IJMA

International Journal of Medical Arts

Volume 7, Issue 7 (July 2025)

http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780

Available online at Journal Website
https://ijma.journals.ekb.eg/
Main Subject [Anesthesiology]

Original Article

Somatic and Visceral Analgesia in Cesarean Section: Transversus Abdominis Plane Block and Intraperitoneal Local Anesthetics Infiltration

Tarek Habeeb Ramadan*; Asmaa Ashraf; Amr Mohamed Yassen; Hosam Ibrahim Elsaid Saber

Department of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Mansoura University, Mansoura, Egypt.

Article information

Received: 1-06-2025

Professionally accepted: 5-7-2025

DOI: 10.21608/ijma.2025.393471.2197.

*Corresponding author

Email: dr_tarekhabeeb@yahoo.com

Citation: Ramadan TH, Ashraf A, Yassen AM, Saber HI. Somatic and Visceral Analgesia in Cesarean Section: Transversus Abdominis Plane Block and Intraperitoneal Local Anesthetics Infiltration. IJMA 2025 July; 7 [7]: 5863-5872. doi: 10.21608/ijma.2025.393471.2197.

Abstract

Background: Cesarean section [CS] remains the most prevalent surgical practice globally that's accompanied with significant postoperative [PO] pain. Transversus abdominis plane block [TAPB] is considered the most preferred truncal block performed to control post-CS pain and discomfort. Intraperitoneal local anesthetics [IPLA] instillation has received the attention of many researchers recently; it had a remarkable visceral pain relief after many procedures. Dexamethasone [DEX] and epinephrine [EPN] were used as adjuvants to LA.

The aim of the work: The study aimed to assess the analgesic effect of ultrasound-guided [USG] TAPB or IPLA and their combination using bupivacaine, EPN, and DEX for the management of post-CS somatic and visceral pain.

Patients and methods: In this randomized, double-blinded study, we compared 3 groups: intraperitoneal [IP], TAP [T], and their combination [C] using bupivacaine 0.2% with DEX and EPN in 102 pregnant females scheduled for CS under spinal anesthesia [SA], concerning the time required until the first analgesic request as the primary outcome.

Results: Group C recorded significantly delayed first requests for both paracetamol [12h] and opioids [14.5h] compared to IP [10 and 13 h] and T groups [10 and 12.25 h], along with the lowest significant total analgesic consumptions, while the T group had the highest. The dual-block group provided superior control for somatic and visceral pain during rest and movements, as evidenced by better visual analogue score [VAS] values than either single-block group.

Conclusion: TAPB proved to have a beneficial effect in the management of post-CS pain, especially the somatic component, while IPLA allows more control over visceral pain. The addition of IPLA to TAP allows more somato-visceral control, reducing pain scores and analgesic consumption and providing more patient satisfaction.

Keywords: Intraperitoneal Local Anesthetics; Transversus Abdominis Plane Block; Cesarean Section; Dexamethasone; Epinephrine.

INTRODUCTION

Cesarean delivery remains the most frequent surgical procedure worldwide, often accompanied by moderate-to-severe PO pain in a considerable proportion of ladies that significantly affects maternal recovery. Such unpleasant sensations represent a major concern for parturients, obstetricians, and anesthesiologists, as they may delay the return to normal daily activities and impact maternal psychological health [1] and postpartum care, including breastfeeding and maternal-infant bonding [2].

Recent decades have seen growing interest in using of local anesthetics [LA] techniques for the management of such pain [3]. TAPB is considered the most common truncal block controlling post-CS somatic pain with opioid-sparing benefits, long duration, and technical simplicity [4]. However, it could be distressing for some pain-sensitive ladies due to the lack of visceral pain relief that is frequently neglected during laparotomies [5]. Intraperitoneal local anesthetic administration is a simple, quick, and safe approach that effectively blocks visceral afferent signaling, modulating visceral nociception while attenuating inflammatory responses and avoiding opioid-induced systemic side effects [6].

Although IPLA has received remarkable attention recently in many procedures [laparoscopic cholecystectomy [LC] and open and laparoscopic gynecology], it has not been adequately studied with post-CS pain [3,7,8].

While regional bupivacaine by itself is short-lived, combining different regional techniques with pharmacological adjuvants targeting different pain pathways can significantly enhance pain control while minimizing side effects and extending the analgesic duration [9]. DEX is a highly-effective, long-acting glucocorticoid that exhibits anti-inflammatory, antiemetic, and analgesic properties. As a peripheral nerve block adjuvant, it prolongs the analgesia up to 12 hours [10]. EPN is a common adjuvant to LA on the basis that it induces vasoconstriction, decreasing tissue blood flow and delaying the drug clearance from its target site. This in turn prolongs anesthesia duration and minimizes systemic LA absorption. Additionally, it was proved to have intrinsic analgesic properties via alpha-2 adrenoreceptor stimulation [11].

We hypothesized that combining TAPB and IPLA with DEX and EPN can cover both pain components and extend post-CS bupivacaine analgesia compared to either technique alone. While TAPB and IPLA have been studied for post-CS analgesia, no studies handled the use of DEX and EPN as adjuvants with their combination. Therefore, this trial aimed to evaluate and compare the analgesic effect of USG-bilateral TAPB to single-shot IPLA infiltration and their combination using bupivacaine with the addition of EPN and DEX for managing post-cesarean somato-visceral pain.

PATIENTS AND METHODS

This was a prospective randomized, double-blinded clinical trial conducted in the obstetric department of Mansoura University Hospital. This study included 102 full-term, ASA II-classified, singleton pregnant females, aged between 19 and 40 years old who were undergoing SA for elective CS .We excluded patients who refused or those with coagulopathy, hypertensive disorders of pregnancy, relevant drug allergy, significant organ dysfunction, recent opioid exposure [at last 6 months], communication problems, weight <65kg, BMI >40 kg/m^2, PO drains, and peritoneal closure inability.

Ethical Considerations

All participants provided written informed consent after receiving complete clarification of the study procedures, goals, and potential risks. The research protocol was ethically approved from the Institutional Review Board of Mansoura University Faculty of Medicine [Approval Code: MS.23.05.2428]. With the identification number PACTR202410889933380, the trial was registered into the Pan African Clinical Trial Registry. Patient's confidentiality was preserved, and their collected data was used for only scientific purposes.

Preoperative management

Every patient underwent detailed history, clinical examination, standard laboratory workup and ECG. Patients fasted for 8 hours preoperatively, and no premedication was used. Patients had a preload of 10 ml/kg pre-warmed 0.9% normal saline. Detailed information on risks, complications and the procedures [TAPB, IP, and SA], together with a preoperative explanation of how to use the10-cm **VAS** for pain assessment, was provided to each lady. The parturient was instructed to mark on the 0-10 vertical line according to her pain intensity, where 0 denoted no pain and 10 was the worst possible pain [12].

