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ORIGINAL ARTICLE

A Comparative Study Between Ultrasound-guided Transversus Abdominis Plane (USG-TAP) Block Versus Open Surgical Technique for Post Cesarean Section Pain Control

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Abstract

Background: **Opioids are linked to significant health problems, such as nausea, vomiting, sedations, pruritus, and respiratory depressions in addition to newborns adverse effects via opioid transmitting across breastfeeding during caesarean section, even after the efficient stages of postoperative analgesia attained with the administration of opioids in combination with NSAIDs and paracetamol continuing to follow general anaesthesia.**

Aim of the work: **This study's objective is to evaluate pain levels at (rests and movements), and need for opioids following cesarean section using TAP block techniques (USG TAP, intraoperative direct vision TAP).**

Patients and methods: **This study comprised 100 pregnant women who underwent elective caesarean sections (50 received intraoperative direct vision TAP block, and 50 received USG TAP block).**

Results: **In the current investigation, we discovered that there was no discernible difference between the two analysed groups in terms of patients' perceptions of pain during rest and movement at various follow-up dates (3H, 6H, 9H, 12H, 24H). Additionally, there was no discernible differences in the research groups' need for analgesics (First time of required analgesia analgesics requirement ratio). Additionally, both the USG and surgical TAP blocks were secure and equally effective at reducing pain following surgery. Additionally, surgical TAP block is an effective, safe, and quick procedure, especially for patients for whom USG TAP block is technically difficult and doesn't necessitate the presence of extra equipment.**

Conclusion: **After a caesarean section while under spinal anaesthesia, transversus abdominis plane blocks performed surgically and with ultrasound guidance were both safe and equally effective.**

Keywords: Cesarean section, Open surgical technique, Ultrasound-guided transversus abdominis plane block

1. Introduction

Despite postoperative pain being a significant problem, caesarean sections represent the most common surgical procedures performed on women worldwide. The main reason for delaying the procedure is said to be the pain experienced after the caesarean section. For pain relief, many types of analgesics could be administered to patients right after surgery via various routes. These range from simple parenteral analgesics (such as paracetamol and NSAID medications) to neuraxial opioids. Parents could use tranversus abdominis planes blocking and TAP blocks, which may be administered either transcutaneously or by open surgery, as well as ultrasonography guidance, to relieve postcesarean section aches.[1]

A foetus is delivered via caesarean section, which involves making incisions (laparotomy) in the uterus' walls and the abdominal wall (hysterotomy).[1]

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While conducting a caesarean section, obstetricians use a variety of surgical procedures. Furthermore, several procedures—such as the Pfannenstiel abdominal entry for elective caesarean section and the Joel-Cohen technique—are only employed by the bulk of obstetricians.[2]

Applying highly effective analgesics for post-section pain relief is vital since childbirth is a unique experience for women. However, in addition to the mother's need to recuperate fast after significant intra-abdominal operation, she also needs to take care of her unborn child.[3]

The American College of Obstetricians and Gynecologists (ACOG) and the American Society of Anesthesiologists (ASA) advise that a mother's request for pain treatment is sufficient justification for pain management.[4]

Somatic and visceral pains are the two main types of post-c-section pain. The anterior divisions of the spinal segmented nerves from T10 to L1 carry the somatic pain emanating from nociceptors in the abdomen region to deeper and cutaneous regions. The stimuli of the visceral uterines nociceptive turned up across afferent nerves fibres that move up via the inferior hypogastric plexus and join the spinal cord through the vertebral column T10-L1 spinal nerves. Such nerves are located in the anterior abdomen walls laterally between the transverses inner obliques and abdominis muscles strands.[5]

Since the prevalence of caesarean sections has dramatically increased over the past 20 years, a new mother's ability to care for her child and effectively manage her pain depend on receiving the right postoperatively analgesics.[6]

There is currently no perfect or gold standards for postoperative pain treatment, although a number of factors, including as goals, anticipated time of sections, length of surgical procedure, and patients preference, influence the choice of analgesia treatments.[7] Because of a lack of available medications and inadequate employee training, certain facilities could not be able to offer all choices for postoperatively analgesia; in addition, some procedures are not used in certain obstetric circumstances such bleeding disorders, local infections, and pre-eclampsia.[8]

