Original Article

# Analgesic Efficacy of Trans Abdominis Plane Block (TAP) in Women Undergoing Caesarean Section; A Randomized Controlled Trial

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## Abstract

Objective: To compare the analgesic efficacy of TAP block in providing post-caesarean analgesia with the control group, in terms of mean postoperative use of opioids

Methodology: This Randomized, single-blind control trial (registered with ClinicalTrial.gov NCT05831501 was conducted at Combined Military Hospital (CMH) Sargodha, Pakistan, from 1st June 2022- 31st Dec 2022. After applying inclusion and exclusion criteria sixty patients were randomly selected using non-probability, consecutive sampling. Patients in Group A had a bilateral TAP block with 20 ml of 0.25% bupivacaine following a caesarean delivery, while patients in Group B received 20 ml of saline. The total amount of opioids used in the first 24 hours following surgery was the primary outcome. Time of first rescue analgesia, mean pain score, and frequency of nausea vomiting in postoperative period was also assessed.

Results: Bupivacain with TAP block (group A) decreased pain score at 6 and 12 hours and total opioid consumption within first 24 hours after the surgery. The TAP block also considerably reduced the requirement for initial rescue analgesia. The difference was not significant in terms of reduction in pain scores at 24 post-operative hours, post-operative nausea vomiting, and duration of hospital stay.

Conclusion: This study found that the TAP block prolongs the duration of postoperative analgesia in comparison to placebo. It reduces the average pain score and postoperative opioid intake up to 24 hrs after the surgery, making it a secure and reliable technique for controlling postoperative analgesia after a C-section.

Key words: TAP block, C-section, Spinal anaesthesia, localized field effects, analgesia, Postoperative pain and Opioids

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## Introduction

One of the most commonly performed surgical procedures nowadays is a caesarean section. The prevalence of caesarean sections has increased from over 7% in 1990 to 21% today, and it is predicted that this trend will continue over the coming years. The study predicts that by 2030, Eastern Asia (63%), Latin America and the Caribbean (54%), Western Asia (50%), Africa's north (48%), Europe's south (47%) & New Zealand (45%) would have the highest rates.[1] Its incidence in 2010 and 2013 was 41.9% and 48%, higher than the World Health Organization's recommended C/S rate of 15% for 2014.[2] The delivery of a fetus through incisions made in the abdominal wall and uterine wall just above the pubic symphysis is known as a caesarean section.[3-5] Like all major abdominal procedures, C-sections come with intense postoperative pain that, if not effectively controlled, can lead to extended immobility and its negative effects as well as interfere with mother-baby bonding, care of new born, breastfeeding and other activities [6], as well as cause chronic pain and post-natal

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depression.[7,8] There are numerous treatment options for this post-C-section pain. The majority of opioids used are systemic, however, they frequently have some unfavorable side effects, including drowsiness, respiratory depression, pruritis, nausea, vomiting and constipation. In addition to opioids, systemic NSAIDS like ketorolac and acetaminophen are also utilized, but they might not be enough on their own to alleviate post-C-section pain. Although neuraxial anaesthesia like lumbar or thoracic epidurals are used but there are strict and continuing monitoring requirements, and neither patients nor hospitals find them to be cost-effective. It has been found analgesics can be injected into the neuro fascial plane during abdominal wall incision to block the cutaneous nerve supplying the anterior abdominal wall (from T6 to L1) that travels between the internal oblique and trans versus abdominis muscle. This block is called TAP (transverse abdominis plane) block.

The TAP block is a quick procedure that can be used as an adjuvant for postoperative pain management in abdominal, gynecologic[9], or urologic surgery affecting the T6 to L1 distribution. Randomized clinical trials have assessed its efficacy in several surgical procedures like inguinal hernia repair, laparoscopic cholecystectomy, abdominal hysterectomy, open appendectomy, nephrectomy, and large bowel resection.[10,11] Also, this method is helpful for treatments when epidural analgesia is not recommended (like patients on anticoagulants). Additionally, a continuous TAP block approach with catheter implantation has been reported if sustained analgesia is required[11-12] However, TAP block's effectiveness as a painkiller after CD (Caesarean Delivery) is still controversial and no research is available in our region. So we conducted this study to evaluate the analgesic effectiveness of TAP block in caesarean section patients in lowering postoperative pain and its effect on decreasing narcotic usage in these patients.