Anesthetic Management

Upon arrival to the operative room, an 18-20G venous cannula and routine monitoring [pulse oximetry, non-invasive blood pressure, and ECG] were initiated. SA was performed aseptically at L4-L5/L3-L4 interspace using a 25-guage Quinke needle and 10-12.5mg of hyperbaric bupivacaine plus 15µg of fentanyl. A pinprick was used to assess sensory level, while motor block was measured via the Modified Bromage Scale [0=no motor block, 1= able to move foot, flex knee, but can't raise leg, 2=can move foot only, and 3=unable to move either foot or knee] [13]. Surgery started when achieving an upper sensory level of T4-T6. All surgeries were standardized and performed by the same surgical team through a Pfannenstiel incision with uterine exteriorization. Before LA instillation, a meticulous pelvic hemostasis using surgical towels was performed to leave a relatively dry pelvis. A large opaque screen kept the patients away from the operating field and the surgeons.

Randomization and Blinding

Using sealed envelopes and computer-generated random numbers, 102 patients were equally assigned into three groups [n=34 each]. An independent anesthesiologist, uninvolved in-patient care or assessments, opened the sealed envelopes and prepared the study solutions in two identical 50ml coded syringes [one containing LA mixture, the other NS]. Blindness was maintained for patients, surgeons, and assessors. All interventions [SA and blockade techniques] and data recording were managed by an anesthesiologist who was unaware of the group allocation. Each single-block group received 50ml of the prepared mixture as a desired block and 50ml of NS as the other block to ensure blindness.

Grouping and Blocks

Using a sterile container, a 40 ml bupivacaine 0.5% [200 mg] diluted in a mixture of 2 ml DEX [8 mg] and 500 micrograms [0.5 ml] EPN with the addition of 57.5 ml of sterile 0.9% NS to obtain a total volume of 100 ml solution containing EPN concentration of 5 µg/ml [1/200000] and bupivacaine concentration of 0.2%. All administered doses of

bupivacaine were within the safe accepted range [the maximum recommended dose of bupivacaine with epinephrine is 3mg/kg [14]].

The IP group included patients infiltrated with 50 ml as IP analgesia from the prepared solution [4 mg DEX, 250 µg EPN, and 100 mg bupivacaine that corresponded to 1.3 mg/kg for the 75 kg patient], while 25 ml NS was given as a TAP per side for blindness. **Patients in the T group** received 50 ml of USG-TAPB from the above mixture solution [25 ml on each side] while 50 ml of NS was infiltrated intraperitoneally for blindness. Using the above mixture solution, the **C group's** patients received 50 ml USG-TAPB [25 in each side] in addition to 50 ml IP infiltration [i.e., 200 mg bupivacaine that corresponded to 2.6 mg/kg for the 75 kg patient].

The USG-TAPB was performed following the surgical wound closure using a SonoScape E2 system [China] with a 12-4 MHz linear transducer. Positioned transversely between the costal margin and iliac crest at the anterior axillary line, the probe identified three abdominal muscle layers: external oblique, internal oblique [IOM], and transversus abdominis [TAM]. Using an in-plane technique, a 22-G Quincke needle was advanced into the TAP space between IOM and TAM. After negative aspiration, 50 mL of either LA mixture [T/C groups] or NS [IP group] was injected slowly through a 3-way stopcock, creating hydrodissection of the fascial plane pushing TAM down.

The IP instillation was performed by the operating obstetrician immediately prior to peritoneal closure using sterile technique. A 50 ml syringe containing either the LA mixture [IP and C groups] or NS [T group] was carefully administered throughout the abdominal and pelvic cavities.

Following the procedure, mothers were carefully observed in the post-anesthesia care unit [PACU] for at least an hour before a 24-hour ward stay. Standardized rescue analgesics were given as paracetamol 1gm/8h if the VAS recorded ≥4. However, if VAS didn't improve within 15 minutes, IV 30 mg ketorolac was added, followed by nalbuphine 5mg IV [with 3mg repeat doses, maximum 20mg/24h] for persistent pain. All patients were blinded to the administered rescue analgesic.

Any decrease in MAP >20% of its basal or systolic blood pressure <90 mmHg was considered hypotension. It could be restored with IV fluids and ephedrine [3 mg increments]. Bradycardia [a drop-in heart rate [HR] below 60 beats/minute] was corrected using IV atropine 0.01 mg/kg. PO nausea and vomiting [PONV] was managed using 4mg IV ondansetron after excluding hypotension.

Outcome:

The primary outcome was the time elapsed to first analgesic rescue within the first 24 postoperative [PO] hours. In addition to documenting the demographic data [age, BMI, gestational age] and duration of the surgery, the secondary outcomes included the total 24-hours consumed analgesics [paracetamol, ketorolac, nalbuphine] and PO hemodynamics [recorded once reaching the PACU, 5-min intervals for the first 15 min, and every 15 min for 2 hours, followed by 2, 4, 6,12, and 24 hours].

Furthermore, the duration of motor [period between motor block initiation and Bromage score of zero] and sensory blocks [time from sensory block to pinprick sensation return] were assessed every 30 minutes. PO complications, including PONV with 24-hours ondansetron requirement, diaphoresis, pruritus, LA toxicity symptoms [peri-oral numbness, metallic taste, convulsions], hypotension, and arrhythmia were also assessed. Patient satisfaction score was assessed by means of five-point scale [1=extremely unsatisfied, 2=unsatisfied, 3=fair, 4=satisfied, and 5=extremely satisfied] [15].

Postoperative pain [somatic and visceral] was assessed using a VAS at rest and with movement [coughing/knee flexion] at 2, 4, 6, 12, and 24 hours. Somatic pain, characterized by localized sharp or burning or throbbing wound pain, was distinguished from visceral pain manifesting as diffuse uterine cramping [potentially oxytocin-enhanced]. It is often described as poorly localized colicky or tugging sensations with possible shortness of breath and referred shoulder/epigastric pain. Visceral pain usually associated with autonomic symptoms including nausea, diaphoresis, and hemodynamic changes [16].

Sample size

The sample size calculation was performed using Power Analysis and Sample Size software program [PASS] 15.0.5 for Windows 2017. Based on the result of **Dagasan Cetin *et al.*** [17], a mean first analgesic request time of 183.6±59 minutes for the IP group after CS was reported. Using a one-way ANOVA test to detect at least a 25% difference, a sample size of 32 patients per group was required to achieve 90% power [1-ß or the probability of rejecting the null hypothesis when it is false] in the proposed study using an F-test with a significance level [α or the probability of rejecting the null hypothesis when it is true]. Accounting for potential dropout, 34 patients were enrolled per group.

Statistical Analysis

Data was analyzed using SPSS-v22. Qualitative data were expressed as numbers [percentages] while Quantitative variables were assessed for normality using Kolmogorov-Smirnov tests and reported as mean±SD [normally distributed data] or median and range [non-normal distribution]. Appropriate statistical test was applied based on the data type with the following recommended tests: Chi-square test for categorical variables, Student t-tests, and Mann-Whitney U-tests.

RESULTS

This prospective, double-blinded, randomized study evaluated 120 pregnant females scheduled for elective CS under SA for eligibility. Only 102 participants were included, as 18 patients did not meet the inclusion criteria. The included patients were assigned to 3 equal groups, either IP, T, or C groups [Figure 1]. Patients' demographic data, surgical duration, as well as levels and durations of both motor and sensory blocks were comparable in the three study groups with non-statistically significant changes [Table 1].

