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Effectiveness of TAP Block for Pain Management in Abdominoplasty with Flank Liposuction: A Comparison of Preoperative and Postoperative Administration Outcomes

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ABSTRACT

Aims: The incidence of enduring pain following abdominoplasty ranges from 5% to 32%. Our goals were to assess how the transversus abdominis plane (TAP) block affects the occurrence of post-abdominoplasty pain and investigate possible connections between when the block is administered, whether it is done before the incision of the surgical operation (preemptively) or post the completion of the surgery, and its impact.

Materials and Methods: Seventy-five patients scheduled for elective abdominoplasty with flank liposuction were chosen at random to have a TAP block while under general anesthesia, either pre-incisional or prior to coming out of anesthesia, or a sham block (group under control that merely had a needle pierced). A visual analogue scale was used to measure pain at rest and during movement after surgery. Sedation, surgical nausea and vomiting ratings, and perioperative analgesic needs were noted.

Results: Both groups showed considerably less severe ache levels than the group under control, however, Group II's pain scores were significantly higher than Group I's (P0.05). Patients who had TAP block had a substantial decrease in their analgesic needs (P0.0001), with the pre-incisional group seeing a more pronounced drop. Compared to other groups, the pre-incisional group experienced a much lower incidence of discomfort. At time point 12 hours after surgery, the control group experienced a greater incidence of sedation (61%) than the other groups (18% and 32%, respectively). Nevertheless, the difference between 12 and 48 hours (awake and alert) was comparable. The incidence was reduced among patients who had TAP block nausea and vomiting following surgery (PONV) (16% and 29% in Groups I and II, respectively), compared to 66.5% in Group III. The TAP block was not the cause of any problems.

Conclusions: TAP block appears to be a suitable option for postoperative pain management; as compared to blockade before anesthesia emergence, before incision, TAP block seemed to lessen the intensity of acute pain and the need for analgesics, despite its unfavorable adverse consequences and frequency of persistent pain.

KEYWORDS: Abdominoplasty; flank liposuction; pain; TAP block; post-operative pain.

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INTRODUCTION

The combination of abdominoplasty and flank liposuction (AFL) is recognised as a significant surgical operation known to result in significant discomfort and pain following surgery [1]. The primary source of this pain has traditionally been attributed to the incision made in the abdominal wall [2]. An alternative approach involves the introduction of local anesthetics across the petit triangle into the transversus abdominis. By obstructing the neurons that sense and innervate the front wall of the abdomen before they enter the muscle, this method successfully anesthetizes the abdominal area [3]. The triangle's anatomical borders are defined by the external oblique in front, the latissimus dorsi behind, and the iliac crest that forms its base [4]. The use of antinociceptive medication to halt the formation of changes how the brain processes afferent information, which might intensify post-surgery pain, is known as preemptive analgesia [5]. Although the idea of anticipatory analgesia has been the subject of several animal experimental trial [6], Results from human investigations have been mixed. Preemptive analgesia is useful in certain trials [7-8], particularly when specific analgesic drugs are used [9-10]. Conversely, certain analyses have found no appreciable positive impact [11], while others have been inconclusive regarding its efficacy [12-13]. This study addresses whether performing a preemptive Transversus Abdominis Plane (TAP) block before the surgical incision yields superior analgesic outcomes compared to performing the TAP block after the surgery. It intends to achieve this by evaluating the effects on postoperative pain levels, the overall consumption of analgesics, and the incidence of pain following abdominoplasty and flank liposuction (AFL).

MATERIALS AND METHODS

Our institutional ethical committee approved this study, and written informed consent was obtained from all patients enrolled. Seventy-five patients were randomly assigned to one of three groups, all patient category I–II according to the American Society of Anesthesiology, with an elective abdominoplasty and flank liposuction (AFL). In Group I, patients underwent the usual general anesthesia with a Transversus Abdominis Plane (TAP) block administered after the induction of anaesthesia. The TAP block was carried out before the patients in Group II emerging from conventional general anesthesia. Standard general anesthesia was administered to Group III, the control group, and a fake block was employed. This collection of control did not get an injection, even though a needle was inserted. According to the study's randomized, prospective methodology, envelopes that were sealed and designed with two masks, patients, and postoperative evaluators were not informed if a TAP block was executed. Anesthesia