## Methodology

After taking approval from the hospital ethical board (registered with ClinicalTrial.gov NCT05831501), patients were enrolled using inclusion and exclusion criteria. After applying inclusion and exclusion criteria patients were randomly selected using non-probability, consecutive sampling. A total of 60 patients undergoing Elective C-Section and of age 20-45 years were included.[6] The results of which showed efficacy of TAP block in terms of cumulative tramadol usage during first 24 h after surgery in study group B vs control group C as 75 ± 22 vs. 168 ± 45 mg in groups B and C respectively and with the help of WHO sample size calculator (Level of significance: 5% Confidence interval: 95% Power of test: 80%)

Patients having a known allergy to local anesthetic, severe pre-eclampsia, and morbidly adherent placenta were excluded. Using a lottery system, patients were randomly assigned to one of two groups, A or B. On the day of surgery, each patient was evaluated, and after thoroughly outlining the risks and advantages to each patient, signed informed consent was obtained. Patients were made ready for surgery on the day of the procedure, and spinal anaesthetic was administered in accordance with institutional standards. A consultant anaesthetist administered intrathecally 1.5ml of 0.75% (150mg maximum dosage) bupivacaine to each patient to provide anaesthesia for C-sections. No medication was administered during surgery except oxytocin and antiemetics (if necessary). In group A, at the end of the surgery, a TAP block was given -via ultrasound-guided subcostal approach. In patients of group B, 20 ml of normal saline was injected instead of bupivacaine. The TAP block's time was noted as time 0. All patients, after being shifted to the ward, received analgesia in the form of intravenous ketorolac 30mg eight hours a day, in accordance with departmental procedure. The presence of nausea and vomiting was systematically assessed. In the postoperative period, the intensity of pain at 6, 12 and 24 hours postop, duration of first rescue analgesia and opioid consumption within 24hrs of surgery were noted. The consultant anaesthetist filled Performa up to the administration of the TAP block, with the duty doctor in the post-operative ward filled the remainder.

Patients were first explained the average length of analgesic effect and also that the duration of action of this block is variable. Based on the evidence, the TAP blocks were expected to last anywhere from 18-48 hours.[17] Patients were told to assume that while somatic abdominal incision pain will be reduced following the treatment, visceral discomfort would not be changed. Patients were also briefed about any possible complications, including bruises around the injection site or features suggestive of infection (i-e, redness, fever, or chills).

SPSS Version 25 was used to enter and evaluate the data. Quantitative and qualitative variables were computed using descriptive statistics. Age, weight, pain severity, and opioid dose were all quantitative factors for

which mean and SD were determined. For qualitative variables, frequency and percentage calculations were made. All results were presented as frequency tables. In order to compare groups A and B's mean tramadol consumption within 24 hours following surgery, an independent t-test was used. P value <0.05 was considered significant

## Results

A total of 60 participants were included in the trial. The demographic features of the two groups were similar (Table I). In this study, participants ranged in age from 20 to 45 years, with a mean age of 32.22 ± 5.17 years. In group B patients had a mean age of 31.33 ± 5.11 years, whereas group A, the mean age was 33.10 ± 5.17 years. The mean weight of patients in group A was 69.97 ± 9.69 kg and in a group, B was 66.90 ± 6.46 kg (Table I). The number of nulliparous and multiparous women was similar in the two groups. The most common reason for cesarean section was elective repeat cesarean section in the two groups while the other indications were malpresentation, abnormal placentation and maternal request.

