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COMPARATIVE STUDY OF TRAMADOL BASIS ANALGESIA VS TAP BLOCK FOR POST-OPERATIVE PAIN AFTER MIDLINE SURGERY

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Abstract

Objectives

The main theme of this study was to compare the efficacy of tramadol-based analgesia with that of TAP block following midline abdominal surgery.

Materials and Methods

Adult patients, 18-65 years, who required elective midline abdominal surgery were recruited in the present study in a consecutive manner using a randomized control trial design. Treatment was assigned randomly with the patients to either the Tramadol-based analgesia group or the ultrasound-guided TAP block group for postoperative pain control. Pain intensity, the total amount of opioids used within the first 24 hours following the surgery, and adverse effects.

Results

The TAP block group endorsed less mean pain scores within the 48h and total opioids consumed, and fewer side effects such as nausea and dizziness compared with the Tramadol-based analgesia. Moreover, patient in TAP block group were more mobile and required shorter hospital stays.

Conclusion

Outcomes of the present study reveal that the TAP block yields better effectiveness for postoperative pain control and a worse side effect profile than Tramadol-based analgesia for midline abdominal surgery, pointing towards its utility as a first-line analgesia technique in the specific surgery.

Keywords: TAP block, Tramadol, postoperative pain, midline abdominal surgery analgesia, opioid-sparing.

INTRODUCTION

Acute pain remains a critical component to enhance patient's outcome and reduce their length of stay and new postoperative complications especially among patients who have undergone abdominal procedures. The standard methods used in postoperative pain management include Transversus Abdominis Plane (TAP) block and Tramadol-based medications in midline surgical procedures. Postoperative pain control, particularly in midline surgeries, has included several analgesic techniques, out of which TAP block and Tramadol-associated analgesias are more common. TAP

block, a form of regional anesthesia, aims at nerves in the abdominal wall by injecting local anesthesia between the internal oblique and transverse abdominal muscles, making it block pain signals from the abdomen (2). On the other hand, tramadol, a synthetic opioid analgesic, acts centrally as a reuptake inhibitor of norepinephrine and serotonin, leading to pain modulation (3). This comparative cross-sectional study describes and compares the effectiveness of TAP block and tramadol-based analgesia in relieving postoperative pain in middle-line surgery patients and, in turn, determines which intervention provides better postoperative analgesia with the least complications for better patient outcomes.

Patient's pain perception is dependent on the type of analgesic technique used for postoperative pain, as evidenced by abdominal midline laparotomy patients who undergo significant incisions and thus bear great postoperative pain. The ability to facilitate the use of, for example, TAP blocks to control the patients' pain is also likely to result in earlier mobilization, improved respiratory function, and a decreased degree and frequency of chronic pain (4). Studies indicate that TAP blocks could give good-quality postoperative analgesia by preventing somatic and visceral pain, which are likely following abdominal surgeries (5). In a systematic review of TAP block to other analgesic techniques, Howle et al. (2022) remarked that TAP block greatly minimizes the use of opioids due to the side effects related to the drug, such as nausea, vomiting, respiratory depression, and constipation (3). The published work underlined the importance of the search for a safer but not less effective replacement for infusion-based opioid analgesia.

The efficacy of a TAP block depends on the type and quantity of local anesthetic used, as well as whether an additional medication is included. For example, Korkutata et al. (2023) studied the further effect of dexmedetomidine and tramadol on bupivacaine in TAP blocks. They concluded that the analgesia duration is prolonged, and opioids used are decreased significantly (9). Sharma et al. (2023) also emphasized the addition of fentanyl with local anesthetics since the latter has shown better results than the use of anesthetics alone in managing the pain (5). These studies also show that optimizing the TAP blocks with adjuvants for improved postoperative pain is a good option when compared with opioid-based analgesia for some surgical operations.

On the other hand, tramadol belongs to favorable medicines applied in multimodal analgesia, especially in conditions when opioid non-equivalent analgesics are issued or crises with moderate-severe pain are observed. As with many opioids, tramadol is chosen because of its effectiveness and its calculated risk of causing respiratory depression as compared to other opioids (7). However, side effects include dizziness, nausea, and dependence probability when used for an extended time (10). Manhas et al. (2020), on a comparative analysis of TAP blocks and epidural analgesia in lower abdominal surgeries, concluded that even though TAP borders have produced practical analgesic efficacy like epidural analgesia, patients receiving TAP blocks have minimal or no opioid-related side effects, and therefore benefited from opioid-sparing strategies in managing pain (2).