was administered uniformly to all patients. Following preoxygenation for three to four minutes, anaesthesia was brought on by using a combination of propofol at a dosage of 2 mg/kg and fentanyl at 1.5 μg/kg. Tracheal intubation was facilitated by administering rocuronium at 0.6 mg/kg. To maintain the required degree of neuromuscular block, 1% isoflurane, a combination of 70% nitrous oxide and oxygen, with further rocuronium dosages administered as required. Tidal volume and breathing rate were meticulously controlled to keep the range of 35 to 45 mm Hg for the end-tidal carbon dioxide level. Any indications of light anaesthesia, such as sweating, ripping, or increased arterial pressure, were all immediately treated by administering extra fentanyl boluses at a dose of 1 μg/kg, and the necessity for these boluses was documented for each patient. Upon completion of the surgical procedure, the neuromuscular blockade was reversed using neostigmine at a dose of 2.5 mg, along with atropine administered at 1 mg. In both Group I and Group II, the Transversus Abdominis Plane (TAP) block was administered with distinct timing—Group I received it after anaesthesia induction. In contrast, Group II received it before anaesthesia emergence. The TAP block procedure began with applying a skin antiseptic solution and draping the surgical site. Following that, the iliac crest was palpated along the latissimus dorsi muscle from the position in front to that behind. The muscle latissimus dorsi is located in front of the Triangle of Petit, an anatomical marker. Several layers comprise the base of this triangle, including the peritoneum, transversus abdominis muscles, internal and external oblique fascial extensions, and more. For the procedure, a blunt needle for regional anesthesia (22G, B. Braun, and Germany) was employed. The area of the Triangle of Petit, immediately above the iliac crest, is where the skin was penetrated. The needle was inserted perpendicular to reach space between the internal oblique and transverse muscle pain, injected 5 cc of normal saline for test to see the dissection felid. Subsequently, a 20 mL solution of 0.375% Bupivacaine was administered by injection into the fascial plane of the transversus abdominis. In Group I, where the TAP block was performed before the surgical incision, a twenty-minute time interval was observed between the completion of the block and the initiation of the surgical incision. Fluid therapy was administered using a balanced salt solution. To guarantee their safety and well-being, patients were continuously monitored during their therapy, using noninvasive arterial blood pressure checks, measurements of end-tidal carbon dioxide, electrocardiograms, and pulse oximetry. Following the removal of the tracheal tube, the post-surgery care unit received the patients. The TAP block duration, which involved the administration of 20 ml of 0.375% levobupivacaine, has been demonstrated to provide analgesia for up to 24 hours [14-15]. The block's effectiveness was verified by assessing the loss of cold perception on the same side as the block in the dermatomal distribution from T7 to L1 [16]. To guarantee an unbiased assessment, a data collector in the recovery unit who was blind to the patient's group assignment examined the block levels. In the recovery room, when patients experienced pain, they were administered a carefully adjusted dose of morphine. This involved giving the patient a 2 mg bolus every 5 minutes till their discomfort subsided measured on the visual analogue scale, reached a score of 30 or lower. For cases of severe pain, defined as a visual analogue scale score greater than 30, intravenous morphine was provided at a dose ranging from The assessment of analgesia effectiveness was conducted under both resting and movement conditions (specifically, transitioning from a lying-down position to a sitting one) during the following time periods: 2, 4, 8, 12, 24, and 48 post-surgeries. This assessment was carried out by an impartial observer unaware of the patients' assigned treatment groups. The evaluation used a 100-millimeter VAS stands for Visual Analog Scale to measure pain intensity. Additionally, the entire amount of morphine total consumed by each patient was meticulously documented. Different TAP blocks complication were systematically recorded. These complications included block failure, m. hematoma or the formation of an abscess and any further case of possible visceral perforation/ puncture. Moreover, opioid related side effects (drowsiness, respiratory depression and postoperative nausea and vomiting [PONV]) were closely monitored and recorded. These measurements were carried out at predetermined times: every 2 hours and then every 4 hours up to 24 and finally at 48 hours after the end of surgery in order to give an overall assessment of patients' conditions. Postoperative nausea and vomiting (PONV) were evaluated using a categorical scoring for: no (0 points), mild (1 point), moderate (2 points), or severe symptoms (3 points). Nausea was considered to be present if the nausea score was equal to zero at any of the predefined times following surgery. Sedation in patients was assessed by a sedation scale of the following categories: awake and alert (scored as 0), quietly awake (scored as 1), asleep but easily aroused (scored as 2) and deep sleep (scored as 3). Sedation was detected when the sedation score became 0 at any postoperative period, this being considered as a cutoff to define sedation. Respiratory depression was defined as the presence of respiratory rate less than 8 breaths/min and/or a $PaCO_2$ (partial pressure of carbon dioxide in arterial blood) >45 mm Hg. Respiratory depression was defined based on these criteria. Patients received a short questionnaire to be returned and were invited for a pain assessment at 3-6-months.The reports listed below were part of the evaluation (Table 1).