Comparing MAP, HR and Spo2 between the 3 examined groups, non-statistically significant values were noticed at all assessment time points [Figures 2, 3, 4].

Regarding the somatic pain during rest [VAS-S/R], both T and C groups demonstrated significantly lower VAS than IP [P1 and P2] throughout the whole trial period. However, from the 6th PO hour onward, the C group showed significantly better VAS readings versus group T [P3<0.05]. While the somatic VAS during movement [VAS-S/M] did not illustrate any significance between IP and T groups [P1>0.05], the C group maintained significantly lower VAS-S/M than group IP [P2] during nearly the entire trial period than group T [P3≤0.01] at 2 and 6 hours [Table 2].

Visceral resting VAS [VAS-V/R] was statistically significant by the fourth post-block hour in both the IP and C groups when compared to

group T [P1≤0.01 and P3=0.001] and in C group when compared to IP group [P2=0.004]. In nearly all study times, visceral pain during movement [VAS-V/M] significantly reduced in IP group compared to T group [4-24 hours; P1≤0.036] and in C group compared to T group [2-12 hours; P3<0.05]. However, no significant change was noticed among IP and C groups [P2>0.1] [Table 3].

As can be seen from Table 4, Group C's patients recorded significantly prolonged times to request both paracetamol [12 h] and opioids [14.5 h]. Meanwhile, the IP and the T's patients started calling their PO paracetamol as early as the 10th hour and their nalbuphine at the 13th and 12.5th hours, respectively. Consequently, the two-block group expressed the lowest significant variable doses and consumption of paracetamol when compared with groups IP [P2≤0.015] and T [P3=0.001]. Although 2 gm doses were utilized the most as paracetamol rescue, group T received the most 3gm doses, while group C received the least. However, no significance was observed in the first analgesic or opioid requests or their consumption by comparing group T to IP [P1>0.005].

Additionally, the doses and number of patients utilizing nalbuphine rescues were significantly lower in group C than in the other 2 groups [P2 and P3<0.05], as 47.1% didn't require nalbuphine. Meanwhile, the total PO nalbuphine and ketorolac consumption did not change significantly among the three groups under investigation [Table 4].

The incidence of ondansetron use and block-related complications was expressed as a number and percentage in Table 5. They did not differ significantly during the whole study period when comparing all groups to each other. According to Table 6, the satisfaction scores of C-group patients were significantly higher than those of the T group [P3=0.029], with 67.6% of patients reporting high levels of satisfaction and no unhappy individuals, compared to 32.4% of TAPB patients reporting great satisfaction and 2.9% expressing dissatisfaction. No significant change was observed between the IP and T groups' satisfaction levels.

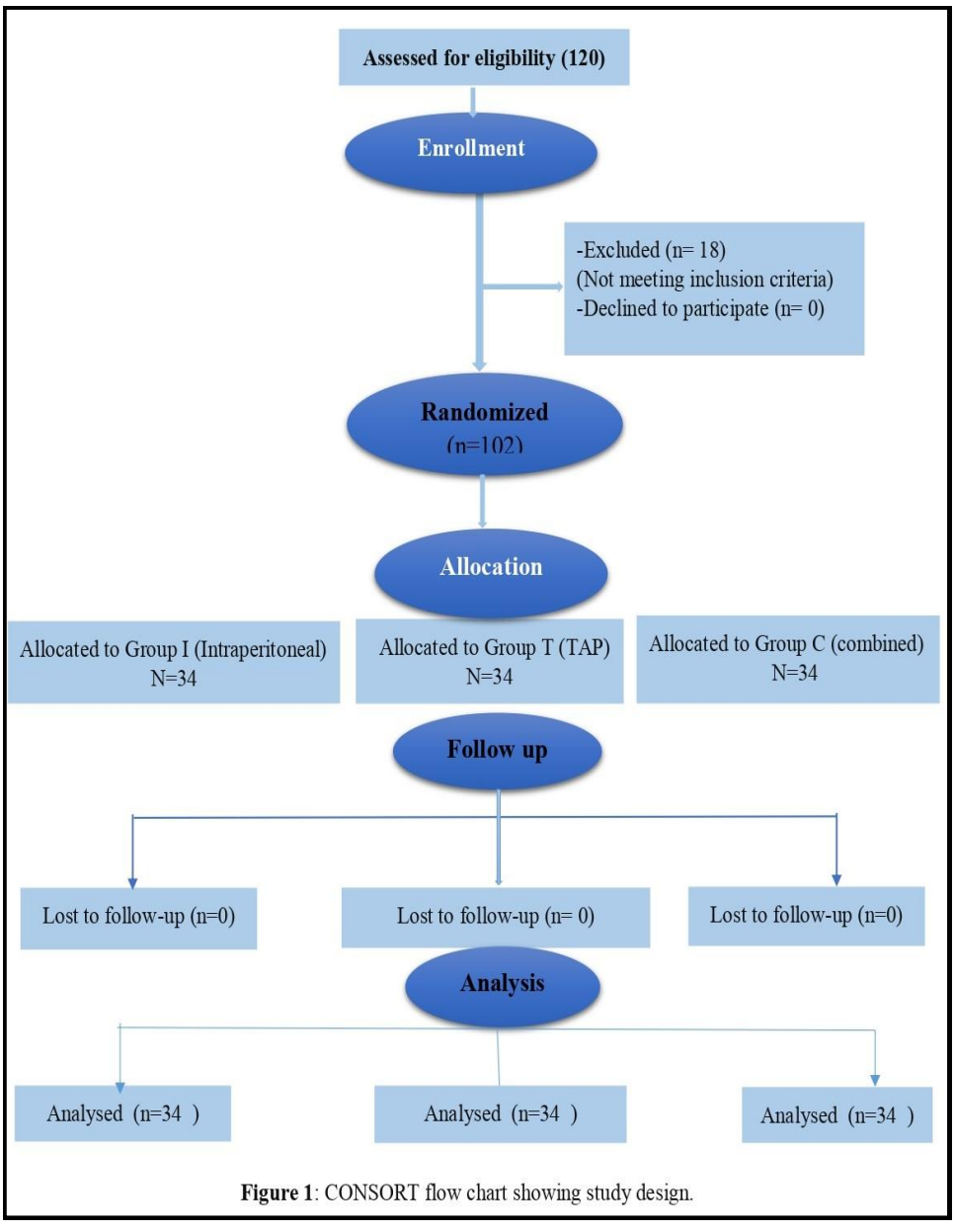

Figure 1: CONSORT flow chart showing study design.

Table [1]: Demographic characteristics, duration of surgery, Level and duration of sensory and motor block.