The mean VAS score was significantly lower in group A at 6 and 12 hours after the surgery however the difference was not significant at 24 hours after the C-section (Table II). The time of first rescue dose of tramadol was substantially longer in group A (401.00 ± 54.48 minutes) than group B (239.33 ± 91.94 minutes).

The mean postoperative use of opioids in patients undergoing Elective C-Section in Group A (TAP block) was 70.17 ± 8.75 mg while in Group B (placebo group) was 170.17 ± 19.00 mg (Figure 1).

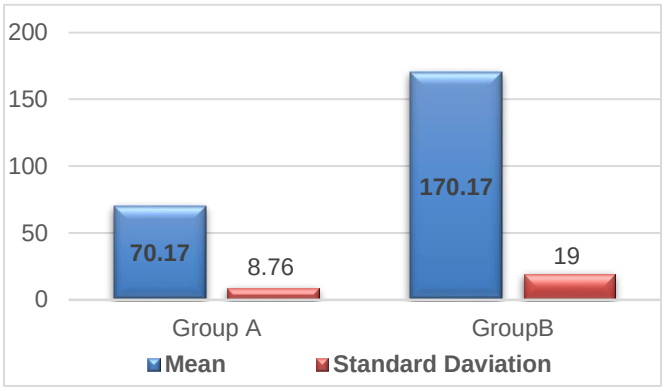


**Figure 1. Postoperative use of opioids in patients undergoing Elective C-Section in both groups.**

In TAP block group six patients experienced some sort of nausea or vomiting as compared to twelve patients in placebo group but the difference was not significant statistically. The VAS score at 24 hours post cesarean section and the duration of hospital stay also showed no significant difference. No complication was reported in either of the two groups.

## Discussion

A significant portion of women delivers by caesarean section every year, making this one of the most commonly performed surgeries in the world. The

**Table I: Demographic characteristics of patients in both groups. (n=60)**

| Characteristics | TAP block Group (Group A) | Placebo Group (Group B) | P-value |
|---|---|---|---|
| Age (years) | 33.10 + 5.17 | 31.33 + 5.11 | 0.19 |
| Weight (Kg) | 69.97 ± 9.69 | 66.90 ± 6.46 | 0.15 |
| Parity | | | |
| Nulliparous | 10 | 8 | 0.57 |
| Multiparous | 20 | 22 | |
| Indication of cesarean section | | | 0.58 |
| Elective repeat cesarean section | 21 | 20 | |
| Malpresentation | 3 | 5 | |
| Abnormal placentation | 1 | 2 | |
| Maternal request | 3 | 3 | |
| others | 2 | 0 | |

**Table II: VAS Score and Tramadol Consumption.**

| Outcome | TAP block group (Group A) | Placebo group (Group B) | p-value |
|---|---|---|---|
| VAS score at | | | |
| 6 hours | 3.60 ± 1.43 | 4.90 ± 1.83 | 0.003 |
| 12 hours | 3.97 ± 1.37 | 5.03 + 1.79 | 0.012 |
| 24 hours | 4.61 ± 1.61 | 5.33 ± 2.13 | 0.135 |
| Time of rescue analgesia (minutes) | 401.00 ± 54.48 | 239.33 ± 91.94 | < 0.001 |
| Postoperative opioid (tramadol) consumption in 24 hours | 70.17 ± 8.75 | 170.17 ± 19.00 | <0.001 |
| Post op nausea & vomiting | | | |
| Yes | 6 | 12 | 0.091 |
| No | 24 | 18 | |

mother's and her child's negative effects from the analgesic regimen should be as mild as possible to make this a memorable experience for the family. The best chance of achieving these objectives is through a multimodal analgesic regimen. However, the components of this multimodal regimen have evolved over time. Previously, the use of opioids has been the main component of postoperative analgesic regimens but because of associated side effects local or regional analgesia has become popular over the past few decades. There is a lot of potential for a local method like TAP block to be an efficient part of a multimodal post-caesarean delivery analgesic regimen.