The cost of an eventual analgesic treatment utilized after a caesarean section is examined, therefore the procedure ought to be simple to carry out, provide excellent pain medication, be affordable, have the fewest adverse effects, and have the least impact on nursing.[7]

Analgesia post-partum can be effectively treated with subarachnoid morphines. However, its use is associated by known negative side effects, particularly pruritus, vomiting, and nausea, which lowers overall patients satisfaction. There is a risk of prolonged maternal pulmonary depressions as a result of morphine's rostral spread, which is among the most serious complications of analgesics or narcotics.[9]

The anterior abdominal wall incisions and wounds, which cause a significant portion of the pain experienced after caesarean delivery, could be completely blocked using a variety of local anaesthetic techniques, including iliohypogastric and ilioinguinal nerve blocks, injury infiltrations, and most recently, the transversus abdominis planes (TAP) blocks.[9]

The transversus abdominis planes (TAP) blocking is a relatively recent treatment that blocks the neural afferents to the anterior abdomen muscles walls by infusing local infiltration anaesthetics into the neurofascial planes between the transversus abdominis and internal obliques muscles.[10]

The TAP blocks have shown to be useful in lowering the dose of intravenous morphines necessary in patients undergoing general surgery following laparotomies and in post-CS women.[11]

Blocking the transversus abdominis planes after a caesarean sections in women is an effective analgesic technique (TAP). Researchers of two randomised controlled studies showed that women receiving TAP blocks needed a lower dosage of opioids in the first 24 h following caesarean delivery.[12]

According to some writers, inhibition of TAP is a relatively new technique that may be more effective in reducing post-CS discomfort. It could be a useful resource for those who shouldn't receive long-acting neuraxial opioids or for people who are under general anaesthesia.[11]

The report's goal is to examine how the ultrasonic transverses abdominis planes (USG-TAP) blocks affects women's pain scores 24 h following surgery during and after caesarean sections.

2. Patients and methods

This prospective research was carried out in the Obstetrics and Gynecology Department of the Faculty of Medicine, El Hussein University Maternity Hospital. The trial involved 100 women who presented from June 2021 to November 2021. At the Obstetrics and Gynecology Department, Faculty of Medicine, El Hussein University Maternity Hospital, women seeking elective caesarean sections.

2.1. Inclusion criteria

Medically free, body mass index <40, elective cesarean section.

2.2. Exclusion criteria

Significant systemic conditions such type 2 diabetes and hypertensions, abuse of drugs or alcohol, body mass index ≥40, emergency cesarean section.

2.3. Randomization and allocation

2.3.1. Study procedure

This prospective study was conducted at the maternity hospital for El Hussein University. The present study comprised 100 pregnant women having caesarean delivery (group 1, Directly Intraoperative TAP blocks & group 2, Ultrasonography assisted TAP blocks, every sample comprised 50 patients). Every patient got standard intrathecal anaesthesia with a dural punctures at level L3-L4 and was given 0.5% hyperbaric bupivacaines in doses of 8.0 mg if they were under 1.60 m tall and 10 mg if they were not.

Following that, the article's standardised CS surgical techniques comprised two-layer uterine closures and the closures of the parietal peritoneum. Fifty patients out of the 100 were given an intraoperatively direct visions TAP blocks (group 2) by an obstetrician.

2.4. Agent and concentration

0.375% bupivacaine 20 ml is the local anaesthetic used for TAP blocking and is administered bilaterally on every side (Fig. 1).

After anesthesiologist-performed surgery, the remaining 50 patients (group 2) had postoperatively ultrasound-guided TAP blocks as follows (Fig. 2).

2.5. Statistical analysis

Dataset were gathered, reviewed, coded, and submitted into IBM SPSS version 23 of the Statistical Package for Social Science. Whenever parametric,

Fig. 1. Procedure of intraoperative TAP block.

Fig. 2. Patient positioning and probe positioning in USG TAP block.

the quantitative values were displayed as means, standard deviations, and ranges. Additionally, qualitative factors were displayed as numbers and percentages. As a result, the P values were deemed significant: Non-significant if $P > 0.05$ Significant, $P < 0.05$ Highly significant at $P < 0.01$.

3. Results

Fig. 3.

Tables 1 and 2.

There is no statistically important difference between the two groups regarding the demographic data (Table 3).

There is no statistically important difference between the two groups regarding the pain score (VAS-10) at different follow-up times at (3,6, 9, 12, 24 h) (Table 4).