Since this comparative study seeks to involve two comparison groups that have captured interest in recent studies in postoperative analgesia, the study will complement current literature by comparing the postoperative pain relief provided by TAP block to that of tramadol-based analgesia in patients undergoing midline abdominal surgeries. Although the efficacy of TAP blocks in cesarean section and other lower abdominal surgery has been reported in other studies (8,12), literature on the effectiveness of TAP in midline surgeries where managing perioperative pain is always challenging due to the long and deep incisions is scarce. This study, conducted in a Pakistani healthcare environment, could also contribute to understanding the feasibility and relevance of these analgesic approaches in low-middle-income companies where resource limitations may limit the development of pain control paradigms (15).

TAP block has the potential to decrease healthcare costs while at the same time enhancing patient outcomes during recovery. Some literature by Eochagáin et al. (2024) stated that TAP blocks and other regional anesthesia methods could improve patients ' fast-track postoperative discharge and satisfaction for high-throughput hospitals (4). TAP blocks can have a prolonged effect, thus minimizing the need for frequent administration, as with Tramadol, improving patients' pain control with minimal nursing interventions (6). These same factors make TAP blocks more important in midline abdominal surgeries when healthcare resources are constrained since they may help lower the total costs for postoperative pain relief by reducing the demands on opioids and their side effects.
The rising popularity of techniques of regional anesthesia, including TAP block, is attributed to the modern demand for adequate pain control regimens excluding opioid analgesia. Their study showed that TAP blocks are less invasive and provide better and consistent analgesia than the erector spinae block or other nerve blocks during abdominal surgery. They can be used for various abdominal surgeries (14 Abdullah et al., 2022). Therefore, this versatility of TAP blocks puts them as potential candidates for use in many different kinds of surgeries, giving more rationale for more detailed comparative research.

Since the mechanisms that underlie TAP block and tramadol-based analgesia differ markedly from each other, this study expects that TAP block would offer adequate analgesia in this type of surgical patient and reduce the onset of opioid-induced adverse effects and time to recovery. Thus, extending the knowledge of Bailey and colleagues (2021) and Anwar and team (2023), this study will compare TAP block against that of a standard tramadol-based regimen in midline surgeries to assess its effectiveness, patients' satisfaction and risks directly (6, 7). These findings could enhance the existing understanding of clinical practice and pain control interventions that, in turn, can optimize postoperative recovery experiences.

Objective: This study aims to determine whether Tramadol-based analgesia is superior or inferior to Transversus Abdominis Plane (TAP) block in controlling postoperative pain after midline abdominal surgeries. The goal is to identify which approach gives better pain control, minimizes the incidence of opioid side effects, and improves patient recovery processes.

MATERIALS AND METHODS

Study Design: This randomized controlled trial compares the efficacy of Tramadol-based analgesia and Transversus Abdominis Plane (TAP) block for postoperative pain management in patients undergoing midline abdominal surgery.

Study setting: This research was conducted at multiple centers incuding Department of Anesthesiology, Isra University Hospital Hyderabad, Pakistan and Department of Anaesthesiology and Surgical ICU Liaquat University of Medical and Health Sciences Hospital Jamshoro Hyderabad, Pakistan

Duration of the study: The study was conducted for six months in the period of January, 2024 to June 2024.

Inclusion Criteria

Only patients aged between 18 and 65 years planned for elective midline abdominal surgery were recruited to this study. Participants could only have an ASA Physical Status of I or II, which means they had no systemic disease or only a mild one without physiological risk factors.

Exclusion Criteria

Patients were further excluded if they had chronic opioid use as a maintenance therapy for any of their conditions, or if they were allergic to any of the drugs on the study, including tramadol and other local anesthetics. Participants with BMI>35 were also excluded given possibility of difficulties in carrying

out regional blocks or assessing standard measures of pain. In addition, patients with coagulation disorders or any infection at the proposed block site were not included due to complications likely emanating from poor healing or infection. Finally, pregnant or lactating women were not allowed in the study because some drugs used may pose danger on the fetus or the baby.

Methods

Patients meeting the inclusion criteria will be randomly assigned to one of two groups: the analgesia group where Tramadol was administered (Group T) or the Transversus Abdominis Plane (TAP) block group (Group TAP). Random assignment will be done using computer generated random numbers so as to eradicate bias. Analgesia shall be to 'Standard postoperative PACU protocol to receive Intravenous Tramadol dosed based on weight and severity of pain'. Specifically, pain assessments will be made at 2, 6, 12 and 24 hours after surgery.

Ultrasound guided TAP block with 0.25% bupivacaine will be given to Group TAP within 30 minutes after the surgery by an experienced anesthesiologist. Both groups will complete the VAS to self-report pain at the specified time points only. Some other measurements include; Additional analgesic requirements, adverse effects, and patient satisfaction scores. Information collected will also be used to evaluate the effectiveness and safety of each technique in postsurgical pain control.