Table 1: Questionnaire of chronic pain

Name of patient			
Group category	I, II, III		
Pain on movements or rest (Movement means considered of sitting from the lying down position)		(VAS 0–100)	(VAS 0–100)
Type of pain	Aching		
	Throbbing		
	Troublesome		
	Burning		
	Troublesome		
	Tender		
	Pricking or stabbing		
	periodicity	Intermittent, continuous	Activity dependent
Analgesic drugs			

The primary outcome measures of the study encompassed the following:
VAS Scores: Evaluation of pain intensity using the Visual Analog Scale (VAS) during both periods of rest and movement. Postoperative Opioid Consumption: Documentation of the total amount of opioids consumed by patients within the initial 48 hours following the surgery. TAP related complications: Complications as recorded from the TAP block. As well as the primary outcomes, the study also reporters on secondary outcome measures: 1) PONV (Postoperative Nausea and Vomiting): Evaluation of the incidence and severity of nausea and vomiting following surgery. Sedation: Ability to assess the level of sedation with a sedation score. Respiratory Depression: Identification of occasions where respiratory rate or PaCO2 indicated that the patient had respiratory depression. Postoperative Pain: Follow-up and documenting post-operative pain at day 3 day6 are secondary outcomes.

Statistical analysis
Taking into consideration a 25% reduction in the use of opioids within the first 48 h after surgery and an initial sample size of 25 patients per group would also be necessary as required to be included. The calculation of this analysis was based on a significance level of 0.05% and a statistical power of 0.8. These calculations were based on the fact that average dose of administered morphine in control group was considered 80 mg and they had standard deviation of 20 mg. The choice to sample 25 patients within each group was made as a result of concerns that possible bias due to the inability to accurately identify technique failures while the patient was anaesthetized. This correction was made in order to increase the general credibility of the study and guarantee preciseness of the findings. Continuous variables were expressed as mean ± standard deviation (SD) whereas categorical data were presented as number and corresponding percentage. Statistical analyses were performed using tests including the Mann-Whitney test, an unpaired t-test and Fisher's exact test according to what was considered appropriate for the respective kinds of data and study subjects. Level of significance in the analysis is at a $P < 0.05$.

RESULTS

75 participants participated in the study. However, The TAP block, or transversus abdominis fascial plane failed, not included were two patients from Group I and one from Group II in the research. One in Group II patient and three control group patients declined to participate in the assessment. Table 2 contains information on these individuals' features. There were no discernible differences between the groups in terms of demographic information or the length of the surgical process, according to statistical analysis, (Table 2).

Table 2: Operational and demographic information for the research groups

A Variable	Group I (No. = 23)	Group II (No. = 24)	Group III (No. = 25)
Age in years	28.8±5.9	27.7±3.8	30.7±5.4
Weight Kg	79.25±12	81.2±13	80.2±12
Height in cm	159.4±13.2	157.2±12.4	160.3±12.5
ASA status I-II	21-3	20–5	22-3
Duration of surgery(Minutes)	122±16	118±15	123±19