There is no statistically important difference between the two groups regarding analgesic requirement and type of analgesia (Table 5).

There is no statistically important difference between the two groups regarding complications.

4. Discussion

Opioids are linked to significant comorbidities, such as nausea, vomiting, sedations, pruritus, and respiratory failure in addition to newborns adverse effects via opioids transmission through breastfeeding during caesarean delivery, despite the efficient levels of postoperatively analgesia that can be accomplished with their use in conjunction with NSAIDs and paracetamol following general anaesthesia.[13,14]

TAP blocking is being utilized following lower segment caesarean birth as a component of multimodal analgesic.[14–16] It reduces the need for postoperative opiates after appendectomy, nephrectomy, and midlines abdominal laparotomies by providing

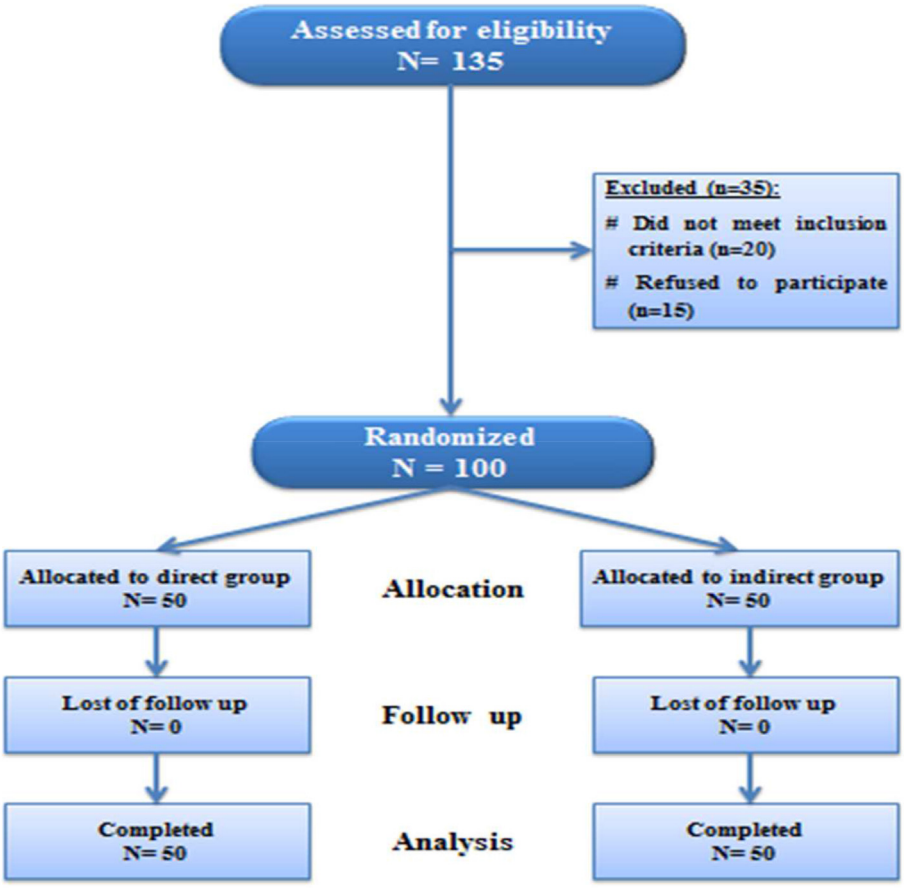

Fig. 3. Flow chart of the studied cases.

good analgesics.[17] TAP blocks provides post-operatively analgesia similar to intrathecal dia-morphines without the danger of respiratory restriction that necessitates monitoring for at least 12 h following CS.[18]

Due to the significant challenges connected with the traditional blind TAP blocks, ultrasonography guiding via the transcutaneous method is employed to lessen internal organs damage.[19]

The USG-TAP block improves efficacy, though liver damage has been recorded and abdominal muscular layers may be visible. Although the use of USG in obese individuals with increasing subcutaneous adiposed tissues, it is still technically difficult.[20] Therefore, it is believed that the more recent surgical TAP block approach has decreased mortality in this particular patient population.[18]

The surgical TAP block was first described by *Saxena et al.*[18] who applied the surgical TAP blocking to 16 women having spinal anaesthesia for caesarean deliveries and discovered that these ladies required less morphines overall than controls.