Demographic Data	Group IP [Intraperitoneal] [N=34]	Group T [TAP] [N=34]	Group C [Combined] [N=34]	Test of significance	Within group significance
Age [year]	26.94±5.06	27.71±5.19	26.12±4.66	F= 0.864; P= 0.425	P1=0.528; P2=0.497;P3=0.192
Gestational age[week]	37.74±2.31	38.06±0.98	38.15±0.78	F= 0.692; P= 0.503	P1=0.382; P2=0.267; P3=0.811
BMI [kg/m^2]	26.67±2.17	26.52±2.66	26.58±2.3	F= 0.034 P= 0.966	P1=0.795; P2=0.882 P3=0.911
Duration of surgery [min]	49.12±12.34	51.18±12.56	52.79±12.86	F= 0.726 P= 0.485	P1=0.502; P2=0.231 P3=0.597
Sensory and Motor Block					
Sensory level					P1=0.332; P2=1.0; P3=0.332
T4	15 [44.1%]	19 [55.9%]	19 [55.9%]	MC=1.25; P=0.533	
T6	19 [55.9%]	15 [44.1%]	15 [44.1%]		
Motor block Degree				MC=1.98;	P1=0.300;
2	13 [38.2%]	9 [26.5%]	8 [23.5%]	P=0.371	P2=0.189;
3	21 [61.8%]	25 [73.5%]	26 [76.5%]		P3=0.779
Duration of motor block [H]	4.35±0.57	4.13±0.48	4.18±0.51	F=1.71; P=0.187	P1=0.084; P2=0.166; P3=0.728
Duration of sensory block [H]	3.04±0.45	2.88±0.52	3.01±0.41	F=1.26; P=0.288	P1=0.135; P2=0.744; P3=0.241

Data are mean±SD or number [%]. **MC**: Monte Carlo correction of Chi-Square test. **F**=one-way ANOVA test. **P1**: comparing IP &T groups, **P2**: comparing IP&C groups. **P3**: comparing T&C groups.

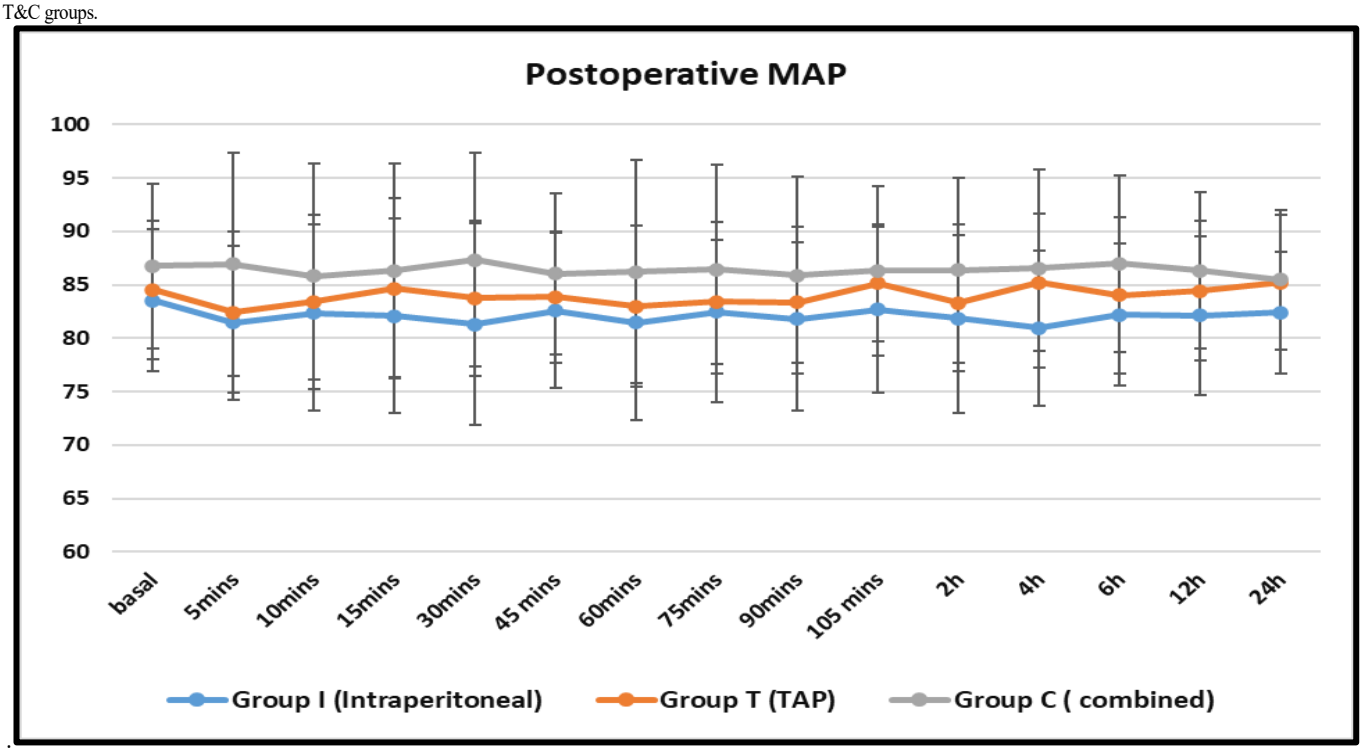

Figure [2]: Comparison between the studied groups as regarding postoperative follow up of MAP.

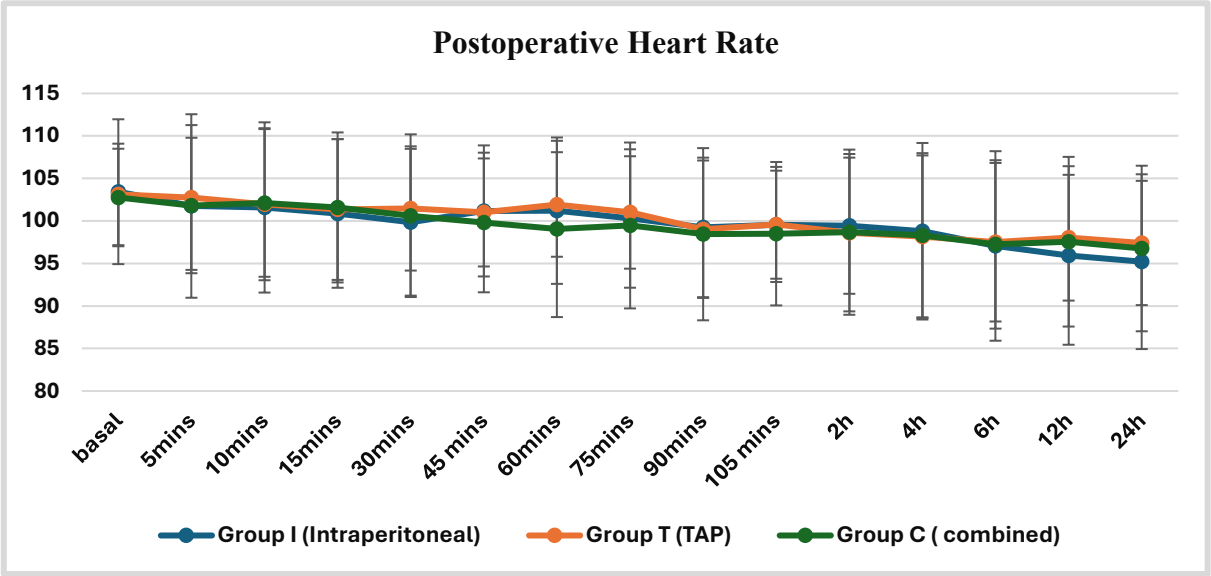

Figure [3]: Comparison between the examined groups regarding postoperative follow up of HR.

