ORIGINAL ARTICLE

Clinical Effectiveness of Intra-Operative Direct Vision of Transversus Abdominis Plane (TAP) Block as Alternative to Ultrasound Guided TAP Block for Pain Control After Cesarean Section (CS) A Randomized Controlled Trial

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Abstract

Background: ***Despite their efficacy, opioids prescribed after CS may result in significant side effects, as nausea, sleepiness, respiratory depression, and potential risks to newborns through breastfeeding.***

Objective: ***To evaluate the analgesic efficacy of USG-TAP block versus intraoperative transversus abdominis block during and after CS, focusing on pain scores within twenty-four hours post-surgery in females.***

Patients and Methods: ***Two hundred pregnant females who underwent elective cesarean sections were enrolled in this trial, with one hundred receiving intraoperative direct vision TAP blocks and one hundred receiving ultrasound-guided TAP blocks. All cases underwent intrathecal anesthesia via dural puncture at the L3-L4 level, receiving 0.25 percent hyperbaric bupivacaine, followed by a standardized surgical approach for cesarean birth.***

Results: ***The Visual Analogue Scale (VAS) was a standardized ten cm laminated card, on which participant indicated or verbalized a number that most accurately reflects their experience. Analgesic usage was documented from the cases' medication records. Recorded, tabulated, and statistically evaluated data indicated that surgically administered TAP block provided comparable benefits, pain management outcomes post-CS to UG-guided TAP. Additionally, there was a corresponding decrease in the necessity for both opioid and non-opioid analgesics, accompanied by a notable postponement of initial requests for such medications.***

Conclusion: ***Both ultrasound-guided , surgical TAP blocks were safe , similarly effective after cesarean section. surgical TAP block is a fast, safe alternative, especially for obese patients or when ultrasound is unavailable.***

Keywords: Cesarean section; TAP block; Postoperative analgesia; Ultrasound-guided

1. Introduction

A significant number of cesarean sections were performed annually. Postoperative pain at the abdominal incision site can complicate cesarean section (CS) delivery. Inadequate pain management was a prevalent cause of dissatisfaction among females who undergo cesarean section. CS was a prevalent procedure.[1]

Pain management must be both effective and safe for breastfeeding in pain. Pain associated with CS comprises two elements: somatic, resulting from abdominal wall incision, and visceral, originating from the uterus. A significant portion of discomfort encountered by patients originates from the abdominal wall incision.[2]

Effective postoperative analgesia after cesarean section accelerates mobilization, reduces mother morbidity, and promotes bonding with the newborn. Neuraxial opioids can deliver substantial postoperative analgesia for several hours; their use was related to notable side effects, such as pruritus and urinary retention.[3] Consequently, alternative pain relief methods present potential for a favorable reduction in side effects without compromising analgesic efficacy.[4]

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Over the past 2 decades, peripheral nerve blocking has been increasingly popular for the prevention and control of acute postoperative pain. The Success of ultrasound-guided peripheral nerve localization with nerve stimulation has stimulated innovation in block techniques and indications. These new blocks can be used with minimal risk of complications in instances Abrahams et al., . The method of action of the TAP block involves administering an anesthetic to the sensory nerve supply of the anterior abdominal wall.[5]

TAP was a neurovascular plane situated among the internal oblique, through which nerves feeding the abdominal wall traverse before innervating the anterior abdominal wall.[6]

Cochrane Collaboration analyzed eight trials including 358 participants, five of which evaluated the TAP block, and three examined the rectus sheath block. Ultrasound-guided TAP blocks carry the danger of intraperitoneal injection and intestinal perforation. Ultrasound availability in the operating room was necessary to consistently visualize the needle tip and accurately identify the right plane, which was time-consuming.[7]

This study aimed to compare analgesic effects of USG-TAP block versus intraoperative transversus abdominis block during , after CS, focusing on pain scores within twenty four hours post-surgery in female.

