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Comparative Study Between Ultrasound Guided(Usg) Transversus Abdominis Plane Block(Tap Block) And Patient Controlled Analgesia (Pca)After Caesarian Section

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ABSTRACT

Background: Women's post-cesarean delivery pain satisfaction is still a problem. Accurate evaluation of post-cesarean delivery pain intensity aids in the selection of the most suitable anaesthetic method, drug, and dosage, and the enhancement of postsurgical pain therapy.

Aim of the work: To compare between ultrasound guided TAP block and patient controlled analgesia after caesarian section as regard safety and pain control as well as patient satisfaction.

Patients and methods: A cross-sectional study has been performed on 100 women at El-Sayed Galal University Hospital and El Hussein University Hospital, who were scheduled to have an elective C-section. They have been split into two groups, with "group 1" (n = 50) receiving TAP block and "group 2" (n = 50) receiving PCA.

Results: The scores of pain, heart rate, rate of respiration, intestinal movement, nausea, and vomiting were all evaluated at 1, 2, 4, 8, 12, and 24 hrs following the operation. In all time intervals, "group 2" had significantly less pain than "group 1" ($p < 0.001$). At 2 and 4 hours after surgery, the heart rate of women in "group 2" was significantly higher than that of women in "group 1" ($p < 0.001$). Those in "group 2" experienced much more nausea and vomiting than women in "group 1." (P value 0.03 and 0.04, respectively). When it came to intestinal motility, "group 1" heard it first, followed by "group 2".

Conclusion: TAP block and PCA are both efficient in relieving postsurgical pain following a caesarean operation. When the dosages have been adjusted, the complications and negative impacts of both are low.

Keywords: *Ultrasound guided; TAP; Caesarian section.*

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INTRODUCTION

According to recent literature, the C-section rate has skyrocketed globally, including in Egypt. [1] This increase is linked to a rise in women's awareness of the procedure and their requests for pain-free techniques both during and following the operation. This encourages obstetricians to experiment with new techniques and approaches rather than rely on traditional postsurgical analgesic techniques. In most cases, an uncomplicated caesarean delivery causes moderate to severe pain for the first 48 hours after the operation. [2] As a result, pain alleviation is crucial, as it impacts both the mom and her newborn's care.

Furthermore, poor pain control may have a negative impact on healing and mother–infant bonding, leading to more prolonged postoperative pain.

Women who are having a caesarean section have even more compelling causes to have adequate pain relief,, because early mobilization is an important element in lowering the risk of thrombo-embolic illness, which would be recognized to be higher during gestation and puerperium. Pain alleviation for these mothers enhances their baby's care and allows them to nurse more effectively. [3]

Controlling postsurgical pain can be done in a variety of ways. The hunt for the optimal technique, though, is still underway. Many methods have been employed. Nonetheless, the gold standard remains the use of opioids through various methods. [4]

Transversus abdominis plane (TAP) block is a practical main analgesic for women who are not getting neuraxial morphine for any reason during

caesarean delivery. TAP block is a type of assisted analgesic that is used to reduce the use of opioids in intraoperative and systemic analgesics for post-surgery pain control. The TAP block is a thoracolumbar nerve field block that runs in the fascial plane across the transversus abdominis muscles and the internal oblique. Near the midaxillary line, the anterior primary rami branch off into the lateral and anterior dermal nerves, running between the transversus abdominis muscles and the internal oblique. [5]

Patient-controlled analgesia, or "PCA," improves patient satisfaction by reducing pain more effectively than non-patient opioid administrations.[6]

Furthermore, PCA has been advisable for women who are in labor. Pain associated with contractions could be efficiently controlled and decreased, especially when exacerbated with the administration of induction drugs such as oxytocin. [7]

At a certain dosage and time, PCA is used to successfully control pain. This is accomplished through permitting patients to give a predefined bolus dosage of medicine on request. Each bolus can be given alone or in combination with another drug. PCA, on the other hand, is used to treat acute, chronic, postsurgical, and labor pain. Opioids and local anesthetics are the most widely used medications, but other analgesics may be used as well.[8]

The objective of this study was to see how ultrasound-guided TAP block compared to patient-controlled analgesia after caesarian section as regards safety and pain control as well as patient satisfaction.

PATIENTS AND METHODS

A cross-sectional study has been performed on 100 women at El-Sayed Galal University Hospital and El Hussein University Hospital, who were scheduled to have an elective C-section.

The patients were divided into groups: Group (1): Included 50 patients using ultrasound guided transversus abdominis plane (USG-TAP) block technique. **Group (2):** Included 50 patients using patient-controlled analgesia (PCA) technique.

