries like iliac crest bone harvesting, inguinal hernia repair, caesarean section and appendicectomy. After registering the protocol in PROSPERO, various databases like PubMed/Medline, Ovid, CENTRAL and clinicaltrials.gov were searched for randomized controlled trials and observational, comparative studies till October 2022. The risk of bias (RoB-2) scale was used to assess the quality of evidence. The database searched identified 149 articles. Out of these, 8 studies were identified for qualitative analysis and 3 studies were TFPB was compared to control in patients undergoing caesarean section were selected for quantitative analysis. At 12 hours, pain scores were significantly less in TFPB group when compared to control on movement with no heterogeneity. At other times, the pain scores were comparable. 24-hr opioid consumption was significantly less in TFPB group when compared to control with significant heterogeneity. Time to rescue analgesia was significantly less in TFPB group when compared to control with significant heterogeneity. Number of patients requiring rescue analgesia were significantly less in TFPB group when compared to control with no heterogeneity. Postoperative nausea/vomiting (PONV) was significantly less in TFPB group when compared to control with minimal heterogeneity. In conclusion, TFPB is a safe block which provides opioid-sparing postoperative analgesia and a delayed time to rescue analgesia with no significant difference in pain scores and lesser PONV postoperatively when compared to control in patients undergoing caesarean section.

Key words: Acute pain, analgesia, fascia, nerve block, postoperative, regional anaesthesia, surgery, ultrasonography

INTRODUCTION

Several abdominal wall blocks are being used by anaesthesiologists to provide postoperative analgesia for surgeries involving lower abdominal incisions. Transversus abdominis plane (TAP) block, quadratus lumborum block (QLB) and ilioinguinal–iliohypogastric block (IIIB) are a few of the popular blocks employed for this purpose.[1-3] Transversalis fascia plane block (TFPB) was first described by Hebbard in the year 2009.[4] The article described the author's experience of TFPB in patients undergoing various surgeries like iliac crest bone harvesting, appendicectomy, cecostomy and inguinal hernia repair, often in combination with TAP block.

How to cite this article: Nair A, Dudhedia U, Rangaiah M, Borkar N. Ultrasound-guided transversalis fascia plane block for postoperative analgesia: A systematic review and meta-analysis. Indian J Anaesth 2023;67:331-42.

The initial description of TFPB was with patients in the supine position, with a linear array or curvilinear probe placed between the iliac crest and the costal margin. The external oblique, internal oblique and transversus abdominis muscles and the transversus aponeurosis are identified. The entry of the needle has to be in-plane, from the anterior aspect, and after traversing through the deep surface of the transversus abdominis muscle, local anaesthetic is injected to separate the transversalis fascia from the transversus muscle. Studies have demonstrated that this intervention blocks the proximal branches of T12 and L1 and to a lesser extent T11 in the plane between the transversus abdominis muscle and the transversalis fascia.

Since its initial description, ultrasound (US)-guided TFPB has been explored in many randomised controlled trials for patients undergoing iliac crest bone harvesting, lower segment caesarean section (LSCS), inguinal hernia repair and hip surgeries.[5-15] To date, there has been no pooled analysis published in which TFPB was compared to either no block, placebo, or any other intervention *per se*. This systematic review and meta-analysis aimed to investigate the efficacy and safety of US-guided TFPB as an intervention providing perioperative analgesia in patients undergoing various surgeries by comparing it with placebo or sham block and other interventions.

METHODS

This systematic review was registered with the international prospective register of systematic reviews (PROSPERO registration number: CRD42022375901) and was reported as per the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines.[16] The search of relevant keywords was from databases starting from January 2008 till October 2022. The strategy included searches of PubMed/MEDLINE, Ovid, Cochrane Library (CENTRAL), and clinical trials.gov. The search strategy for PubMed database was as follows: ((((((Acute pain) AND (Postoperative pain)) AND (Surgery)) AND (Fascia)) AND (Transversalis)) AND (Ultrasonography)) AND (Regional Anaesthesia). The full search strategy in all databases is provided in Supplementary File 1.

The results obtained from the databases were carefully screened for randomized controlled trials in which TFPB was compared to placebo, systemic opioid and/or non-opioid analgesia, or any other regional anaesthesia technique. The titles and abstracts were separately reviewed, and duplicates were removed by two authors (AN and MR). The final included studies were chosen after consideration by both authors who also read the complete texts. Any disagreement and inconsistency were settled by a third author (NB). Data were extracted independently by each reviewer using a standardized format. The finalised articles were assessed for study characteristics and study outcomes. The collected data comprised of author name, publication year, study design, number of participants, country, age, type of surgical intervention, use of adjuvant medications and volume/concentration/type of local anaesthetic (LA).

Participants (inclusion and exclusion criteria)

Randomised controlled trials or observational studies in which TFPB was compared with either a placebo, or no block, or any other interventions in patients undergoing lower abdominal and hip surgeries were included. Studies in which there were no control groups, case reports/series, editorials, review articles and conference abstracts were excluded.

Intervention and comparators

The intervention under investigation was US-guided TFPB which was compared with either a placebo, or no block, or any other interventions like TAP block, QLB, or IIIH block in patients undergoing lower abdominal or hip surgeries were included.

Outcomes: Primary and secondary

Primary outcomes were pain scores at rest and movement in the first 24 hrs. The secondary outcomes were 24-hr opioid consumption, time to first analgesia, patients requiring rescue analgesia, adverse events like postoperative nausea/vomiting (PONV), patient satisfaction, complications due to block and length of hospital stay.

Methodological quality assessment

The Revised Cochrane risk-of-bias tool for randomized trials (RoB 2) was used to access the methodologic quality and risk of bias of the included randomized control trials. Six categories were taken into consideration for bias assessment: bias due to randomization, bias due to deviation from intended intervention, bias due to missing data, bias due to outcome measurement, bias due to selection of reported result and overall bias.[17] The quality of non-randomized trials was assessed independently by two authors based on the Newcastle–Ottawa scale (NOS).[18]

Data extraction

The reference data, populations and outcomes were extracted from the articles and entered in pre-planned tables. The two authors used a systematic process for data extraction. Prior to being used, the data gathering form underwent a pilot test. We gathered data on the study's design, number of arms, primary result, participants' demographics, sample size, surgical procedures and the experimental intervention (unilateral or bilateral blocks, drug used, concentration and volume of LA used). The distinction between the presence or absence of a therapeutic or adverse effect was retrieved as a dichotomous outcome. We calculated means and standard deviations (SDs) for continuous data. If not stated, the SDs were derived from confidence intervals (CIs) or *P* values that related to the variances in means between the two groups. If certain outcome details are represented in graphs and not in numbers, the corresponding authors were contacted to retrieve details.