2. Patients and methods

This randomized controlled study was done at El Hussein University Maternity Hospital, Obstetrics , Gynecology Department, Faculty of Medicine, from December 2021 to June 2022. research involved 200 female who underwent elective CS during study period.

Sample size justification: was determined using EpiInfo version 6.0, with a power (β) of eighteen percent, an alpha error of 0.05. The confidence interval is (1 - α) = ninety-five percent. The Risk ratio was 1.5. Data from a prior trial suggested that TAP blocks offer postoperative analgesia equivalent to that of a placebo following cesarean delivery. The Calculation based on this data yielded a minimal sample size of fifty cases.

Inclusion criteria: Pfannenstiel incision. All cases used spinal anesthesia.

Exclusion criteria: female possessing one of the following conditions: female exhibits hypersensitive reactions to local anesthetics such as bupivacaine. Individuals receiving anticoagulant therapy. Opiate tolerance was characterized by cases who were currently receiving opiate medication or had a history of opiate addiction. Hemorrhagic diathesis (e.g., von Willebrand factor deficiency): Risk of hematoma at injection or surgical site. Perioperative drugs that deviate or were anticipated to deviate from research protocol, such as in the case of DM cases. Inability to autonomously comprehend the nature of permission or to respond correctly, independently, to postoperative data collection. Perioperative complications: a Postpartum hemorrhage or uterine atony necessitating additional medicinal or surgical intervention. Cases withdraw or decline to participate in the trial due to the necessity of a postoperative drain.

Randomization and allocation:

Two hundred cases were randomly allocated into two equal groups of one hundred each by a computer-generated system: Group 1 (direct intraoperative TAP block) and Group 2 (ultrasound-guided TAP block). Allocation was obscured by the use of sequentially numbered, sealed opaque envelopes derived from a randomization table. Each case was assigned by sequentially opening the next packet upon arrival.

Study procedure:

This was a prospective research conducted at Alhusein Hospital. Our study comprised a total of 200 pregnant females undergoing cesarean section. All cases underwent standardized intrathecal anesthesia via dural puncture at the L3-L4 level, receiving 0.5 percent hyperbaric bupivacaine at a dosage of eight mg for those under 160 cm in height, ten mg for others. Subsequently, the surgical approach for cesarean sections was standardized within research, incorporating closure of the uterine incision in 2 layers with effective hemostasis.

Of 200 cases, 100 underwent intraoperative direct vision TAP block (D group) as follows: Agent, concentration: local anesthetic employed for TAP block was 0.375 percent bupivacaine, administered at a volume of twenty ml on each side for bilateral blockade. The solution was derived using the subsequent formula: Volume per syringe (ml) = Weight (kg) / 3.75

Procedure:

Surgical assistant laterally withdrew the abdominal wall on the side opposite the surgeon, while the surgeon used their non-dominant hand to retract the colon and uterus. Precautions were implemented to execute the block laterally to the rectus muscle to prevent damage to the inferior epigastric vessels. Access to the TAP plane was obtained by introducing a 22G-100 mm spinal needle through the parietal peritoneum, progressing it into the TAP plane, as indicated by a notable reduction of resistance ('one pop'). Following aspiration to prevent intravascular injection, 1 mL of anesthetic solution will be administered gently.

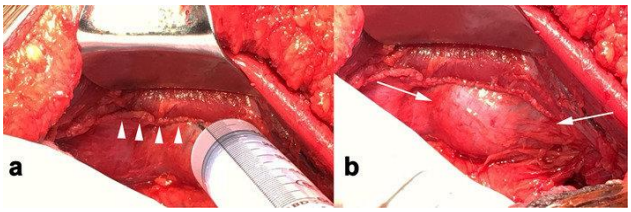

Figure 1. Intraoperative TAP block .[8]

One hundred more cases underwent a postoperative ultrasound-guided TAP block (U group) immediately following the conclusion of surgery, as outlined:

Patient positioning:

Supine reveals an area among the coastal border, the iliac crest. The ultrasound equipment was positioned directly opposite the block side.