Inclusion criteria: American society of anesthesiologist (ASA) physical status class II, age above 21 years, undergo CS with spinal anaesthesia, and primigravida beyond 37 weeks of gastation with singleton live baby.

Exclusion criteria: Patient refusal, patient with known reaction to study drugs, (BMI) $\geq$30 kg/m^2, patients on chronic analgesics, (ASA) physical status class III, IV, and patient with coagulation disorders and thrombocytopenia.

All the participants were requested a written informed consent regarding the procedure according to the study protocol, and no harm to the patients would be allowed and both groups were subjected to:

A 500 ml saline solution IV was giving in obstetric department before the operation.

They were monitored by standard method (non-invasive arterial blood pressure, heart rate, and pulse oximeter for the duration of CS).

A conventional spinal anesthesia was initiated as 2.2 ml of intrathecal hyperbaric bupivacaine (0.5%) was administrated using a 25-gauge spinal needle with patients in the sitting position at the L 4/5 interspace under strict septic precaution.

Ephidrine was 3mg titrate administered as needed to treat hypotension as well as IV infusion of 10 unit of oxytocin after delivery.

They were received 1gm of paracetamol every 6 hours.

The rescue pain analgesia was given postoperatively for VAS >3 by ketolac (30mg IV every 12 hours) and (VAS) was reassessed 15 minutes later to rescue analgesic injection.

In TAP block group: The TAP block was guided by ultrasound (USG) and after closure of the incision. Therefore, the injection is painless and would not be detected by the patient as they are still under spinal anesthesia. The TAP block was performed by using bupivacaine 0.25% (20 ml in each side) .

In PCA group: The PCA system is carefully expland to patient prior to CS and its filled by pethidine 5 ml/kg in 24 hours which diluted in 100 ml of normal saline via IV PCA device.

Statistical analysis:

The data was tallied and statistically analysed using SPSS 20.0 software (Statistical Package for Social Sciences). Descriptive statistics have been calculated for numerical parametric data as mean±SD and min and max ranges, as well as numerical non parametric data as median and first and third interquartile ranges, and categorical data as numbers and percentages. For quantitative variables, inferential analyses have been performed using the independent t-test when there were two independent groups having parametric data and the Mann Whitney U when there were two independent groups having non-parametric data. For qualitative data, inferential analyses have been performed using the Chi-square test for independent groups. P values of less than 0.050 have been considered significant; otherwise, they have been considered non-significant. The p-value is a statistical estimate of the likelihood that the outcomes of a study happened by coincidence.

RESULTS

Parameters	Group		Test	
	TAP block group N=50 Mean ± SD	PCA group N=50 Mean ± SD	t	p
Age (year)	28.86 ± 6.42	29.6 ± 5.85		
Range	22 – 40	23 – 40	-0.603	0.837
Weight (kg)	86.4 ± 7.38	86.5 ± 8.14	-0.064	0.949
Height (cm)	169.44 ± 5.35	170.04 ± 6.09	-0.523	0.602
BMI (kg/m^2)	30.1 ± 2.26	29.93 ± 2.56	0.346	0.73
Duration of surgery (min)	37.98 ± 4.32	36.6 ± 3.94	1.669	0.098

Table 1: Comparison of demographic, anthropometric, and operation time data between the groups studied.

The age difference between the groups studied was statistically non-significant. Mean age in TAP block and PCA groups is 28.86 and 29.6 years respectively. In terms of weight, height, and body mass index, there were no statistically significant differences between the study groups. In terms of operation duration, there were no statistically significant differences between the groups tested (Table 1).

VAS	Group		Test	
	TAP block group Median (range)	PCA group Median (range)	Z	p
At 1st hour	1 (1 – 2)	1 (0 – 2)	-0.876	0.381
At 2nd hour	1 (1 – 4)	1 (0 – 2)	-4.298	<0.001**
At 4th hour	2 (1 – 5)	1 (0 – 4)	-5.113	<0.001**
At 8th hour	2 (1 – 4)	1 (0 – 4)	-4.027	<0.001**
At 12th hour	1 (0 – 3)	1 (0 – 4)	-4.677	<0.001**
At 24th hour	1 (0 – 2)	0 (0 – 2)	-5.137	<0.001**

Table 2: Comparison of the study groups in terms of VAS over time

In the first hour, there were no statistically significant differences between the studied groups regarding VAS score. The VAS score at the 2nd, 4th, 8th, 12th, and 24th hrs following intervention was significantly lower in the PCA group, indicating a statistically significant difference between the tested groups. There is a significant change in VAS score in each group over time (Table 2)