This randomised controlled clinical trial involved 100 pregnant women who underwent elective C.S. at Al-Hussein University Hospital's Obstetrics and Gynecology Unit. Participants were allocated evenly and randomly into two groups: group 1 (Direct intraoperatively TAP blocks) and group 2. (Ultra-sound-guided TAP blocks).

Table 1. Demographic descriptive information.

	Number = 100
Age	
Mean ± SD	27.19 ± 5.23
Range	19–40
BMI	
Mean ± SD	30.83 ± 3.81
Range	25–39
Parity	
Zero	13 (13.0%)
One	32 (32.0%)
Two	30 (30.0%)
Three	22 (22.0%)
More than three	3 (3.0%)
Gestational Age	
Mean ± SD	38.35 ± 1.06
Range	37–41

Table 2. Comparison between group 1 and group 2 regarding demographic data.

	Group 1 Number = 50	Group 2 Number = 50	Test value	*P* value	Sig.
Age					
Mean ± SD	28.12 ± 5.91	26.26 ± 4.30	1.798[a]	0.075	NS
Range	19–40	19–38			
BMI					
Mean ± SD	31.54 ± 3.76	30.12 ± 3.77	1.885[a]	0.062	NS
Range	25–37	25–39			
Parity					
Zero	6 (12.0%)	7 (14.0%)	0.088	0.767	NS
One	14 (28.0%)	18 (36.0%)	0.735	0.391	NS
Two	15 (30.0%)	15 (30.0%)	0.000	1.000	NS
Three	12 (24.0%)	10 (20.0%)	0.233	0.629	NS
More than three	3 (6.0%)	0 (0.0%)	3.093	0.079	NS
Gestational Age					
Mean ± SD	38.16 ± 1.06	38.54 ± 1.03	−1.817[a]	0.072	NS
Range	37–41	37–41			

P value > 0.05 indicates non significance, *P* value 0.05 indicates significance, and *P* value 0.01 indicates highly significance.
[a] Independent *t*-test.

Table 3. Comparison between group 1 and group 2 regarding pain score (VAS-10).

Pain score	Group 1 number = 50	Group 2 number = 50	Test value‡	*P* value	Sig.
3 h					
Mean ± SD	2.66 ± 1.53	2.12 ± 1.89	−1.609	0.108	NS
Range	0–6	0–7			
6 h					
Mean ± SD	3.26 ± 1.58	2.72 ± 1.74	−1.896	0.058	NS
Range	0–6	0–6			
9 h					
Mean ± SD	4.96 ± 0.99	4.56 ± 1.46	−1.852	0.064	NS
Range	4–8	2–8			
12 h					
Mean ± SD	7.10 ± 1.22	6.82 ± 1.19	−1.240	0.215	NS
Range	5–9	5–9			
24 h					
Mean ± SD	8.72 ± 0.88	8.80 ± 0.73	−0.192	0.847	NS
Range	5–10	7–10			

Mann Whitney test: *P* value > 0.05: Non-significant; *P* value < 0.05: Significant; *P* value < 0.01: Highly significant.

Table 4. Comparison between the two groups regarding analgesic requirement and type of analgesia.

	Group 1 number = 50	Group 2 number = 50	Test value[a]	*P* value	Sig.
Analgesia requirement					
Not required	34 (68.0%)	37 (74.0%)	0.614	0.736	NS
Ketolac	14 (28.0%)	12 (24.0%)			
Ketolac/nalofen	2 (4.0%)	1 (2.0%)			
Analgesia doses					
No	34 (68.0%)	37 (74.0%)	0.451	0.798	NS
One dose	12 (24.0%)	10 (20.0%)			
Two doses	4 (8.0%)	3 (6.0%)			
First time analgesia					
No	34 (68.0%)	37 (74.0%)	1.038	0.595	NS
At 12 h	4 (8.0%)	5 (10.0%)			
At 24 h	12 (24.0%)	8 (16.0%)			

P value > 0.05 indicates non significance, *P* value 0.05 indicates significance, and *P* value 0.01 indicates highly significance.
[a] Chi-square test.

Table 5. Comparison between the two groups regarding analgesic complications.