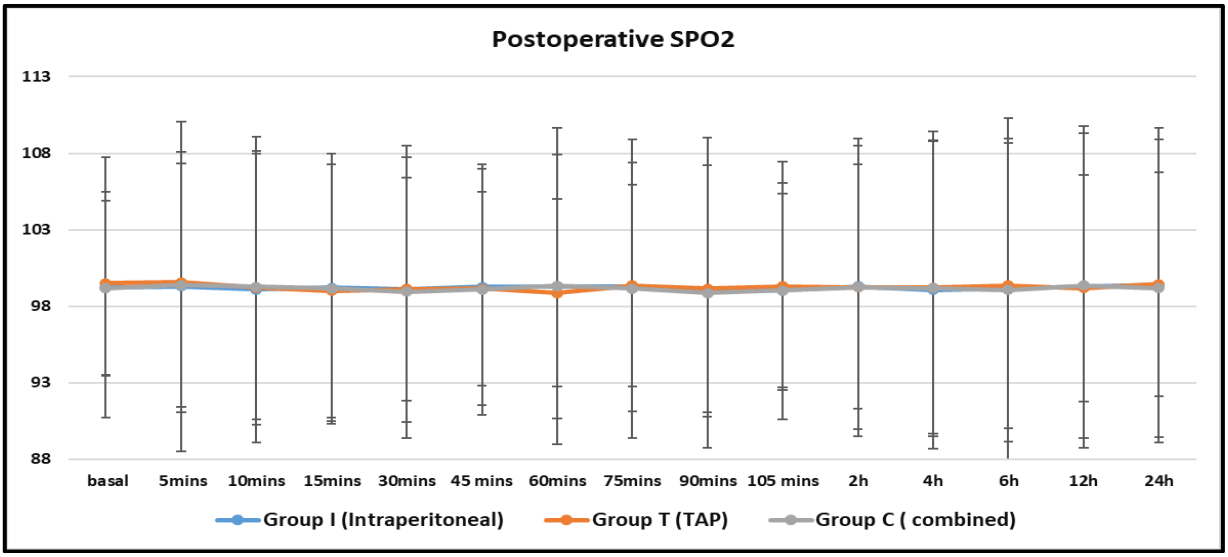

Figure [4]: Comparison between the examined groups as regards PO oxygen saturation.

Table [2]: VAS of somatic pain during rest [R] and movement [M] among studied groups

VAS of somatic pain		Group IP [Intraperitoneal] N=34	Group T [TAP] N=34	Group C [combined] N=34	Test of significance	Within group significance
R	**2h**	0[0-2]	0[0-2]	0[0-0]	KW=15.73; P=0.001*	P1=0.008*; P2=0.001*; P3=0.317
	4h	1[0-2]	0[0-2]	0[0-1]	KW=25.56; P=0.001*	P1=0.001*; P2=0.001*; P3=0.709
	6h	2[0-5]	1[0-4]	1[0-2]	KW=26.56; P=0.001*	P1=0.047*;P2=0.001*;P3=0.001*
	12h	3[1-4]	2[1-4]	2[0-3]	KW=32.79; P=0.001*	P1=0.001*;P2=0.001*;P3=0.006*
	24h	4[2-6]	3[2-6]	2[1-4]	KW=24.08;P=0.001*	P1=0.001*; P2=0.001*; P3=0.04*
M	**2h**	0[0-3]	0[0-2]	0[0-0]	KW=14.43; P=0.001*	P1=0.117; P2=0.001*; P3=0.006*
	4h	2[0-3]	2[0-3]	1[0-3]	KW=4.58; P=0.101	P1=0.671; P2=0.054; P3=0.086
	6h	3[1-6]	3[0-5]	2[1-3]	KW=14.38; P=0.001*	P1=0.255; P2=0.001*; P3=0.01*
	12h	4[3-6]	4[2-6]	3[2-5]	KW=16.22; P=0.001*	P1=0.06; P2=0.001*; P3=0.152
	24h	4[4-8]	4[3-6]	4[2-5]	KW=5.35; P=0.07	P1=0.172; P2=0.02*; P3=0.340

Data are presented as median [minimum- maximum].**KW**: Kruskal Wallis test. **P1:** comparison between IP &T groups, **P2**: comparing IP &C groups, **P3**: comparing T&C groups. [*] statistically significant P-value <0.05.

Table [3]: VAS of visceral pain during rest [R] and movement [M].

VAS of visceral pain		Group I [Intraperitoneal] N=34	Group T [TAP] N=34	Group C [combined] N=34	Test of significance	Within group significance
R	**2h**	0[0-2]	0[0-2]	0[0-1]	KW=1.26; P=0.530	P1=0.970; P2=0.292; P3=0.299
	4h	1[0-2]	2[0-3]	0[0-2]	KW=28.08; P=0.001*	P1=0.003*; P2=0.004*; P3=0.001*
	6h	1[0-4]	2[1-4]	1[0-2]	KW=23.44; P=0.001*	P1=0.001*; P2=0.729; P3=0.001*
	12h	2[1-4]	3[1-6]	2[0-3]	KW=21.72; P=0.001*	P1=0.001*; P2=0.989; P3=0.001*
	24h	3[2-6]	4[2-8]	3[1-4]	KW=12.01; P=0.002*	P1=0.01*; P2=0.480; P3=0.001*
M	**2h**	0[0-2]	0[0-3]	0[0-2]	KW=5.14; P=0.08	P1=0.108; P2=0.664; P3=0.049*
	4h	2[0-4]	2[0-4]	2[0-3]	KW=15.18; P=0.001*	P1=0.001*; P2=0.312; P3=0.003*
	6h	2[0-5]	3[1-5]	3[0-5]	KW=19.54; P=0.001*	P1=0.001*; P2=0.109; P3=0.001*
	12h	3[1-6]	4[3-6]	4[2-5]	KW=21.83; P=0.001*	P1=0.001*; P2=0.322; P3=0.001*
	24h	4[3-7]	5[3-8]	4[3-6]	KW=5.14; P=0.08	P1=0.036*; P2=0.492; P3=0.099

Data are shown as median [minimum- maximum].**KW**: Kruskal Wallis test. **P1:** comparison between IP &T groups, **P2**: comparing IP &C groups. **P3**: difference between T&C groups. [*] statistically significant P [<0.05].

Table [4]: Time to request analgesia and their consumption.