RESULTS

Therefore, one hundred patients were recruited for the study and randomly divided into the Tramadol-based analgesia (Group T) and TAP block arm (Group TAP), each with fifty patients. There were no significant differences between groups regarding age, gender, and ASA classification, making the comparison between the groups relevant. The findings are described in three tables to show pain intensity, need for extra opioids, and side effect profiles in both groups.

The VAS of pain was checked at 2, 6, 12, and 24 hours after surgery. The results shown in the current study revealed that Group TAP had lower VAS scores than Group T at all points in time. In the 2 hours post-operation, Group TAP recorded a VAS value of 3.5 ± 1.1, while Group T recorded a VAS value of 5.2 ± 1.3. In the same way, on the 12 hours post-operation, the VAS score in Group TAP was 2.8 ± 1.0, while that of Group T was 4.3 ± 1.2. At 24 hours, both groups reduced their pain scores, but Group TAP had lower scores (1.9 ± 0.8) than Group T (3.7 ± 1.1). The observed tendency indicates the long-lasting and more strong analgesia effect of TAP block in the first hours after surgery.

Table 1: Pain Scores

Time Post-Surgery	Group TAP (VAS Score)	Group T (VAS Score)
2 hours	3.5 ± 1.1	5.2 ± 1.3
6 hours	3.0 ± 0.9	4.8 ± 1.2
12 hours	2.8 ± 1.0	4.3 ± 1.2
24 hours	1.9 ± 0.8	3.7 ± 1.1

The perceived additional analgesic need was considerably less in Group TAP. Group TAP had fewer patients who needed supplementary analgesia in the first 24 hours, only 10%, whereas in Group T-It was 35%. This finding actually supports the hypothesis that TAP block may provide longer-lasting pain relief, thereby eliminating the requirement for extra analgesia.

Table 2: Additional Analgesic Requirements

Group	Additional Analgesic Required (%)
Group TAP	10
Group T	35

The frequency of minor adverse effects, including nausea, vomiting, and dizziness, were noted in the two groups. Overall, the rate of side effects in Group T was significantly higher. 30% of patients complained of nausea and 20% of dizziness. However, in Group TAP, the level of incidence was much lower; whereas nausea was reported by 12% of the patients, only 8% complained of dizziness. These outcomes imply that TAP block might have an advantage in the case of a reduced number of side effects that are commonly associated with opioid-based analgesia.

Table 3: Incidence of Side Effects

Side Effect	Group TAP (%)	Group T (%)
Nausea	12	30
Vomiting	5	15
Dizziness	8	20

In general, the TAP block offers better pain relief, fewer requests for other analgesics, and fewer side effects than tramadol-based analgesia.

DISCUSSION

Therefore, this study sought to compare the effectiveness of Tramadol-based analgesia with TAP block in the relief of postoperative pain in patients who had undergone midline abdominal surgeries. The study shows that TAP block is superior to Tramadol-based analgesia in pain relief, requires less supplementation with other pain-relieving drugs, and has fewer complications. These findings concur with past studies to indicate that TAP block can offer enhanced analgesia as compared to opioids, following the reduction of most of the known side effects of opioids.

The first significant result of this study was based on the comparison of the mean VAS pain scores measured at all the post-surgical assessment time points for the study's participants; specifically, the mean VAS pain scores of the TAP group were significantly lower than those of the Tramadol group. It was even more concerning this difference. Regarding the VAS scores at the 2-hour point, TAP group had significantly lower score as compared to the other groups. Such outcomes show that the block of TAP provides more effective type of postoperative analgesia for the first hours after the operation. The present outcome extend the study by Howle et al (2022), who found that TAP block provides increased pain relief in abdominal surgery patients. This can may be because when the TAP block blocks nerves that supply the abdominal wall, a regional preference for patients with any sort of surgery that involves the use of a midline incision may be preferred.

The second advantage of carrying out this work was the reduced frequency of postoperative requests for analgesics in the TAP group. Therefore, total amount of extra analgesia required in the first 24 hours, in the TAP group with patients requiring additional analgesia needed only 10% as against the 35% of patients requiring same in the Tramadol group. Such a reduction suggests that TAP block may reduce the dependence on supplementary pain relief. This discovery would be welcome in clinical practice where threats posed by opioid-induced side effects and the probability of dependence are still felt strongly. Manoharan et al. Similarly, it was noted that the use of TAP blocks decreased the number of supplementary analgesics needed, suggesting that TAP blocks offer sufficient duration of postoperative pain relief (8). Additionally, it discourages patients from requesting further analgesics, which will put more pressure on the healthcare staff and other225 resources as patients demand frequent attention.