Complications	Group 1 number = 50	Group 2 number = 50	Test value[a]	*P* value	Sig.
No	47 (94.0%)	48 (96.0%)	0.211	0.646	NS
Yes	3 (6.0%)	2 (4.0%)			

P value > 0.05 indicates non significance, *P* value 0.05 indicates significance, and *P* value 0.01 indicates high significance.
[a] Chi-square test.

In the current investigation, we discovered that there was no discernible distinction between the two analysed groups in terms of patients' perceptions of pain during repose and movements at various follow-up dates (3H, 6H, 9H, 12H, 24H). Additionally, there was no discernible difference in the research groups' need for analgesics (Rate of first analgesia and analgesia drug needs).

The present study corresponds with studies by ***Urfalioglu et al.***[21], ***Urfalioglu et al.***[22] ***and Narasimhulu et al.***[23] which found that at all stages, there was no discernible differences in VAS score between the samples, and the mean duration to first analgesic necessity was comparable between the two groups.

In harmony with current study, ***Urfalioglu et al.***[21] evaluated seventy-five The following groups of pregnant women were randomly assigned: USG-TAP blocks (UT group) and surgical TAP blocks (ST group). Age, the mean duration until the first painkiller was needed, and the total amount of analgesics consumed in a 24-h period were shown to be comparable between groups. Additionally, there were never any statistically significant disparities in VAS rate across the groups ($P > 0.05$ for all).[21]

Seventy-five pregnant women were recruited for the present study, which was in line with a later survey performed by the same publishers in 2017. Both studies reported similar findings, with no statistically significant differences between groups being found for either the first analgesic demand or the total amount of analgesics consumed over a 24-h period ($P = 0{,}168$ and $P = 0.539$, respectively). Additionally, both groups' median VAS values at 2, 3, 9, 12, and 24 h after surgery ($P > 0.05$ for all).[22]

Additionally, both the USG and surgical TAP blocks were secure and equally effective at reducing pain following surgery. Additionally, surgical TAP block is an effective, safe, and quick procedure, especially for patients for whom USG TAP block is technically difficult and doesn't necessitate the availability of extra devices.

In accordance with current study, ***Narasimhulu et al.*** 41 women experiencing caesarean deliveries were enrolled in a randomised trial, and they were given the option of either a surgical TAP block or a standard TAP blocks. The groups did not significantly differ in their 24-h opioids intake. The mean postoperatively pain ratings at resting and at (4 h, 8 h, 24 h, 48 h) with *P*. value (0.61, 0.46, 0.33, 0.13) respectively and pain ratings on movements with *P* value (0.13) did not vary between the surgical TAP group and the traditional TAP group (0.27, 0.96, 0.43, 0.12). Additionally, they discovered that surgical TAP blocks patients spent significantly less time in the operating room after birth.[23]

Only a few studies have so far evaluated surgical TAP versus US assisted TAP in CS. The surgeon is in the rare position of being able to administer local anaesthetic into the TAP planes while the intraperitoneal components are under direct view to prevent unintentional organ harm during surgical TAP block during closures of the abdominal wounds.

Despite the fact that TAP block offers efficient postoperatively analgesia, it is not frequently carried out in numerous centres. The lengthened duration in the surgery room, the requirement for specialised equipment (Sonogram), and the accessibility of an anesthesiologist trained to perform the blocks under ultrasound guidances could all be contributing factors.

Contrarily, the operative TAP block is quick and doesn't need specific equipment, therefore it might be simpler to include in a multimodal postoperatively analgesic regimen. In situations without access to competent operators or intraoperative ultrasonography, the operative TAP block offers an alternative for postoperative analgesia. Additionally, the surgically TAP block is easier to conduct on morbidly obese individuals since the distances the needles must travel to enter the TAP planes is so tiny and unaffected by the patient's body mass index. The traditional TAP block may be difficult to carry out on such individuals. The learning curve is anticipated to be lower than for ultrasound-guided TAP blocks because it is conducted without ultrasonography assistance.

4.1. Conclusion

After a caesarean section while under spinal anaesthesia, transversus abdominis planes blocks performed surgically and with ultrasound guidance were both secure and equally effective. In particular for individuals (such as obese women) for whom ultrasound-guided transversus abdominis planes blocks are functionally problematic and when the ultrasonography is not accessible in the operating room, surgical transversus planes block is an effective, secure, and quick method.

Authorship

All authors have a substantial contribution to the article.

Disclosure

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Conflicts of interest

The authors declared that there were NO conflicts of Interest.

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