Significant findings revealed that there was a notable reduction in the requirement for fentanyl in the operating room among patients who received pre-incisional Transversus Abdominis Plane (TAP) block compared to those in the other groups. The fentanyl requirements were reported as mean ± standard deviation (SD) for each group: 80 ± 9 for the pre-incisional TAP block group, 157± 12 for one of the comparison groups, and 160± 12 for another comparison group. The statistical analysis showed a highly significant difference ($P < 0.0001$) among these groups, indicating a substantial reduction in fentanyl utilization in the group that obtained a TAP block prior to incision. The study demonstrated a substantial reduction in analgesic requirements in the recuperation area between those who had pre-incisional Transversus Abdominis Plane (TAP) block. The intravenous morphine usage was reported as mean ± standard deviation (SD) for each group: 4.7 ± 0.5 for Group I, 7.3 ± 0.6 for Group II, and 11.2 ± 1.6 for Group III. This difference was extremely significant, as evidenced by a P-value below 0.0001. Furthermore, morphine intake within the first 48 hours in the hospital ward was also considerably lower in the team that received pre-operative TAP block than in the other groups. The values were reported as mean ± SD: 21 ± 4 for the pre-operative TAP block, 33 ± 5 for one of the comparison groups, and 66 ± 5 for the other comparison group. Once again, this difference was highly significant, with a P-value of less than 0.0001. In comparison to the control group, patients who got the TAP block showed a considerable reduction in their overall analgesic needs, which was statistically significant ($P < 0.0001$). The time in minutes to the first request of analgesics in the ward was recorded and described as mean ± SD for each group: Group I, 122 ± 16 minutes Group II, 118 ± 15 minutes Group III, 123=20 minutes. The findings showed that this period was significantly longer in patients receiving the Transversus Abdominis Plane block. The Details: The difference between Group I and III was significantly big ($P < 0.0001$), the more were increased the periods for first analgesic requirement in pre-incisional TAP block group (Group I). There was similarly a significant difference ($P = 0.0002$) in Group III when compared to Group II. In addition, the time to first analgesic was significantly later in the pre-incisional TAP block group (Group I) than in Group II ($P = 0.0046$). Overall, these results underscore the efficacy of the pre-incisional TAP block to prolong the WITNB time in MO patients with a major effect in Group I: Thus, this WBN technique has worked as expected by acting instantaneously (ΔT 0) both in transiently perturbing and delaying postoperative end points (Tables II–VI). Figure 1 gives an illustrative overview on POS pain at rest. Numeric analogue pain scores at rest were recorded at 2, 4, 8, 12, and 24 postoperative hours. Statistical analysis demonstrated that the resting postoperative pain scores were significantly higher in the post-operative Transversus Abdominis Plane (TAP) block group compared to the TAP group pre-incision ($P < 0.05$) at all-time points evaluated. By contrast, the groups that received pre-incisional and postoperative TAP blocks experienced significantly lower pain scores at all time-points studied when compared with the

control group. In comparison to the control group, it means that the pre-incisional and post-surgical use of TAP blocks significantly reduced a degree of postoperative pain, (Figure 1).

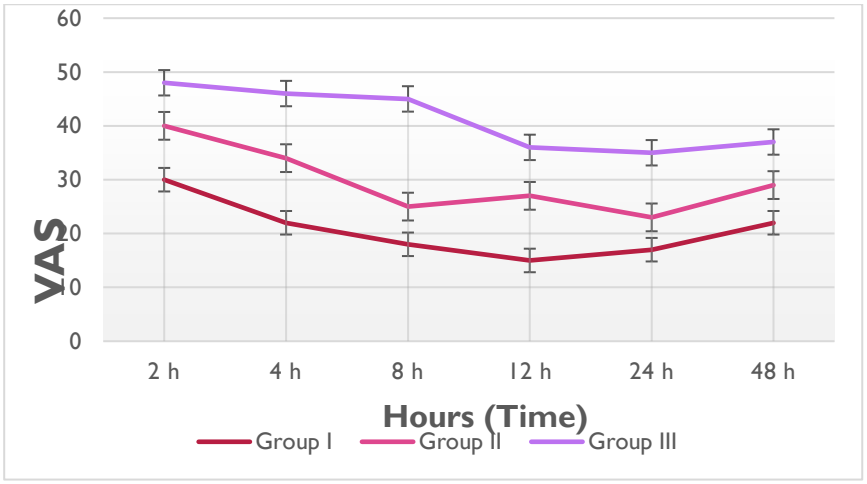

Figure 1: Mean ± SD is the statistic for postoperative pain at rest

Figure (2) shows the information on postoperative discomfort during mobility. VAS stands for Visual Analog Scale ratings of the pre-incisional TAP block group were found to be statistically significantly lower than those of the post-surgical TAP block group. At the 4, 8, 12, 24, and 48-hour postoperative time periods, these differences were significant ($P<0.05$). Importantly, both groups that received TAP blocks, whether pre-incisional or post-surgical, exhibited a significant decrease in postoperative pain scores when compared to the control group for every time point that was evaluated. This suggests that the utilization of TAP blocks, regardless of the timing, resulted in a notable reduction in postoperative pain levels compared to patients who did not receive TAP blocks.