Data synthesis and analysis

If trials were clinically homogenous in terms of demographic, intervention (the kind of block employed) and control, data pooling was performed. When sufficient numbers of adequately homogenous studies were revealed following data extraction, Review Manager software was used to conduct the meta-analysis *post hoc* (version 5.4.1).[19]

For the meta-analysis, aggregate-level data were utilized. Mantel–Haenszel technique was used to assess dichotomous variables, and the risk ratio with the associated 95% confidence interval (CI) was determined. For units-unified continuous variables, the mean difference (MD) with the accompanying 95% CI was determined using the inverse variance approach. We evaluated the heterogeneity between studies using the I^2 statistic which was defined as 0–40%-might not be important, 30—60%-may represent moderate heterogeneity, 50–90%-may represent significant heterogeneity and 75–100%-considerable heterogeneity.[20]

The results were compared with the random effects model and fixed effects model, and the reliability of the combined results was eventually analysed according to the consistency degree of the results. When $P > 0.01$ and $I^2 < 50\%$, the fixed effects model was used, and when $P < 0.01$ and $I^2 > 50\%$, the random effects model was used for meta-analysis.[20] Mean difference (MD) was used to combine continuous outcomes recorded on the same scale, and the result was given as a mean difference with a 95% confidence interval (CI). For comparison purposes between the trials, different opioids were converted to IV morphine equivalent. Risk ratios (RR) with 95% CI were used to report dichotomous results.

RESULTS

Description of the studies

Results of the literature search

The original database search found 149 citations. The PRISMA flowchart is displayed in Figure 1. The data for this systematic review were provided by seven randomised controlled trials and one observational study after duplicates were removed. The research that is considered was finished between 2008 and 2022. The population, intervention and control characteristics of the studies that were considered are listed in Table 1.

Risk of bias

The risk of bias within the trials according to ROB2 is depicted in Figure 2a. The summary plot of the quality assessment is shown in Figure 2b. The bias from the randomization process was low in 7[21] studies and high in one study.[22-28] Bias due to deviations from intended interventions (allocation concealment) was low in seven[22-28] studies and high in one study.[21] Bias arising due to missing outcome data was low in seven studies[22-28] and no information in one study.[21] Bias in the measurement of outcome was low in six studies,[22-25,27,28] with no information in one study[26] and high in one study.[21] Bias arising due to the selection of reported results was low in seven studies,[22-28] and there was no information in one study.[21] The overall bias was low in seven studies[22-28] and high in one study.[21] Methodological quality assessment of the one non-randomized study included in our meta-analysis[21] showed that both studies are of fair quality as per the NOS scale.

The technical performance of the blocks and other details are as follows:

Block technique

LA used

The volume, concentration and local anaesthetic are used for different for all studies. In all the studies, the blocks were single-shot, and no catheter was placed

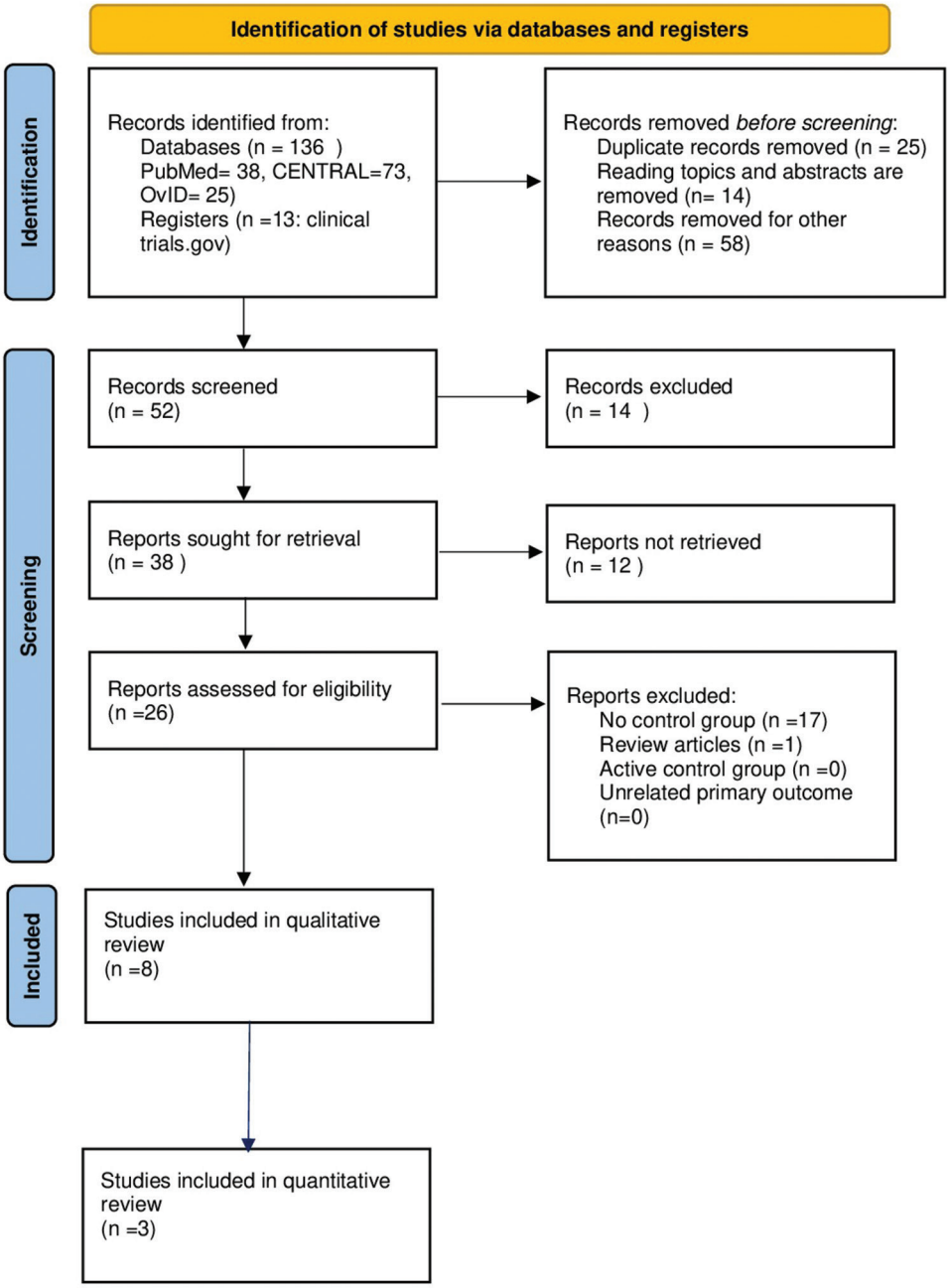

Figure 1: PRISMA flowchart

for continuous infusion.[21-28] In three studies, blocks performed were bilateral[23,25,28] and were unilateral for other studies.[21,22,24,26,27] The details of the block characteristics are depicted in Table 1.