Heart rate (b/min)	Group		Test	
	TAP block group	PCA group	t	p
	Mean ± SD	Mean ± SD		
Baseline	74.38 ± 5.11	74.88 ± 4.55	-0.516	0.607
At 5th minute	75.64 ± 5.32	76.16 ± 5.38	-0.468	0.628
At 10th minute	76.02 ± 5.59	76.16 ± 5.58	-0.125	0.9
At 15th minute	78.2 ± 4.58	78.28 ± 4.4	-0.089	0.929
At 20th minute	79.6 ± 4.77	79.7 ± 4.65	-0.106	0.919
At 30th minute	79.46 ± 5.57	79.52 ± 5.2	-0.056	0.956
At 40th minute	79.46 ± 5.19	79.44 ± 5.06	0.02	0.984

Table 3: Comparison of the study groups in terms of heart rate intraoperatively

There are statistically non-significant differences between the study groups in respect of heart rate baseline, at the 5th, 10th, 15th, 20th, 30th, and 40th minutes. In each group, there is a significant change in heart rate over time (Table 3).

	Group		Test	
	TAP block group N=50	PCA group N=50	t	p
Duration of analgesia (min)			-3.427	0.001**
Mean ± SD	809.8 ± 287.33	1021.6 ± 329.35		
Range	400 – 1440	480 – 1440		
Time for ambulation (hr)			4.254	<0.001**
Mean ± SD	6.466 ± 0.951	5.566 ± 1.222		
Range	4.5 – 8.5	4 – 8.5		

Table 4: Comparison of the study groups regarding analgesia duration and time to first ambulation

There have been statistically significant differences across the study groups regarding analgesia duration, which have been significantly greater among those in the PCA group. There have been statistically significant differences across the tested groups regarding time for ambulation, which was significantly lower among the PCA group (Table 4)

Parameter	Group		Test	
	TAP block group N=50 (%)	PCA group N=50 (%)	χ^2	p
Need for rescue analgesia: Yes	16 (32%)	7 (14%)	4.574	0.032*
Time for first analgesia (hr):	N=16	N=7		
Mean ± SD	4.785 ± 1.909	8.5 ± 1.626	-4.618	<0.001**
Range	2 – 8	5 – 10		

Table 5: Comparison of the study groups regarding the need for rescue analgesia

There have been statistically significant differences across the study groups regarding the time for first analgesia, which was later in the PCA group (mean 4.785 hours for the TAP block group versus 8.5 hours in the PCA group). There have been statistically significant differences across the tested groups regarding the frequency of patients who needed rescue analgesia. Twenty-two percent of those within the TAP block group versus 14% within the PCA group needed analgesia (Table 5).

Complications	Group		Test	
	TAP block group N=50 (%)	PCA group N=50 (%)	χ^2	p
Local anesthesia complications	1 (2)	2 (4)	Fisher	>0.999
Nausea and vomiting	0 (0)	6 (12)	6.383	0.027
Hemodynamic instability	0 (0)	0 (0)		
Arrhythmias	0 (0)	0 (0)		

Table 6: Comparison of the study groups regarding complications

There have been statistically significant differences across the study groups regarding nausea and vomiting (Table 6).

DISCUSSION

The current research found that, while pain sensation (as measured by VAS) was reduced in both groups during the first 24 hrs following operation, VAS values in the PCA group "group 2" had been significantly reduced compared to those in the TAP block group "group 1" ($p \leq 0.001$).

A meta-analysis by Champaneria et al. [9] comparing TAP block for acute pain alleviation after C-section to normal/control practice. According to the research, TAP block was found to be more effective than control for pain at rest and pain with motion, i.e., TAP block, in comparison to placebo or no TAP block, considerably lowers pain at rest.

Likewise, in a meta-analysis, Mishriky et al. [10] discovered that post-cesarean TAP block is linked to decreased pain degrees at rest (8 and 12 hours) and with motion (8 and 12 hours).

According to the existing evidence, transversus abdominis plane block seems to be useful for postsurgical analgesia. Generally, the studies revealed that TAP block minimizes the opioid requirement as well as could lower pain levels within the first 12 hours after C-section.

Ng et al. [11] did a meta-analysis to assess the effectiveness of a high vs. low TAP block dosage. Both groups (low-dosage and high-dosage) had equivalent postsurgical analgesia and opioid-sparing impacts, according to their meta-analysis (opioid use, time to initial request, and pain scores at 24 hours). As a result, it has been determined that, above a specific dose threshold, local anaesthetics would provide no additional benefit. Low-dose post-cesarean TAP block can also lower the risk of local anaesthetic toxicity while preserving analgesic effectiveness.

This is consistent with our findings. Women who underwent intravenous PCA in "group 2" experienced significantly lower pain levels following 2, 4, 8, and 6 hours than women who got TAP block in "group 1."

Due to its putative anticholinergic effect, meperidine in an appropriate PCA was assumed to be safer, have a lower risk of addiction, and be better in pain treatment when compared to morphine.