Probe positioning:

Position a high-frequency linear probe (6-13 Hz) among iliac crest & costal margin, aligned with anterior axillary line, angling probe to form an acute angle with anterior axillary line. This device enhances accessibility for needle insertion in an aircraft.

Sonoanatomy:

Three layers of muscle were discernible in scan beneath subcutaneous fat. peritoneum appeared as a lustrous layer, & bowel was discernible due to its peristaltic motion. TAP was situated in face plane among inferior oblique , transverse abdominis muscles.

Agent and concentration:

The Local anesthetic employed for the TAP block was 0.375% bupivacaine, administered at a volume of twenty ml on each side for bilateral application.

Procedure:

A spinal needle was placed in alignment with the transducer, from medial to lateral in an anteroposterior orientation. Hydrodissection enabled the placement of a local anesthetic solution deep into the facial layer within the plane among the internal oblique and transversus abdominis muscles. Twenty units of local anesthetic were administered bilaterally into the plane. The Distribution of local anesthetic was distinctly observed using ultrasound. The Needle point was consistently visible to prevent intraperitoneal injection or bowel perforation. Data were collected at 2, 4, 6, and 24 hours, documented on a standardized form (Appendix VAS, Data Collection Forms). The Visual Analogue Scale (VAS) was a standardized ten cm laminated card marked with numbers from one to ten. The Participant indicates or verbalizes a number that quantifies the intensity of their pain, where 0 signifies no pain, and 10 represents the worst pain imaginable. Mild pain intensity should not exceed a VAS score of 3, as a score of 4 necessitates treatment. Analgesic usage was documented from the cases' medication records.

Randomization: Was done using a computer-generated randomization sheet.

Statistical analysis

Data were analyzed using SPSS version twenty-three. Quantitative variables were presented as mean ± SD for normally distributed data, as median (IQR) for non-parametric data. Qualitative variables were shown as counts and percentages. Normality was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. An independent t-test was used to compare two means: the Mann-Whitney U test for non-parametric data and the Chi-square or Fisher's exact test for categorical variables. A p-value <0.05 was considered significant, and a p-value <0.001 was considered highly significant.

3. Results

Table 1 shows no statistically significant difference among groups according to demographic data about age (years), wt. (kg), BMI (Kg/m2), parity , gest. age (wk), with p-value (p>0.05).

Table 1. Comparison among Direct Group , US Group according to Demographic data.

DEMOGRAPHIC DATA	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
AGE (YEARS)					
MEAN±SD	28.39±6.44	27.81±6.42	0.407	0.524	NS
RANGE	18-41	18-41			
WT. (KG)					
MEAN±SD	82.87±10.85	82.25±10.61	0.167	0.683	NS
RANGE	64-113	63-109			
BMI (KG/M2)					
MEAN±SD	29.39±3.54	30.53±3.45	1.311	0.225	NS
RANGE	22.1-37.4	23.1-37.1			
PARITY (N, %)					
MULTI	69 (69.0%)	67 (67.0%)	0.092	0.762	NS
PRIMI	31 (31.0%)	33 (33.0%)			
GEST. AGE (WK)					
MEAN±SD	38.39±1.12	38.44±1.19	0.094	0.760	NS
RANGE	37-41	37-41			

Table 2 shows no statistically significant difference among direct group , US group according to pain score during at rest, with p-value (p>0.05).

Table 2. Comparison among Direct Group , US Group according to Pain score during rest.

PAIN SCORE DURING AT REST	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
VAS AT 2HRS. AT REST					
MEAN±SD	0.28±0.57	0.24±0.51	0.271	0.603	NS
MEDIAN (IQR)	0 (0-0)	0 (0-0)			
RANGE	0-2	0-2			
VAS AT 4HRS. AT REST					
MEAN±SD	1.11±0.96	1.13±1.03	0.020	0.887	NS
MEDIAN (IQR)	1 (0-2)	1 (0-2)			
RANGE	0-3	0-3			
VAS AT 6HRS. AT REST					
MEAN±SD	2.07±1.01	1.97±0.93	0.534	0.466	NS
MEDIAN (IQR)	2 (1-3)	2 (1-3)			
RANGE	0-4	0-4			
VAS AT 24HRS. AT REST					
MEAN±SD	3.86±1.20	3.76±1.19	0.351	0.554	NS
MEDIAN (IQR)	4 (3-5)	4 (3-5)			
RANGE	1-6	1-6			

Table 3 shows no statistically significant difference among direct group , US group according to pain score during at movement, with p-value (p>0.05).