Type of surgeries

All of the trials comprised adult and paediatric patients who underwent various hip or lower abdominal surgeries. Study characteristics are listed in Table 1. The following surgical procedures were done with TFPB in the trials that were included: LSCS (three studies),[23,25,28] inguinal hernia repair (three studies-one paediatric, two adults),[21,22,26] iliac crest bone harvesting (one study)[24] and developmental dysplasia of hip repair (one study).[27]

Comparators

All trials compared TFPB with either a placebo (normal saline or dextrose) or another intervention (US-guided QLB). In studies involving LSCS, the interventions (TFPB or placebo) were performed bilaterally.[23,25,28] For other studies, the interventions were unilateral.[21,22,24,26,27] In the three studies involving hernia repair, one study compared TFPB

Table 1: Characteristics of all the included studies

Authors/ year	Country	Type of study	Surgery	Patients included	Number of patients	Comparator	LA used in block	Primary outcome	Secondary outcome	Conclusions
López-González *et al.*[21]/ 2016	Spain	Retrospective, observational study	Unilateral inguinal hernia repair	Adults	61	Anterior TAP	30 ml of 0.25% levobupivacaine	Postoperative pain at rest and movement)	Postoperative opioid consumption, sensory block level, complications, patient satisfaction,	Analgesic efficacy of TFPB and TAP block was similar with comparable opioid requirement postoperatively
Abdelbaser *et al.*[22]/ 2020	Egypt	Randomized, double-blind, controlled study	Inguinal herniorrhaphy	Paediatric (1-5 years)	38	Saline	0.4 ml/kg of 0.25% bupivacaine	Postoperative non-opioid requirement	Pain score, time to rescue analgesia, parental satisfaction	TFP block decreases postoperative analgesic consumption and postoperative pain intensity after paediatric inguinal herniorrhaphy.
Aydin *et al.*[23]/ 2020	Turkey	Randomized, double-blind, placebo-controlled trial	LSCS	Parturient	60	Saline	20 ml of 0.25% bupivacaine on each side	Postoperative opioid requirement	Pain scores, time to rescue analgesia, opioid-related side effects	Postoperative TFP block reduced opioid consumption and relieve acute pain after a caesarean section under spinal anaesthesia
Black *et al.*[24]/ 2019	UK	Randomized controlled trial	Iliac bone graft harvesting for wrist fusion surgery	Adults	50	Dextrose	20 ml 0.5% ropivacaine with 5 µg/ml epinephrine	Postoperative opioid requirement	Pain scores, persistent pain at 6 and 12 months	TFP block provides effective early analgesia for anterior ICBG harvesting with low persistent pain.
Chilkoti *et al.*[25]/ 2022	India	Randomized controlled trial	LSCS	Parturient	60	Wound infiltration	20 ml of 0.375% ropivacaine was infiltrated on both sides	Pain scores	Time to rescue analgesic, total opioid consumption, persistent postoperative pain	TFP block is efficacious for management of both acute and chronic post-caesarean pain management.
Fouad *et al.*[26]/ 2020	Egypt	Randomized controlled trial	Inguinal hernia repair	Adults	50	Transmuscular quadratus lumborum block	30 mL of 0.25% bupivacaine	Rest and movement pain at 30 minutes	Percentage of patients receiving rescue analgesia in the first postoperative day, ease of performance of the technique, and incidence of adverse effects	TFP block could be as effective as the QL block in lowering pain scores and decreasing opioid consumption following non-recurrent inguinal herniorrhaphy
Huang *et al.*[27]/ 2021	China	Double-blinded randomized controlled trial	Developmental dysplasia of hip repair	Paediatric (2-10 years)	110	Quadratus lumborum block	0.8 ml/kg of 0.3% ropivacaine	Pain scores (FLACC)	Perioperative opioid consumption, the time until first press of nurse-controlled analgesia/patient-controlled analgesia, length of post-anaesthesia care unit (PACU) stay, length of hospital stays, parental satisfaction with pain management and adverse events.	TFP block was superior to QLB for DDH repair.

Contd...

Table 1: Contd...

Authors/ year	Country	Type of study	Surgery	Patients included	Number of patients	Comparator	LA used in block	Primary outcome	Secondary outcome	Conclusions
Serifsoy *et al.*[28]/ 2019	Turkey	Prospective, randomised controlled clinical trial	LSCS	Parturient	70	No block	25 mL of local anaesthetic (10 mL bupivacaine 0.5%, 5 mL lidocaine 2%- and 10-mL normal saline)	24-hr opioid consumption	Pain scores- rest and movement	Bilateral ultrasound-guided TFPB leads to effective analgesia and a decrease in analgesia requirement in first 24 h in patients undergoing LSCS

with anterior TAP block,[21] one study compared with transmuscular QLB[26] and in one study the comparator was placebo.[22] In the study involving patients undergoing iliac crest bone harvesting, the comparator was placebo (dextrose),[24] and in the study involving paediatric patients undergoing developmental dysplasia of hip repair, the comparator was QLB.[27]

Outcomes studied

The studies compared various outcomes like pain scores at various intervals (up to 24 hr), time to rescue analgesia, 24-hr opioid consumption, adverse events like PONV and patients receiving rescue analgesia. Pain scores at rest and movement were assessed by six studies.[21,23,25-28] Pain scores (without specifying at rest or movement) were assessed by two studies.[22,28] Time to the first analgesia was assessed by all eight studies.[21-28] 24-hr opioid consumption was assessed by seven studies.[21,23-28] Adverse events like PONV were assessed by five studies.[21,23-25,28] Block-related complications were assessed by five studies.[21,22,24-26] Patient satisfaction was assessed by five studies.[21-23,27,28] Block performance time was assessed by two studies.[24,26] Hospital stays were reported by one study,[27] and assessment of dermatomal level was reported by two studies.[21,24]

Data analysis

There was a lot of heterogeneity across the studies in this systematic review in terms of the type of surgery performed, the comparison groups and the outcomes that were assessed. As a result, the intended quantitative synthesis (meta-analysis) was only carried out for patients having caesarean deliveries and comparing TFPB to placebo or no block. Table 1 provides an overview of each study's key findings.