Postoperative Analgesia	Group IP [Intraperitoneal] N=34	Group T [TAP] N=34	Group C [combined] N=34	Test of significance	Within group significance
Time to first analgesic request [H]	10 [6-14]	10 [6-14]	12 [6-18]	Kw=25.27 P=0.001*	P1=0.659; P2=0.001* P3=0.001*
Time to 1st opioid request [H]	13 [10-14.5]	12.25 [10-14.5]	14.5 [13-18]	Kw =22.50 P=0.001*	P1=0.659; P2=0.001* P3=0.001*
Paracetamol [gm]					
1	1 [2.9%]	1 [2.9%]	5 [14.7%]	Mc=12.25 P=0.016*	P1=0.324; P2=0.015* P3=0.001*
2	25 [73.5%]	21 [61.8%]	27 [79.4%]		
3	8 [23.5%]	12 [35.3%]	2 [5.9%]		
Total postoperative Paracetamol [gm]	2 [1-3]	2 [1-3]	2 [1-3]	Kw=11.45 P=0.003*	P1=0.321; P2=0.012* P3=0.001*
Ketorolac [mg]					P1=1.0; P2=0.637
0	2 [5.9%]	2 [5.9%]	3 [8.8%]	Mc=0.307 P=0.858	P3=1
30	32 [94.1%]	32 [94.1%]	31 [91.2%]		
Total postoperative ketorolac [mg]	30 [0-30]	30 [0-30]	30 [0-30]	Kw=0.304; P=0.859	P1=1.0; P2=0.645 P3=0.645
Nalbuphine [mg]					
0	8 [23.5%]	8 [23.5%]	16 [47.1%]	Mc=7.71 P=0.260	P1=0.908; P2=0.048* P3=0.037*
5	15 [44.1%]	15 [44.1%]	11 [32.4%]		
8	11 [32.4%]	11 [32.4%]	7 [20.6%]		
11	0	1 [2.94%]	0		
Total postoperative nalbuphine [mg]	5 [0-8]	5 [0-11]	5 [0-8]	Kw=4.85 P=0.09	P1=0.942; P2=0.06 P3=0.054

Data are median [minimum- maximum] or number and percentage. **KW**: Kruskal Wallis test. **P1**: comparing IP &T groups, **P2**: comparing IP &C groups, **P3**: comparing T&C groups. [*] indicates significant P [<0.05].

Table [5]: Complications and ondansetron use.

Postoperative Complications	Group IP [Intraperitoneal] N=34[%]	Group T [TAP] N=34[%]	Group C [combined] N=34[%]	Test of significance	Within group significance
Pruritus	2 [5.9%]	1 [2.9%]	3 [8.8%]	χ^2=1.06; P=0.588	P1=1.0; P2=1.0 P3=0.614
Nausea and Vomiting	10 [29.4%]	7 [20.6%]	6 [17.6%]	χ^2=1.46 P=0.482	P1=0.401; P2=0.253 P3=0.758
Ondansetron [4mg]	10 [29%]	7 [20.6%]	6 [17.6%]	χ^2=1.46 P=0.482	P1=0.401; P2=0.253 P3=0.758
Diaphoresis	3[8.8%]	3 [8.8%]	1 [2.9%]	χ^2=1.22 P=0.541	P1=1.0; P2=0.614 P3=0.614
Hypotension	0 [0%]	1 [2.9%]	1 [2.9%]	χ^2=1.02 P=1.0	P1=1.0; P2=1.0 P3=1.0
Arrhythmias	0 [0%]	0 [0%]	0 [0%]		
Metallic taste	0 [0%]	0 [0%]	0 [0%]		
Numbness	0 [0%]	0 [0%]	0 [0%]		
Convulsions	0 [0%]	0 [0%]	0 [0%]		

Data are number [%.]. **χ2=**Chi-Square test. **P1**: comparing IP &T groups, **P2**: comparing IP &C groups, **P3**: comparing T&C groups. **P:** significant when <0.05.

Table [6]: Comparison of satisfaction between studied groups.

	Group IP [Intraperitoneal] N=34	Group T [TAP] N=34	Group C [combined] N=34	Test of significance	Within group significance
Satisfaction score				χ^2=9.13	P1=0.660
Unsatisfied	1 [2.9 %]	1 [2.9 %]	0	P=0.166	P2=0.309
Fair	2 [5.9 %]	3 [8.8 %]	1 [2.9 %]		P3=0.029*
Satisfied	15 [44.1 %]	19 [55.9 %]	10 [29.4 %]		
Very satisfied	16 [47.1 %]	11 [32.4 %]	23 [67.6 %]		

Data are number and percentage. χ^2= Chi-Square test, **P1**: comparing IP &T groups, **P2**: comparison between IP &C groups, **P3**: comparing T&C groups. [*] statistically significant, when P value is < 0.05.

DISCUSSION

TAP has proven to be an efficient analgesic technique, suitable for surgeries where parietal pain represents a major element of PO suffering, as in CS. TAP provides profound analgesia to the musculature and skin of the anterior abdominal wall [18].

IPLA, used since 1950, offers significant visceral analgesia through a two-fold mechanism; direct visceral nociceptor blockade and systemic LA absorption through the peritoneum [19]. However, there is a lack of evaluation of IPLA in CS using bupivacaine with DEX and EPN with or without TAPB.

Our trial investigated the efficacy of three analgesic techniques [IPLA, TAP, and their combination] in managing PO somatic and visceral pain following CS, focusing on the time to initial analgesic call as the primary outcome. The combination of TAPB and IPLA using bupivacaine, EPN, and DEX significantly delayed the first analgesic request, reduced opioid requirements, and VAS values with a reflected higher patient satisfaction, and had no reported block-related complications. Notably, the comparable baseline characteristics across all study groups [p>0.05] confirm successful randomization and minimize potential selection bias that could influence outcomes. Pain following CS has 2 components: somatic [incisional] and visceral [uterine]. Visceral pain resulting from surgical manipulation including stretching, suturing, and approximating the uterine walls is hard to control with opioids due to different involved pain pathways and individuals' variability in analgesics responses [20].

Targeted blockade of peritoneal nerve terminals represents an effective strategy for controlling postoperative pain by interrupting nociceptive signal transmission. Peritoneal blockade exerts its analgesic effect through dual mechanisms: sodium channel inhibition in peritoneal nociceptors and local its anti-inflammatory action [5].

During PO rest, both somatic and visceral pain were documented [VAS ≥ 4] by the 6th hour in IP and T groups, but group C experienced both of them later at the 24th hour. With patient's movement, somatic pain was recognized by the 6th hour in single-block groups, while it was delayed till the 12th hour with the dual block. Meanwhile, visceral pain was presented in the T and IP groups as early as the 4th hour and in group C by the 6th. Our results followed a trial that randomized 180 pregnant women undergoing CS into three groups: TAPB, combined TAP-peritoneal block, and control. The combined group expressed lower VAS scores than the TAP and control groups. Pain was reported at the 6th and 12th PO h in the control and intervention groups, respectively [5].

Likewise, **Gupta** observed reduced somatic and visceral VAS following CS in patients receiving bilateral TAPB with ropivacaine plus NS or DEX. Visceral pain relief was due to systemic DEX absorption, peaking 8hs post-TAPB [4].

Contrariwise, **Lee *et al.*** [21] discovered that combined somato-visceral LA therapy improved incisional pain following LC but not intrabdominal or shoulder pain beyond somatic blockade could do alone [21]**.** The lack of observed effects of IP or combined regimens on visceral pain may reflect the low visceral VAS scores in LC patients who demonstrate predominant incisional rather than visceral pain, unlike post-CS pain with extensive intra-abdominal manipulation. This variation may also be attributed to the different drug regimens or patient populations between the studies.

Notably, group C showed more control over visceral and somatic pain, which can be attributed to the comprehensive coverage of both visceral and somatic pain pathways. The IP block, by anesthetizing the peritoneal surfaces and underlying visceral structures, may provide additional relief of visceral pain, which is not adequately addressed by the TAPB alone, which primarily targets the somatic nerves supplying the anterior abdominal wall. IPLA effectively reduces somatic pain related to decreased central sensitization by effective visceral pain control that improves somatic pain perception. These findings align with prior studies highlighting the efficacy of IPLA and TAPB on PO pain and its analgesic requirements [22].