Table 3. Comparison among Direct Group , US Group according to Pain score during movement (/ 10).

PAIN SCORE DURING MOVEMENT (/10)	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
AT 2HRS. AT MOVEMENT					
MEAN±SD	1.12±1.19	1.09±1.26	0.030	0.863	NS
MEDIAN (IQR)	1 (0-2)	1 (0-2)			
RANGE	0-4	0-4			
AT 4HRS. AT MOVEMENT					
MEAN±SD	2.43±1.30	2.37±1.32	0.105	0.746	NS
MEDIAN (IQR)	2 (1-3)	2 (1-3)			
RANGE	0-5	0-5			
AT 6HRS. AT MOVEMENT					
MEAN±SD	3.03±1.17	2.87±1.19	0.924	0.338	NS
MEDIAN (IQR)	3 (2-4)	3 (2-4)			
RANGE	0-5	1-6			
AT 24HRS. AT MOVEMENT					
MEAN±SD	4.19±1.27	4.23±1.32	0.048	0.828	NS
MEDIAN (IQR)	4 (3-5)	4 (3-5)			
RANGE	2-7	2-7			

Table 4 There was no statistically significant difference among direct group , US group according to analgesia consumption, with p-value (p>0.05).

Table 4. Comparison among Direct Group , US Group according to Analgesia consumption.

ANALGESIA CONSUMPTION	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
NO	66 (66.0%)	69 (69.0%)	0.205	0.651	NS
YES	34 (34.0%)	31 (31.0%)			

Table 5 showed that ,there was no statistically significant difference among direct group , US group according to type of required analgesia (NSAIDS Vs. NSAIDs + opioids), with p-value (p>0.05).

Table 5. Comparison among Direct Group , US Group according to Type of required analgesia (NSAIDS Vs. NSAIDs + opioids).

TYPE OF REQUIRED ANALGESIA (NSAIDS VS. NSAIDS + OPIOIDS)	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
NO	66 (66.0%)	69 (69.0%)	0.333	0.846	NS
N+O	3 (3.0%)	2 (2.0%)			
NSAIDS	31 (31.0%)	29 (29.0%)			

Table 6 showed that, there was no statistically significant difference among direct group , US group according to frequency of analgesia administration, with p-value (p>0.05).

Table 6. Comparison among Direct Group , US Group according to -Frequency of Analgesia administration.

FREQUENCY OF ANALGESIA ADMINISTRATION	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
NON	66 (66.0%)	69 (69.0%)	0.667	0.717	NS
ONCE	25 (25.0%)	25 (25.0%)			
TWICE	9 (9.0%)	6 (6.0%)			

Table 7 showed that, there was no statistically significant difference among direct group , US group according to 1st time required analgesia, with p-value (p>0.05).

Table 7. Comparison among Direct Group , US Group according to -1st time required analgesia.

1ST TIME REQUIRED ANALGESIA	DIRECT GROUP (N=100)	US GROUP (N=100)	TEST VALUE	P-VALUE	SIG.
NO	66 (66.0%)	69 (69.0%)	0.667	0.717	NS
6HRS.	9 (9.0%)	6 (6.0%)			
24HRS.	25 (25.0%)	25 (25.0%)			

4. Discussion

While effective postoperative analgesia was achieved using opioids alongside NSAIDs, paracetamol following general anesthesia, opioids were related to considerable complications, including nausea, vomiting, respiratory depression, and neonatal effects resulting from opioid transmission via breastfeeding during CS.[9,10]

The TAP block was currently utilized as a component of multi-modal analgesia following lower-segment Cesarean delivery .[10; 11] It offers excellent analgesia , reduces postoperative opioid requirements following appendectomy, nephrectomy, midline abdominal laparotomies. 12 postoperative analgesia following cesarean section produced by transversus abdominis plane block was comparable to intrathecal diamorphine, without associated risk of respiratory depression necessitating monitoring for at least twelve hours.[13].