Pooled data for LSCS

Primary outcome meta-analysis

Three studies fulfilled inclusion criteria (for LSCS) and were taken for quantitative analysis[23,25,28] A total of 190 patients were included for the quantitative analysis: TFPB group-95 and control-95. In the study by Aydin *et al.*,[23] single-shot bilateral TFPB with LA was compared with saline. In the study by Chilkoti *et al.*,[25] single-shot bilateral TFPB with LA was compared with wound infiltration. In the study by Serifsoy *et al.*,[28] single-shot bilateral TFPB with LA was compared with no block.

Meta-analysis for pain scores (at rest and at movement)

Pain scores were reported at various intervals. However, we could perform a pooled analysis of the pain scores at 1, 12 and 24 hours. Three studies reported pain scores at rest and at movement.[23,25,28]

Pain scores at 1 hour:

Pain scores at rest at 1 hour were reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed comparable pain scores at 1 hour at rest (MD: -0.48; 95% CI: -1.46, 0.50; P = 0.340). A random effect model was applied which revealed considerable heterogeneity (P = 0.003; I^2 =89%) [Figure 3a].

Pain scores at rest on movement at 1 hour were reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed comparable pain scores at 1 hour at movement (MD: -0.99; 95% CI: -2.95, 0.97; P = 0.320). A random effect model was applied which revealed considerable heterogeneity (P < 0.00001; I^2 =97%) [Figure 4a].

Pain scores at 12 hours:

Pain scores at rest at 12 hours at rest were reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed comparable pain scores at 12 hours at rest (MD: 0.00; 95% CI: -0.4, 0.4, P = 1.00). A fixed effect model revealed no heterogeneity (P = 1.00; I^2 =0%) [Figure 3b].

Pain scores on movement at 12 hours were reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled

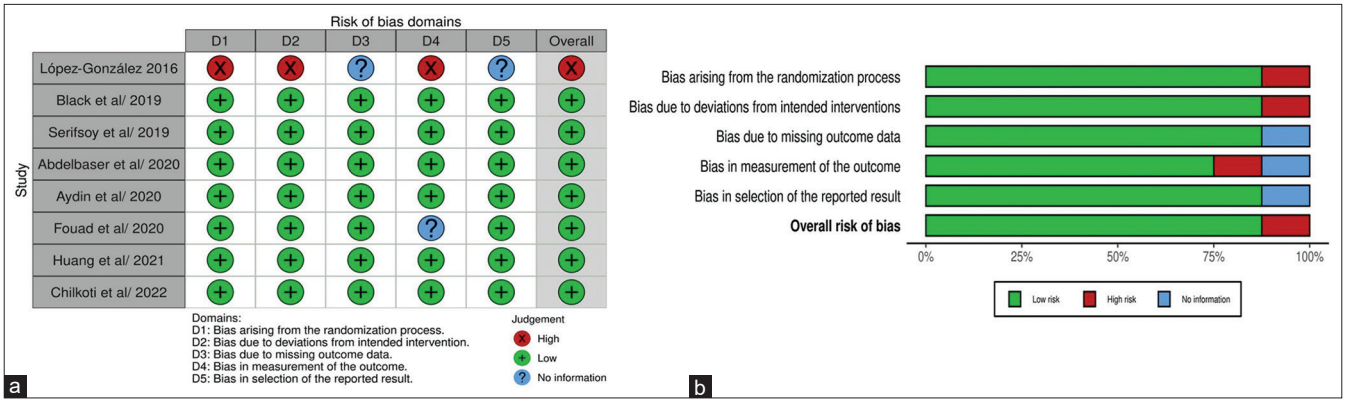

Figure 2: Risk of bias diagram. (a) Traffic plot diagram showing risk of bias within the trials. (b) Summary plot diagram showing quality assessment for each included study

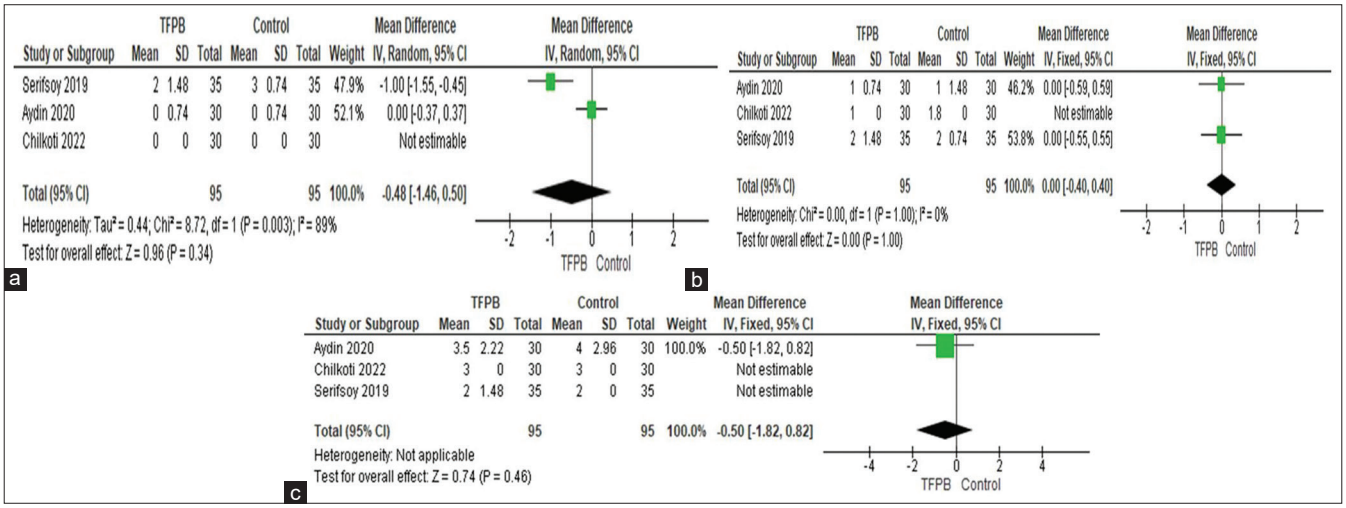

Figure 3: (a) Forest plot showing comparison of pain scores at 1 hr (rest). (b) Forest plot showing comparison of pain scores at 12 hr (rest). (c): Forest plot showing comparison of pain scores at 24 hr (rest)