Our study showed that TAP block provided analgesia up to about 401.00 minutes (6.7 hours) after the surgery thus delaying the need of first rescue analgesia. A prospective study conducted by Wudie Mekonnen Alemu et al[13] showed the same results with TAP block delaying the need of postoperative analgesia to about 4.5 to 6 hours. Rajagopalan Venkatraman et all[14] did a similar study on patients having inguinal hernia repair. Their study also showed similar results. A randomized control trial[15] was done on 60 patients comparing the analgesic efficacy of TAP block with wound infiltration. No analgesic advantage of TAP block over local wound infiltration was found and there was a comparable time to first analgesic requirement as well. This difference in results may be due to the addition of epinephrine, resulting in decreased local anesthetic absorption in the systemic circulation and as a result, can reduce the analgesic effect of local anesthetic.

In our study, TAP block effectively reduced pain scores at 6 and 12 hours after C-section, but the average pain score was the same in both groups at 24 post-operative hours. A study by Wudie Mekonnen Alemu et al [13] concluded with lower pain scores at 8, 12 and 24 hours' post-surgery. However, the pain scores were similar at 2, 4, and 6 hours postoperatively, consumption of rescue analgesia was similar between the two groups. A prospective cohort study of 62 patients[16] and two randomized control trials [17,18] showed similar results in terms of average pain scores. Regarding the pain scores at 6 and 12 hours post-surgery, these results are comparable to our study, but they differ from our study as in our study no significant difference in pain scores was detected at 24 hours. In 2012, Tan TT and All [19] found no reduction in visual analog pain scores in women with TAP block undergoing C-section under general anesthesia. The authors hypothesized that this finding may could be because both groups received PCA-morphine and they may have self-administered when required. However, maternal satisfaction was found to be higher in the patients of TAP block group.

In our study, the average consumption of opioids (tramadol) was lower in the study group as compared to the control group similar to the study by Uma Srivastava and colleagues[6], which showed a significant reduction in cumulative use of tramadol during the first 24 hours after caesarean section. However, the difference between 24 hours and 48 hours was not statistically significant. McDonnell et al[20] and Patel et al[21] also showed the similar results. Belavy et al[22] found that using Ultrasound guided TAP block reduced morphine consumption as well as the need of antiemetics in the postoperative period. A meta-analysis by Champaneria et al[23] concluded that TAP blockade is helpful after caesarean, but the additional benefit of TAP block when used with intrathecal morphine is conflicting.

Many studies have shown that morphine requirements are reduced in patients receiving TAP block, and thus reducing opioid-related side effects such as sedation, postoperative nausea and vomiting. Scharine et al[24] reported that long-term and effective pain relief is achieved with TAP block, lower pain scores, earlier oral intake, early mobilization and a shorter stay at hospital is observed when no narcotic analgesia is used. Although our study showed a reduction in consumption of opioids with the use of TAP block, it did not have a significant affect on post op nausea vomiting or length of hospital stay. Pain scores were also similar 24 hours after surgery, which may indicate a short-term effect of TAP blockade.

Our study contained some limitations. The main disadvantage of our trial was that analgesia was effective only for a maximum of 24 hours. A catheter may be used to increase the duration of pain relief. Addition of certain medications such as clonidine and dexmedetomidine can also be used to prolong the duration of analgesia provided by TAP block. It was a single-center study and had a smaller sample size. Multicenter studies with larger samples are needed to confirm the results and see the long-term effects on mother and baby.

## Conclusion

We concluded that the TAP block prolongs the duration of analgesia when compared to placebo in postoperative period. It reduces the average pain score and reduces postoperative opioid intake up to 24 hrs after the

surgery, making it a secure and effective method of managing postoperative pain following caesarean section. Thus TAP block can improve mother baby bonding by reducing pain scores and opioid consumption. Future research is required to assess the drugs that can be used as an adjuvant along with TAP block to prolong its analgesic efficacy until up to at least 24 postoperative hours.

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