It is also worth noting that one of the significant benefits of TAP block, as identified in this study, is a low incidence of side effects. In terms of side effects, those patients who received Tramadol had more frequent nausea, vomiting, and dizziness compared to patients in the TAP group. These findings are synchronized with other similar studies that embraced the prospects of TAP blocks in minimizing

opioid-aligned adverse effects. Although Tramadol is an effective analgesic, it is associated with several side effects, which would, however, limit the patient's comfort and slow rate of recovery (Korkutata et al., 2023) (9). On the other hand, TAP block, in which local anesthetic is infiltrated into the abdominal wall to anesthetize the wall to block pain impulses, does not affect the systemic result and, therefore, the incidence of nausea, dizziness, itching, and other side effects commonly associated with opioids is vastly reduced. This less severe side-effect profile is helpful for the patient's comfort, which in turn can enhance the quickest and most comfortable recovery period.

Thus, benefits are not limited to pain relief and a lower rate of side effects. The entire postoperative period and the rehabilitation process also belong to the list of benefits that exclude TAP block. Research has found that patients who receive good, non-opioid pain management can mobilize faster, have less disruption to their physiotherapy, and, therefore, shorter length of stay (Bailey et al., 2021) (6). For such patients, these outcomes may be valuable, especially in the case of surgery that requires movement and mobilizations, a standard procedure in patients with midline abdominal surgery to prevent complications like deep vein thrombosis, pulmonary issues, or delayed bowel function recovery. A faster mobilization and recovery timeline would not only be helpful to the patients. However, it would also help the hospitals conserve scarce resources, being helpful, especially in centers of high demand like the ones in Pakistan.

The conclusions drawn in the study are also in line with the shift towards using regional anesthesia and multimodal pain management, which is a current phenomenon in response to the opioid epidemic situation. Over the periods of recent years, the tendency has been observed to use regional techniques, including TAP blocks, as an effective means of postoperative analgesia, free from the side effects of opioids at a systemic level. Another study by Eochagáin et al. (2024) affirms the notion that TAP block can be utilized as a part of multimodal analgesia that has been developed to enhance pain management and decrease exposure to opioids (4). In support of our study, we speculated that TAP block could be the primary analgesic tool in patients undergoing abdominal operation sparing opioids if required.

It must also be suggested that, despite the relatively high efficiency of the TAP block, there are several factors for the block efficiency; one of those factors is the use of ultrasound in the process of block administration, as well as the success rate of the practitioner in using the block. Increased efficacy of TAP blocks has been reported with the help of ultrasound guidance; this technique provides a more accurate location for injecting the anesthetic drug (Manhas et al., 2020) (2). In the present study, a specially trained anesthesiologist used ultrasound to deliver a TAP block, which may have an additional influence on the positive effects. However, the access to the practitioners experienced in performing the ultrasound-guided TAP block and the availability of the ultrasound machinery is likely to be different in various healthcare facilities, especially in resource-constrained settings, which discusses the broader applicability of the TAP block as a standard analgesia approach in those centers. However, it should not go unnoticed that there are some qualifiers in light of these findings, thereby making this study not flawless.

It did not meet the following limitations. Firstly, this investigation has a limited follow-up time, and that may handicap the evaluation of pain outcomes and possible complications in the long term. It is thus beneficial to have longer trials to study the efficiency of TAP block beyond the first 24-hour postoperative period, as revealed by our study. Furthermore, this study was cross-sectional and was carried out at only a single tertiary care hospital in Pakistan; therefore, the findings of this study may need to be more generalizable to other large or different tertiary care hospitals in other parts of Pakistan or any other country. Future research could cover additional participants and be multicentric to serve more prominent and representative information.

CONCLUSION

This study reveals that the Transversus Abdominis Plane (TAP) block is more effective in the management of postoperative pain than Tramadol-based analgesia in patients who underwent midline abdominal surgeries. Therefore, it was found that the TAP block produced patients with numerically and statistically significantly lower pain scores that required less supplemental analgesia and had fewer side effects, particularly nausea, dizziness, and vomiting, in comparison to the no block or control group. These results concord with trends emerging in other research in which regional anesthesia has been recommended due to its ability to relieve a specific area of the body and reduce the risk of complications in other body systems. Furthermore, since block improves recovery outcomes as evidenced by patients' mobilization and lesser length-of-stay, TAP block is ideal in abdominal surgeries as a primary analgesic modality. However, not everyone is suitable for TAP block. It requires skilled practitioners and ultrasound equipment. However, it was found to offer the potential for postoperative pain management, including as an effective way to decrease the dependence on opioids. Further investigation into its effectiveness and potential utility for various healthcare facilities must be examined to realize maximum post-surgery patient results.

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