analysis revealed significantly lesser pain scores at 12 hours on movement (MD: -1.00; 95% CI: -1.44, -0.56, $P < 0.00001$). A fixed effect model revealed no heterogeneity ($P = 1.00$; $I^2 = 0\%$) [Figure 4b].

Pain scores at 24 hours:

Pain scores at rest at 24 hours at rest were reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed comparable pain scores at 12 hours at rest (MD: 0.40; 95% CI: -0.35, 1.15; $P = 0.300$). Heterogeneity could not be assessed for analysis of pain scores at 24 hours on movement [Figure 3c].

Pain scores on movement at 24 hours were reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed comparable pain scores on movement at 24 hours (MD: -0.50; 95% CI: -1.82, 0.82; $P = 0.460$). Heterogeneity could not be assessed for analysis of pain scores at 24 hours on movement [Figure 4c].

24-hour opioid consumption

24-hour opioid consumption was reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed significantly less opioid consumption in the TFPB group when compared to the control group (MD: -13.27; 95% CI: -24.04, -2.50; P=0.020). A random effect model revealed significant heterogeneity (P=0.0002; I^2 =93%) [Figure 5a].

In the study by Chilkoti *et al.*,[25] diclofenac 75 mg intravenously (IV) injection was used to relieve the breakthrough pain. If the patient experienced poor pain alleviation, defined as an NRS score of 3 or more, tramadol 1 mg/kg was given after IV ondansetron. In the control group, only one patient received 50 mg IV

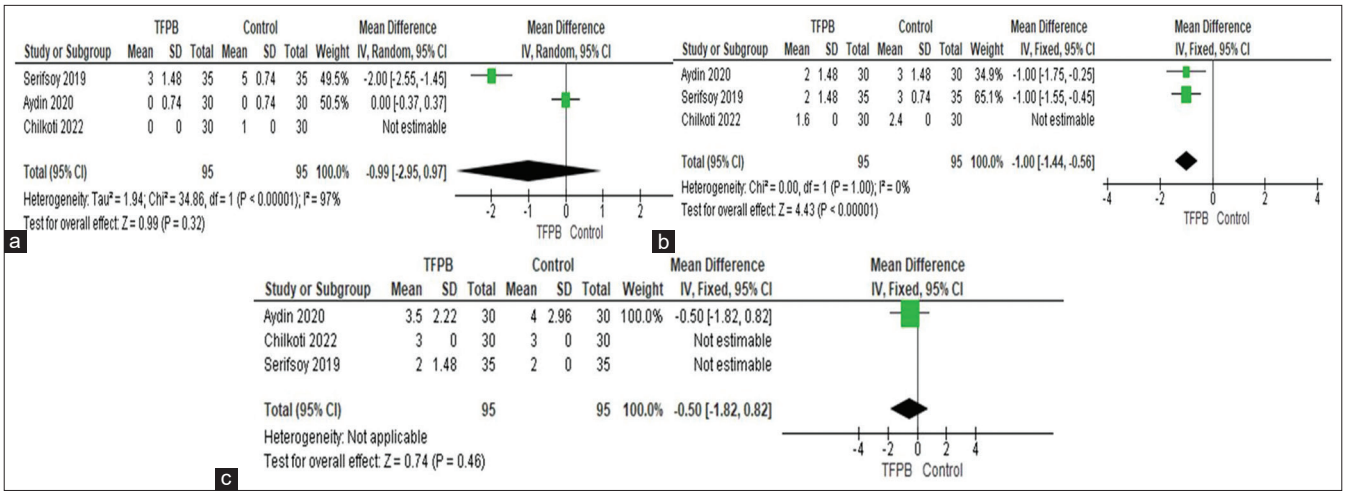

Figure 4: (a) Forest plot showing comparison of pain scores at 1 hr (movement). (b) Forest plot showing comparison of pain scores at 12 hr (movement). c: Forest plot showing comparison of pain scores at 24 hr (movement)

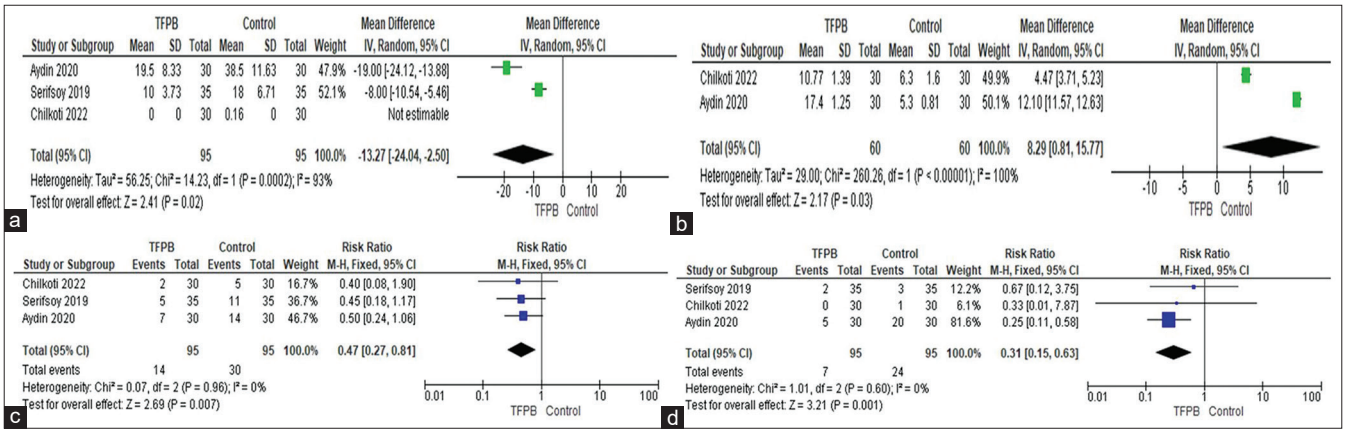

Figure 5: (a) Forest plot showing comparison of 24-hr opioid consumption. (b) Forest plot showing comparison of time to rescue analgesia. (c) Forest plot showing comparison of patients requiring rescue analgesia. (d) Forest plot showing comparison of PONV

tramadol and none received in the TFPB group. This could be the reason for the significantly lesser 24-hr opioid use in this study.