Because the TAP block performed using the classic blind technique was related to substantial complications, ultrasound guidance through the transcutaneous route was used to reduce internal organ injury .[6]

USG-TAP block enhances safety, allows visualization of abdominal muscle layers, has been related with documented liver injury. it continues to present technical difficulties, even with application of ultrasound in obese cases with heightened subcutaneous adipose tissue (Dal Moro et al., novel surgical TAP block approach was deemed to diminish morbidity in this cohort of cases.[13]

Surgical TAP block was first described by Saxena et al.[13] Surgical TAP block was administered to sixteen females undergoing cesarean delivery under spinal anesthesia, resulting in diminished overall morphine doses compared to the control group.

This randomized controlled clinical trial involved 200 pregnant females undergoing elective CS at El Hussein Hospital's Obstetrics, Gynecology Department, Faculty of Medicine, to evaluate pain scores at rest, during movement, as well as the requirement for opioids post-cesarean section. Participants were randomly assigned to Group 1 (Direct intraoperative TAP block) or Group 2 (Ultrasound-guided TAP block).

current investigation revealed no significant difference among two groups concerning cases pain perception during rest , movement at various follow-up intervals (2H, 4H, 6H, 24H). No substantial variation in analgesia requirements was seen among study groups regarding initial time of required analgesia , rate of analgesic necessity.

USG-TAP block enhanced safety; abdominal

muscle layers , needle tip were visible, with reported liver injury. it continues to be technically difficult, even with application of ultrasound guidance in obese cases with elevated SC adipose tissue.[14] newer technique of surgical TAP block was considered to have reduced morbidity in this group of cases .[13]

The present study corresponds with studies by Urfalioglu et al.[15] No significant variations in VAS scores were seen among groups at any time, mean time to 1st analgesic necessity was comparable among two groups.

In harmony with the current study, Urfalioglu et al.[15] Seventy-five pregnant females were assessed, randomly assigned to two groups: ultrasound-guided TAP block (UT group), surgical TAP block (ST group). The Study revealed that age, mean time to initial analgesic requirement, and total analgesic intake over twenty-four hours were comparable across groups. No significant changes in VAS scores were detected among groups at any time ($p > 0.05$ for all).

In accordance with the current study, Narasimhulu et al.[16] conducted a randomized trial including forty-one females undergoing cesarean delivery, allocating them to either a surgical TAP block or a traditional TAP block. Twenty-four-hour opioid usage did not differ significantly among groups. Furthermore, there were no significant changes in average postoperative pain levels at rest among the surgical TAP group and the conventional TAP group at four h, eight h, 24h, and 48h, with p-values of 0.61, 0.46, 0.33, and 0.13, respectively. Similarly, pain scores during movement showed no significant differences, with p-values of 0.27, 0.96, 0.43, and 0.12. Additionally, it was shown that the duration spent in the operating room post-delivery was significantly reduced with the surgical TAP block.

surgical TAP block was executed during wound closure, facilitating secure injection under direct visualization. It was rapid, requires no specialized apparatus, was simpler to master. It was efficacious, particularly in obese individuals, serves as a pragmatic option when ultrasonography or qualified personnel were inaccessible.

4. Conclusion

Ultrasound-guided surgical transversus abdominis plane blocks were demonstrated to be safe, equally effective in delivering postoperative analgesia to pregnant females after CS under spinal anesthesia. Surgical transversus abdominis plane block has demonstrated efficacy, safety, and rapidity, especially in scenarios where ultrasound-guided transversus abdominis plane block is technically difficult, as in obese females, or if ultrasound is unavailable in the operating theater.

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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