Ismail *et al.* [23] found comparable times passed to first analgesia and overall opioid consumption among bilateral TAP and IPLA infiltration in major gynecological procedures. However, each block effectively improved the analgesic consumption and its first request compared with a controlled group.

Farahat *et al.* [24] confirmed the efficacy of TAPB following lower gynecological surgeries, showing that 0.2% bupivacaine with 6 mg DEX prolonged the first analgesic request time versus an equivalent volume of bupivacaine-NS. However, a study reporting non-significant improvement in first analgesic request time or opioid consumption with the combined TAPB-IPLA technique didn't support our findings [5]**.**

Similarly, **Das *et al.*** [25] examined 60 CS patients who received 40 ml of 0.25% ropivacaine as TAPB or incisional infiltration, noting a significantly longer time to first analgesia with the TAPB [5.99 ± 1.514 h vs. 2.537 ± 1.149 h]. By 2023, a study of 100 LC patients didn't match our findings as it showed a significantly reduced analgesic requirement in the IPLA group receiving ropivacaine with DEX compared to the bilateral TAPB [26]**.**

The findings of **Elhouty *et al.*** [5] are consistent with our results concerning the significant improvement in patient satisfaction in the C group versus the T group. Whereas **El Sharkwy *et al.*** demonstrated a significantly higher satisfaction score with TAPB over LA instillation in 90 ladies undergoing laparoscopic gynecological procedures, receiving 0.25% bupivacaine with EPN in either group [27]**.**

Our three groups didn't record any PO complications, either related to the LA or the blocks. Such data are in harmony with that achieved by **Lee *et al.*** [21]**,** who revealed that neither combined somato-visceral LA nor visceral block affected the incidence of PONV. This also aligns with previous studies comparing the TAP with IP bupivacaine in LC [28] or open total abdominal hysterectomy [29] with no recorded PO complications.

The combined TAP-IP plus DEX and EPN is a novel, cost-efficient, and easily trainable technique that could be easily integrated into clinical practice. It demonstrated comprehensive analgesia while reducing systemic opioid requirements and associated side effects. However, our study is limited by its relatively small sized sample, the lack of chronic pain assessment, and drug concentration monitoring. Future studies can be considered to overcome these issues. Furthermore, based on the prior effectiveness of both approaches compared to a placebo [3,7,30-33], a control group was not included in our trial. Moreover, the distinction between somatic and visceral pain relied on subjective VAS reporting. Incorporating objective biomarkers [for inflammation or pain] could strengthen further studies.

Conclusion: TAP proved to have a beneficial effect in the management of post-CS pain, particularly its somatic component, while IPLA allows more control over visceral pain. Adding IPLA to TAP allows additional somato-visceral block, reducing pain scores, analgesic consumption, complications and enhancing overall patient satisfaction.

Funding: This trial did not receive any fund or grant

Conflict of interest: None of the authors have any conflicts of interest that are directly related to the trial's content.

REFERENCES

1. Hussen I, Worku M, Geleta D, Mahamed AA, Abebe M, Molla W, et al. post-operative pain and associated factors after cesarean section at Hawassa University Comprehensive Specialized Hospital, Hawassa, Ethiopia: A cross-sectional study. Ann Med Surg [Lond]. 2022 Aug 9; 81:104321. doi: 10.1016/j.amsu.2022.104321.

2. Aga A, Abrar M, Ashebir Z, Seifu A, Zewdu D, Teshome D. The use of perineural dexamethasone and transverse abdominal plane block for postoperative analgesia in cesarean section operations under spinal anesthesia: an observational study. BMC Anesthesiol. 2021 Nov 22;21 [1]: 292. doi: 10.1186/s12871-021-01513-4.

3. Patel SD, Sharawi N, Sultan P. Local anaesthetic techniques for post-caesarean delivery analgesia. Int J Obstet Anesth. 2019 Nov; 40:62-77. doi: 10.1016/j.ijoa.2019.06.002.

4. Gupta A, Gupta A, Yadav N. Effect of dexamethasone as an adjuvant to ropivacaine on duration and quality of analgesia in ultrasound-guided transversus abdominis plane block in patients undergoing lower segment cesarean section - A prospective, randomised, single-blinded study. Indian J Anaesth. 2019 Jun;63[6]:469-474. doi: 10.4103/ija.IJA_773_18.

5. Elhouty MG, Abu Sabaa M, Elawady MS. Transversus Abdominis Plane Block Combined with Peritoneal Block Versus Transversus Abdominis Plane Block Alone for Postoperative Analgesia after Cesarean Section. Egy J Hospital Med 2002; 89[2]:7942-7949.

6. Patel R, Carvalho JC, Downey K, Kanczuk M, Bernstein P, Siddiqui N. Intraperitoneal Instillation of Lidocaine Improves Postoperative Analgesia at Cesarean Delivery: A Randomized, Double-Blind, Placebo-Controlled Trial. Anesth Analg. 2017 Feb;124[2]:554-559. doi: 10.1213/ANE. 0000000000001799.

7. Qin Y, Yang Y, Qin S, Xiong Z. Regional nerve block in postoperative analgesia after cesarean section: A narrative review. Medicine [Baltimore]. 2024 Dec 27;103[52]: e41159. doi: 10.1097/MD.0000000000041159.

8. Kahokehr A. Intraperitoneal local anesthetic for postoperative pain. Saudi J Anaesth. 2013 Jan;7[1]:5. doi: 10.4103/1658-354X.109554.

9. Mazy A, Gad M, Bedairy M. Preperitoneal post-cesarean section bupivacaine analgesia: Comparison between dexamethasone and dexmedetomidine as adjuvants. Saudi J Anaesth. 2018 Apr-Jun;12[2]:183-189. doi: 10.4103/ sja.SJA_450_17.

10. Zhang D, Zhou C, Wei D, Ge L, Li Q. Dexamethasone added to local anesthetics in ultrasound-guided transversus abdominis plain [TAP] block for analgesia after abdominal surgery: A systematic review and meta-analysis of randomized controlled trials. PLoS One. 2019 Jan 8;14[1]: e0209646. doi: 10.1371/journal.pone.0209646.

11. Wiles MD, Nathanson MH. Local anaesthetics and adjuvants--future developments. Anaesthesia. 2010 Apr;65 Suppl 1:22-37. doi: 10.1111/j.1365-2044.2009.06201.x.

12. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale for Pain [VAS Pain], Numeric Rating Scale for Pain [NRS Pain], McGill Pain Questionnaire [MPQ], Short-Form McGill Pain Questionnaire [SF-MPQ], Chronic Pain Grade Scale [CPGS], Short Form-36 Bodily Pain Scale [SF-36 BPS], and Measure of Intermittent and Constant Osteoarthritis Pain [ICOAP]. Arthritis Care Res [Hoboken]. 2011 Nov;63 Suppl 11: S240-52. doi: 10.1002/acr.20543.