Time to first analgesic

Time to the first analgesic was reported by two studies (60 patients in the TFPB group and 60 patients in the control group).[23,25] A pooled analysis revealed significantly less time to rescue analgesia in the control group when compared to the TFPB group (MD: 8.29; 95% CI: 0.81, 15.77; $P = 0.030$). A random effect model was applied which was suggestive of significant heterogeneity ($P < 0.00001$; $I^2 = 100\%$) [Figure 5b].

Patients requiring rescue analgesia

The number of patients requiring rescue analgesia was reported by three studies (95 patients in the TFPB group and 95 patients in the control group).[23,25,28] A pooled analysis revealed significantly fewer patients requiring rescue analgesia in the TFPB group when compared to the control group (RR: 0.47; 95% CI: 0.27, 0.81; $P = 0.007$). A fixed effect model was suggestive of no heterogeneity ($P = 0.96$; $I^2 = 0\%$) [Figure 5c].

PONV

PONV as an adverse event was reported by three studies (95 patients in the TFPB group and 95 patients in the control group.[23,25,28] A pooled analysis revealed significantly less PONV in the TFPB group when compared to the control group (RR: 0.31; 95% CI: 0.15, 0.63; $P = 0.001$). A fixed effect model revealed no heterogeneity ($P = 0.60$; $I^2 = 0\%$) [Figure 5d].

Other surgeries

Hernia repair

Three studies assessed the efficacy of TFPB in providing postoperative analgesia after hernia repair. In the first study, patients were children between 1 and 5 years.[22] Children the in TFPB group received the block after induction of general anaesthesia. There was decreased postoperative analgesic consumption and better pain scores in patients who received the block when compared to the control group (Placebo). In the other study (Fouad), adult patients were administered TFPB in one group and QLB in another group.[26] US-guided TFPB was as effective as QLB in providing better pain scores and postoperative opioid consumption after herniorrhaphy. The study by López-González *et al.*[21] was a retrospective observational study in which authors compared TFPB with anterior TAP block for outpatient, unilateral inguinal hernia surgery. The analgesic efficacy in terms of verbal numerical scale was comparable in both groups with no significant differences in additional analgesia requirements and the cumulative dose of morphine.

Iliac crest bone graft harvesting

One study assessed the efficacy of TFPB for providing postoperative analgesia in adult patients undergoing iliac crest bone graft harvesting for wrist fusion surgery when compared to a placebo (dextrose).[24] The anaesthesia provided for wrist fusion was a brachial plexus block in both groups. In the TFPB group, patients received the block. TFPB provided effective early analgesia for anterior ICBG harvesting with a low incidence of persistent postoperative pain.

Development dysplasia of hip repair

One study assessed the efficacy of TFPB in paediatric patients (2–10 years) undergoing development dysplasia of hip repair when compared to QLB-III.[27] Both interventions were performed after induction of general anaesthesia. Both blocks provided comparable pain scores, but patients in the TFPB group had a later time to first analgesia when compared to QLB-III.

DISCUSSION

Summary of evidence

This systematic review and meta-analysis demonstrated the efficacy and safety of adding US-TFPB in patients undergoing caesarean sections. The qualitative analysis involving eight studies investigated the efficacy of TFPB in various surgeries like caesarean sections, hernia repair, repair of congenital hip dysplasia and iliac crest bone harvesting. The details like surgeries done, primary and secondary outcomes, details of block performed (volume and concentration of LA, unilateral or bilateral) and details of the control group were summarized. The quantitative analysis of primary and secondary outcomes was performed only for studies in which TFPB was used for patients undergoing caesarean section.

When compared to the control group, the pain scores on movement at 12 hours were considerably lower. The pain scores at other occasions were comparable at rest and movement. When compared to the control group, 24-hour opioid intake was significantly lower in the TFPB group. When compared to the control group, the time to rescue analgesia was much shorter in the TFPB group. When compared to the control

group, the number of patients in the TFPB group who needed rescue analgesia was significantly lower. When compared to the control group, PONV in the TFPB group was considerably lower. To the best of our knowledge, this is the first systematic review and meta-analysis that has investigated the safety and efficacy of US-guided TFPB in various lower abdominal surgeries when compared to control or other interventions.

US-guided TFPB is a unique block because it selectively blocks T12, L1 dermatome and at times T11. The other abdominal fascial plane blocks like TAP, QLB and paraspinal blocks like erector spinae plane block (ESPB) have an unpredictable dermatomal distribution which depends on the point of injection, volume and concentration of LA used. Many clinicians have argued that TFPB and QLB-I are essentially the same technique, given the close anatomical injection end-points. However, there is a difference in local anaesthetic distribution and variable clinical outcomes which suggests that the two blocks are inherently different.[11]

The lateral and cutaneous branches of the subcostal nerve (T12), the ilioinguinal nerve (L1) and the iliohypogastric nerve are among the branches of the 12th thoracic and 1st lumbar spinal nerves that supply sensory innervation to the Pfannenstiel incision in LSCS (Th12-L1). The sensory blocks of all three of these nerves are necessary for effective postoperative analgesia.[2,6,9] For postoperative pain control after LSCS, regional anaesthetic procedures such as TAP blocks, IIIH blocks and QLB blocks can be employed which cover T12 and L1 distribution with variable success.[29]

Vasques *et al*.[30] conducted microscopic and macroscopic analysis of a series 10 dissections of unembalmed cadavers. On histological staining, the authors demonstrated the presence of transversalis fascia exists which is adherent to the fascia of the transversus abdominis muscle. The authors described a small triangle lateral to the quadratus lumborum muscle that contains the iliohypogastric and ilioinguinal nerves. The authors suggested performing the injection in this triangle for the TFPB. The authors concluded that the injected LA reaches the target nerves (T12 and L1 nerves) by spreading through the thin transversalis fascia.