The systemic impact of PCA combination therapies on visceral pain, as opposed to TAP block that solely operates upon physical pain in the wall of the anterior abdomen, may explain PCA's advantage over TAP block in terms of pain alleviation as well as patient satisfaction. In contrast to our findings, Erbabacan et al. [12] observed that 30 mL of TAP block seems to be as efficacious as IV PCA in pain relief during lower abdominal operations. Furthermore, while comparing IV PCA to TAP block, it was discovered that the latter is considered to be the preferable method because it avoids the systemic effects of the meperdine utilized in PCA and its analgesic impact begins earlier. This research, though, has been conducted on lower abdomen operations rather than C-sections, which do

not include pain from contractions of the uterus after surgery.

The current research found that the heart rate of women in "group 2" was not significantly greater than that of women in "group 1" at the 5th, 10th, 15th, 20th, 30th, and 40th minutes ($p \leq 0.001$). Nonetheless, significant differences existed between the two groups throughout time.

We found no statistically significant differences in respiration rate when we compared the impacts of TAP block and intravenous PCA, which could be accounted by the fact that both groups had low pain scores. In terms of nausea and vomiting, women in "group 2" have been shown to have significantly higher levels than those in "group 1". This difference could be due to the PCA group's meperdine dose. There has been evidence of decreases in postsurgical nausea and vomiting, as well as antiemetic needs.

Siddiqui et al. [13] disagreed with our findings and performed a meta-analysis to assess the therapeutic efficacy of TAP block on nausea solely, finding no major decrease in nausea scores. This, however, could be due to the varied dosages administered. Similarly, Mäkelä et al. [14] assessed oxycodone that has an emetic impact, in 205 patients and found that intravenous PCA patients had greater nausea at 4 hours and greater vomiting at 8 hours ($p = 0.001$ and $p = 0.01$, respectively). These studies contradicted our findings, but this may be explained by the fact that they employed different dosages than we did in our research. In our research, 32% of patients from "group 1" (TAP block) needed extra analgesics administered intravenously.

At 2, 6, and 24 hour intervals, auscultation with a stethoscope has been performed to assess intestinal motility. It has been discovered that "group 1" was audible before "group 2." Intestinal motility has been observed to be significantly audible in "group 1" at 2 hours after surgery compared to "group 2," with no significant differences between the two groups at 6 and 24 hours. This could be due to PCA medications' systemic impact. Charoenkwan and Matovinovic [15] found in a Cochrane review that postsurgical eating following significant gynecological operations is safe and allows for faster return to normal bowel function, shorter hospital stays, as well as greater satisfaction.

In terms of early case mobilization in the study groups, PCA delayed patient mobilization due to its sedative impact, as compared to those who received TAP block. Likewise, Mäkelä et al. [14] discovered that mobilization took an average of 17 hours, which is longer than the 6-hour suggestion.

Complications and frequent negative impacts of the PCA technique have been linked to the procedure's basic mechanism and the drugs employed. The most prevalent PCA pump complications are failing to employ anti-reflux valves, "runaway" pumps, PCA via proxy, poor needle positioning, and machine manipulation. [16]

While the TAP blocks in caesarean section are effective as a main means of analgesia in women who do not require neuraxial morphine for any reason, challenges in applying the block may arise as a result of anatomical alterations following the surgery. Nevertheless, to conduct the block, the ultrasonographic anatomy is preferably indicated to overcome this issue, even after a caesarean section. TAP block does not give visceral analgesia, which is its primary disadvantage. As a result, it's possible that this is why certain research has been unable to show TAP block's superiority to other methods.

TAP blocks have been shown to be a less invasive procedure with a high level of safety. Nevertheless, complications such as needle trauma, intraperitoneal injections, unintentional intravascular injectors, neural ischemia, femoral nerve palsy, local anaesthetic toxicity, infection, as well as poor or failed block are still a possibility. With sufficient training, however, just a few occurrences of significant incidents have been reported in the literature.[17]

We looked through the literature and discovered that the majority of the studies on both approaches had been performed on surgeries other than C-section. As a result, we hope that our research will pave the way for additional research on this topic, particularly given the tremendous rise in C-section rates and the ongoing need for pain-free operations.

CONCLUSION

Controlling pain following a C-section is a common request among today's ladies. Because both TAP block and intravenous PCA are beneficial in alleviating postsurgical pain, they were compared. Intravenous PCA, on the other hand, was preferable to TAP block because of its visceral impact, whereas TAP block was favored because it avoided the systemic effects of the opioids employed in PCA. PCA is simple to use, whereas the TAP block requires manual dexterity. Complications and negative impacts of both types have been limited when adjusting medicine doses.

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