13. Diana M, Yachine A. The influence of passive range of motion on lower extremity in postoperative patients with spinal anesthesia in Rumkitban sidoarjo. International Conference of Kerta Cendekia Nursing Academy 2019; 1:194-198. doi. 10.5281/zenodo.3374202.

14. Gropper MA, Cohen NH, Eriksson LI, Fleisher LA., Leslie K, Wiener-Kronish JP[Eds.] Miller's Anesthesia [9th ed]. Philadelphia, PA: Elsevier, 2020; pages 742-767.

15. Tawfik MM, Mohamed YM, Elbadrawi RE, Abdelkhalek M, Mogahed MM, Ezz HM. Transversus Abdominis Plane Block Versus Wound Infiltration for Analgesia After Cesarean Delivery: A Randomized Controlled Trial. Anesth Analg. 2017 Apr; 124 [4]: 1291-1297. doi: 10.1213/ANE.0000000000001724.

16. Schuster B, Ness T, Sellers A. Basic Science: Pathophysiology of Acute and Chronic Pain; Somatic Versus Visceral Pain. In Anesthesiology In-Training Exam Review: Regional Anesthesia and Chronic Pain 2022:207-211.Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-87266-3_40.

17. Dagasan Cetin G, Dostbil A, Aksoy M, Kasali K, Ince R, Kahramanlar AA, Atalay C, Topdagi Yilmaz EP, Ince I, Ozkal MS. Intraperitoneal instillation versus wound infiltration for postoperative pain relief after cesarean delivery: A prospective, randomized, double-blind, placebo-controlled trial. J Obstet Gynaecol Res. 2023 Jan;49[1]:209-219. doi: 10.1111/jog.15469.

18. Manoj K, Pratibha S.D, Shivanand L.K, Talikoti DG. A Randomized Comparative Clinical Trial to Know the Efficacy of Ultrasound Guided Transversus Abdominis Plane Block Against Multimodal Analgesia for Post-Operative Analgesia Following Caesarean Section. Int J Cur Res Rev. 2021; 13[23]:26-31. doi:10.31782/IJCRR.2021.132305

19. Dubey N, Bellamy F, Bhat S, MacFacter W, Rossaak J. The impact of timing, type, and method of instillation of intraperitoneal local anaesthetic in laparoscopic abdominal surgery: a systematic review and network meta-analysis. Br J Anaesth. 2024 Mar;132[3]:562-574. doi: 10.1016/j.bja.2023.11.046.

20. Staahl C, Christrup LL, Andersen SD, Arendt-Nielsen L, Drewes AM. A comparative study of oxycodone and morphine in a multi-modal, tissue-differentiated experimental pain model. Pain. 2006 Jul;123[1-2]:28-36. doi: 10.1016/j.pain.2006.02.006.

21. Lee IO, Kim SH, Kong MH, Lee MK, Kim NS, Choi YS, Lim SH. Pain after laparoscopic cholecystectomy: the effect and timing of incisional and intraperitoneal bupivacaine. Can J Anaesth. 2001 Jun;48[6]:545-50. doi: 10.1007/BF03016830.

22. Shahin AY, Osman AM. Intraperitoneal lidocaine instillation and post-cesarean pain after parietal peritoneal closure: a randomized double-blind placebo-controlled trial. Clin J Pain. 2010 Feb;26[2]:121-7. doi: 10.1097/AJP.0b013e3181b99ddd.

23. Ismail S, Mistry AA, Siddiqui AS, Aziz A, Zuberi NF. The analgesic efficacy of ultrasound-guided transversus abdominis plane block vs. local anesthetic infiltration technique in major gynecologic surgery: A randomized controlled trial. J Anaesthesiol Clin Pharmacol. 2023 Oct-Dec;39[4]:557-564. doi: 10.4103/joacp.joacp_78_22.

24. Farhat AE, Elkafrawy ME, Effat DM. TAP Block with dexamethasone as a Pain Treatment Modality after Lower Abdominal Gynecological Procedures. Al-Azhar Int Med J 2021; 2[4]: 9-15. doi:10.21608/aimj.2021.62238.1413

25. Das N, Shukla U, Singh D. Comparison of analgesic efficacy between TAP block and local site infiltration postoperatively in caesarean section. Int J Res Med Sci 2018; 6[4]:1407. doi: 10.18203/2320-6012.ijrms20181305.

26. Gupta A, Angral R, Chander AM. A comparative study of ultrasound-guided dual TAP block versus intraperitoneal instillation and periportal infiltration of ropivacaine with dexamethasone for postoperative analgesia in laparoscopic cholecystectomy. J Cardiovasc Dis Res 2023; 14 [9]: 1865-1877. doi: 10.59847/jsan368.

27. El sharkwy IA, Noureldin EH, Mohamed EA, Mohamed AA. Laparoscopic-guided transversus abdominis plane block versus trocar site local anesthetic infiltration in gynecologic laparoscopy. Gynecol Surg 2018; 15:1-6. doi:10.1186/s10397-018-1047-3.

28. Janjua S, Aslam K Z, Sarfraz S, Qarni A, Niazi W, Sarfraz MB. Comparison of modified unilateral ultrasound guided subcostal transversus abdominis plane block with conventional port-site and intraperitoneal infiltration of bupivacaine for postoperative pain relief in laparoscopic cholecystectomy. Pak Armed Forces Med Jl 2019; 69[4]:800-807. Available at: https://www.pafmj.org/index.php/PAFMJ/article/view/3203

29. Gasanova I, Alexander J, Ogunnaike B, Hamid C, Rogers D, Minhajuddin A, Joshi GP. Transversus Abdominis Plane Block Versus Surgical Site Infiltration for Pain Management After Open Total Abdominal Hysterectomy. Anesth Analg. 2015 Nov; 121[5]:1383-8. doi: 10.1213/ANE.0000000000000909.

30. Abdallah FW, Halpern SH, Margarido CB. Transversus abdominis plane block for postoperative analgesia after Caesarean delivery performed under spinal anaesthesia? A systematic review and meta-analysis. Br J Anaesth. 2012 Nov; 109[5]:679-87. doi: 10.1093/bja/aes279.

31. Mishriky BM, George RB, Habib AS. Transversus abdominis plane block for analgesia after Cesarean delivery: a systematic review and meta-analysis. Can J Anaesth. 2012 Aug;59[8]:766-78. doi: 10.1007/s12630-012-9729-1.

32. Riemma G, Schiattarella A, Cianci S, La Verde M, Morlando M, Sisti G, et al. Transversus abdominis plane block versus wound infiltration for post-cesarean section analgesia: A systematic review and meta-analysis of randomized controlled trials. Int J Gynaecol Obstet. 2021 Jun;153[3]:383-392. doi: 10.1002/ijgo.13563.

33. Kahokehr A, Sammour T, Soop M, Hill AG. Intraperitoneal local anaesthetic in abdominal surgery - a systematic review. ANZ J Surg. 2011 Apr; 81 [4]: 237-45. doi: 10.1111/j.1445-2197.2010.05573.x.

IJMA

International Journal of Medical Arts

Volume 7, Issue 7 (July 2025)

http://ijma.journals.ekb.eg/

P-ISSN: 2636-4174

E-ISSN: 2682-3780