Huang *et al*.[27] demonstrated that TFPB provided a greater duration of analgesia when compared to QLB III. This was possibly due to the more localized spread of the injected LA and targeting IIIH, subcostal nerves more effectively. In this study, the block provided effective analgesia for dysplastic hip in paediatric patients due to possible spread around the femoral nerve.

Lee *et al*.[31] reported a case of unanticipated quadriceps and hip flexor weakness after US-guided TFPB in a 50-year-old lady undergoing left distal radius osteotomy with an iliac crest bone graft. The explanation provided was that there was a partial lumbar plexus block due proximal spread of the LA injected in the TFP which is possible as the lumbar plexus plane is anatomically contiguous with the transversalis fascia plane.

Several myofascial plane blocks have been used utilised for providing postoperative analgesia for lower abdominal surgeries especially caesarean section like lumbar paravertebral block, QLB, TAP block, IIIH block, ESP block and the TFPB. The dermatome that needs to be covered importantly is T12 and L1. Although the above-mentioned blocks are effective, most of them have certain limitations. TAP block might not be effective if T12 and L1 lateral cutaneous branches happen to originate proximally than usual.[32] A recent meta-analysis concluded that although postoperative opioid consumption was lesser with lumbar ESPB in caesarean section, postoperative pain scores were comparable to TAP block and intrathecal morphine.[33] In another meta-analysis, it was concluded that QLB and TAP provided superior analgesia after caesarean section provided intrathecal morphine had not been administered.[34] The TFPB reliably blocks ilioinguinal, iliohypogastric and subcostal nerves closer to the lumbar plexus and is therefore expected to provide adequate analgesia involving T12 and L1 dermatomes.

The heterogeneity in the methodologies used in the included studies is a major limitation of this review. The trials that are included for analysis have a variety of control groups, including placebo, no block, various RA methods and multimodal analgesia. Each research had slightly different primary outcomes, although the majority of them assessed pain levels and/or opioid use at various intervals throughout the first 24 hours postoperatively. The quality of recovery and other patient-centred outcomes have received less attention from studies, and none of the studies has assessed the block's economic value.

CONCLUSION

TFPB appears to be a reliable block for providing opioid-sparing analgesia in the first 24 hours following caesarean section, with a longer time to rescue analgesia, based on the current qualitative and quantitative study. TFPB appears to be comparable to QLB and TAP block in hernia surgeries. However, postoperative pain levels are comparable to placebo and other comparison groups, with the exception of 12 hours on mobility. It is advised that TFPB is investigated for various lower abdominal procedures through well-designed clinical trials that address blinding, attrition, reporting biases and is appropriately powered.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Chin KJ, McDonnell JG, Carvalho B, Sharkey A, Pawa A, Gadsden J. Essentials of our current understanding: Abdominal wall blocks. Reg Anesth Pain Med 2017;42:133-83.
2. Fernandes HDS, Azevedo AS, Ferreira TC, Santos SA, Rocha-Filho JA, Vieira JE. Ultrasound-guided peripheral abdominal wall blocks. Clinics (Sao Paulo) 2021;76:e2170.
3. Urits I, Ostling PS, Novitch MB, Burns JC, Charipova K, Gress KL, *et al*. Truncal regional nerve blocks in clinical anesthesia practice. Best Pract Res Clin Anaesthesiol 2019;33:559-71.
4. Hebbard PD. Transversalis fascia plane block, a novel ultrasound-guided abdominal wall nerve block. Can J Anaesth 2009;56:618–20.
5. Peksöz U, Yayık AM, Çelik EC. Efficacy of ultrasound-guided transversalis fascia plane block in pediatric ureteroneocystostomy surgery. Korean J Anesthesiol 2022;75:188-90.
6. Ahiskalioglu A, Aydin ME, Doymus O, Yayik AM, Celik EC. Ultrasound guided transversalis fascia plane block for lower abdominal surgery: First pediatric report. J Clin Anesth 2019;55:130-1.
7. Tian Y, Zhan Y, Liu K, Bu S, Tian Y, Xiong C, *et al*. Analgesic effects of different concentrations of ropivacaine in transversalis fascia plane block during laparotomy. BMC Anesthesiol 2022;22:54.
8. Singh S, Singh S, Sharma M. Successful use of Transversalis fascia plane block for iliac crest bone harvesting in a Polytrauma patient-A case report. Saudi J Anaesth 2020;14:107-8.
9. Sequera-Ramos L, Ruby JM, Jackson OA, Ganesh A, Gurnaney H, Kraemer FW, *et al*. Continuous transversalis fascia plane catheter infusion in a pediatric patient undergoing alveolar cleft repair with iliac crest bone graft: A case report. A A Pract 2019;13:162-5.
10. Tulgar S, Yılmazer MS, Kızıltunc B, Thomas DT, Manukyan MN. The combination of ultrasound guided transversalis fascia plane block and transversus abdominis plane block: An alternative method for anesthesia in inguinal herniorrhaphy. J Clin Anesth 2019;56:129-30.
11. Tulgar S, Serifsoy TE. Transversalis fascia plane block provides effective postoperative analgesia for cesarean section: New indication for known block. J Clin Anesth 2018;48:13-4.
12. Scimia P, Basso Ricci E, Petrucci E, Behr AU, Marinangeli F, Fusco P. Ultrasound-guided transversalis fascia plane block: An alternative approach for anesthesia in inguinal herniorrhaphy: A case report. A A Pract 2018;10:209-11.
13. Choudhary J, Mishra AK, Jadhav R. Transversalis fascia plane block for the treatment of chronic postherniorrhaphy inguinal pain: A case report. A A Pract 2018;11:57-9.
14. Vasques F, Stecco C, Mitri R, De Caro R, Fusco P, Behr AU. Blocking around the transversalis fascia: Behind the scene. Minerva Anestesiol 2019;85:15-20.
15. Chin KJ, Chan V, Hebbard P, Tan JS, Harris M, Factor D. Ultrasound-guided transversalis fascia plane block provides analgesia for anterior iliac crest bone graft harvesting. Can J Anaesth 2012;59:122-3.
16. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, *et al*. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev 2015;4:1.
17. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, *et al*. RoB 2: A revised tool for assessing risk of bias in randomised trials. BMJ 2019;366:l4898.
18. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. Eur J Epidemiol 2010;25:603-5.
19. Review Manager (RevMan) [Computer program]. Version 5.4.1, The Cochrane Collaboration; 2020.
20. Deeks JJ, Higgins JP, Altman DG, Cochrane Statistical Methods Group. Analysing data and undertaking meta-analyses. Cochrane handbook for systematic reviews of interventions. 2019 Sep 23:241-84.
21. López-González JM, López-Álvarez S, Jiménez Gómez BM, Areán González I, Illodo Miramontes G, Padín Barreiro L. Ultrasound-guided transversalis fascia plane block versus anterior transversus abdominis plane block in outpatient inguinal hernia repair. Rev Esp Anestesiol Reanim 2016;63:498-504.
22. Abdelbaser I, Mageed NA, El-Emam EM, ALseoudy MM, Elmorsy MM. Preemptive analgesic efficacy of ultrasound-guided transversalis fascia plane block in children undergoing inguinal herniorrhaphy: A randomized, double-blind, controlled study. Korean J Anesthesiol 2021;74:325-32.
23. Aydin ME, Bedir Z, Yayik AM, Celik EC, Ates İ, Ahiskalioglu EO, *et al*. Subarachnoid block and ultrasound-guided transversalis fascia plane block for caesarean section: A randomised, double-blind, placebo-controlled trial. Eur J Anaesthesiol 2020;37:765-72.
24. Black ND, Malhas L, Jin R, Bhatia A, Chan VWS, Chin KJ. The analgesic efficacy of the transversalis fascia plane block in iliac crest bone graft harvesting: A randomized controlled trial. Korean J Anesthesiol 2019;72:336-43.
25. Chilkoti GT, Gaur D, Saxena AK, Gupta A, Agarwal R, Jain S. Ultrasound-guided transversalis fascia plane block versus wound infiltration for both acute and chronic post-caesarean pain management- A randomised controlled trial. Indian J Anaesth 2022;66:517-22.
26. Fouad AZ, Abdel-Aal IRM, Gadelrab MRMA, Mohammed HMES. Ultrasound-guided transversalis fascia plane block versus transmuscular quadratus lumborum block for post-operative analgesia in inguinal hernia repair. Korean J Pain 2021;34:201-9.
27. Huang C, Zhang X, Dong C, Lian C, Li J, Yu L. Postoperative analgesic effects of the quadratus lumborum block III and transversalis fascia plane block in paediatric patients with developmental dysplasia of the hip undergoing open reduction surgeries: A double-blinded randomised controlled trial. BMJ Open 2021;11:e038992.
28. Serifsoy TE, Tulgar S, Selvi O, Senturk O, Ilter E, Peker BH, *et al*. Evaluation of ultrasound-guided transversalis fascia plane block for postoperative analgesia in cesarean section:

A prospective, randomized, controlled clinical trial. J Clin Anesth 2020;59:56-60.
29. Staker JJ, Liu D, Church R, Carlson DJ, Panahkhahi M, Lim A, *et al*. A triple-blind, placebo-controlled randomised trial of the ilioinguinal-transversus abdominis plane (I-TAP) nerve block for elective caesarean section. Anaesthesia 2018;73:594–602.
30. Vasques F, Stecco C, Mitri R, De Caro R, Fusco P, Behr AU. Blocking around the transversalis fascia: Behind the scene. Minerva Anestesiol 2019;85:15-20.
31. Lee S, Goetz T, Gharapetian A. Unanticipated motor weakness with ultrasound-guided transversalis fascia plane block. A A Case Rep 2015;5:124-5.
32. Lee TH, Barrington MJ, Tran TM, Wong D, Hebbard PD. Comparison of extent of sensory block following posterior and subcostal approaches to ultrasound-guided transversus abdominis plane block. Anaesth Intensive Care 2010;38:452–60.
33. Ribeiro Junior IDV, Carvalho VH, Brito LGO. Erector spinae plane block for analgesia after cesarean delivery: A systematic review with meta-analysis. Braz J Anesthesiol 2022;72:506-15.
34. El-Boghdadly K, Desai N, Halpern S, Blake L, Odor PM, Bampoe S, *et al*. Quadratus lumborum block vs. transversus abdominis plane block for caesarean delivery: A systematic review and network meta-analysis. Anaesthesia 2021;76:393-403.

SUPPLEMENTARY FILE 1.

PUBMED SEARCH DETAILS

((“acute pain”[MeSH Terms] OR (“acute”[All Fields] AND “pain”[All Fields]) OR “acute pain”[All Fields]) AND (“pain, postoperative”[MeSH Terms] OR (“pain”[All Fields] AND “postoperative”[All Fields]) OR “postoperative pain”[All Fields] OR (“postoperative”[All Fields] AND “pain”[All Fields])) AND (“surgery”[MeSH Subheading] OR “surgery”[All Fields] OR “surgical procedures, operative”[MeSH Terms] OR (“surgical”[All Fields] AND “procedures”[All Fields] AND “operative”[All Fields]) OR “operative surgical procedures”[All Fields] OR “general surgery”[MeSH Terms] OR (“general”[All Fields] AND “surgery”[All Fields]) OR “general surgery”[All Fields] OR “surgery s”[All Fields] OR “surgerys”[All Fields] OR “surgeries”[All Fields]) AND (“fascia”[MeSH Terms] OR “fascia”[All Fields] OR “fasciae”[All Fields] OR “fascias”[All Fields]) AND “Transversalis”[All Fields] AND (“diagnostic imaging”[MeSH Subheading] OR (“diagnostic”[All Fields] AND “imaging”[All Fields]) OR “diagnostic imaging”[All Fields] OR “ultrasonography”[All Fields] OR “ultrasonography”[MeSH Terms] OR “ultrasonographies”[All Fields]) AND (“regional anaesthesia”[All Fields] OR “anesthesia, conduction”[MeSH Terms] OR (“anesthesia”[All Fields] AND “conduction”[All Fields]) OR “conduction anesthesia”[All Fields] OR (“regional”[All Fields] AND “anesthesia”[All Fields]) OR “regional anesthesia”[All Fields])) AND (randomizedco ntrolledtrial[Filter])

OVID SEARCH DETAILS

fascia transversalis and surgery).mp.[mp=tx, bt, ti, ab, ct, sh, hw, tn, ot, dm,mf, dv, kf, fx, dq, nm, ox, px, rx, an, ui,ds, on, sy, pt