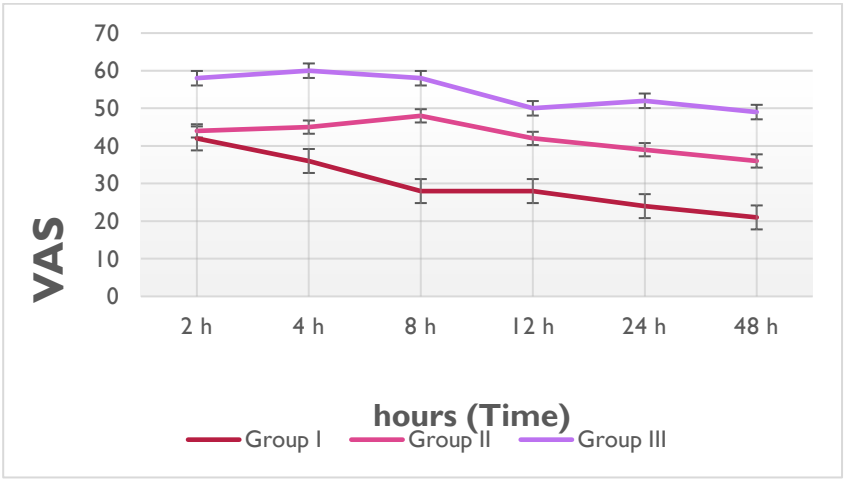

Figure 2: The mean ± SD is the movement-based postoperative pain data

The failure rate of the technique was determined to be 6%, and no other potential complications were documented in the study. The incidence of sedation, defined as a sedation score of 0, showed that the control group had a greater percentage (61%) during the early postoperative period (specifically, 12 hours postoperatively) compared to the other groups, where it was 18% for Group I and 32% for Group II. This observation was correlated with a decrease in opioid use. However, it's worth noting that between 12 and 48 hours following surgery, every patient in the three groups exhibited a sedation score of 0, indicating that they were awake and alert, with no signs of sedation. Significant differences between the pre-incisional and post-surgical TAP block groups were found by statistical analysis in early after surgery especially with regard to the decline in the usage of opioids. It appears that the timing of the TAP block had a significant effect on sedation levels early in the postoperative period but not later, since similar variations were not seen at the other time points evaluated. TAP block significantly decreased the occurrence of Postoperative Nausea and Vomiting (PONV), with rates of 16% in Group III (the control group) had 66.5%, in Group I, and Group II had 29%. It is important to note, nonetheless, that the pre-incisional TAP block group (Group I) saw a statistically significant decrease in PONV incidence as compared to the post-surgical TAP block group (Group II). Furthermore, the study did not record any instances of respiratory depression in any of the patients. These findings underscore the potential benefits of TAP blocks in reducing the incidence of PONV following surgery, with a more pronounced effect observed when the TAP block was administered pre-incisional. Additionally, the absence of recorded cases of respiratory depression is a positive safety outcome. When it came to chronic pain [Table 3], Group I experienced a substantially lower incidence of discomfort at three and six months after surgery than P values for Groups II and III are 0.035 and 0.029, respectively, (Table 3)

Table 3: At three and six months following surgery, characteristics of persistent pain in each patient group

Characteristics of chronic pain		Group I (No.= 24)	Group II (No.=25)	Group III (No.=26)
Throbbing	3 months		0	1
	6 months		0	1
Aching	3 months	1	1	1
	6 months	1	1	1
Tender	3 months	0	1	2
	6 months	0	2	1
Troublesome	3 months		1	2
	6 months		1	1
Burning	3 months	1	3	2
	6 months	1	2	2
Stabbing or pricking	3 months		2	0
			2	2

At three and six months after surgery, more patients in Group II (13.6%) and control (17.4%) were taking non-steroidal anti-inflammatory medicines as analgesics to manage their pain than any patients in Group I.

DISCUSSION

The study provides valuable insights into using the TAP block in patients undergoing abdominoplasty and flank liposuction. While the findings indicate differences between pre-surgical and post-surgical TAP block administration, it's important to note that including a placebo group adds scientific rigor to the research. The presence of a placebo group allows for a more comprehensive assessment of the TAP block's effectiveness by comparing it to a control condition where patients receive a sham procedure. This makes sure you are not getting any effect from elsewhere but the TAP block. There might be sparse clinical data in this regard. However, these studies demonstrate the important benefits of TAP blocks outside postoperative pain and other outcomes. Larger trials and additional research could help to more firmly define the best timing and technique for TAP block in various surgical procedures. Although small, and well conducted (it included 75 patients) this prospective randomized study does provide some useful information about the effectiveness of blocking the TAP when it is used to control postoperative pain. The main results of the study demonstrate that there are statistically significant differences between both groups in terms of different outcomes of patients who were administered a TAP block before incision and those whose block was given postoperatively. These are less pain, less use of analgesics, less PONV, decrease in sedation and development of chronic pain. Importantly, patients in whom the TAP was administered (either pre-incisionally or post-surgically) experienced better analgesia and less PONV and sedation than control subjects. Also, there was a 6% failure rate with no complications; the procedure may be safe. Although this study is evidence that there is intrinsic benefit of TAP block to the surgical patient, larger populations and more diverse types of patients could demonstrate these findings and show the spectrum in which the technique can be applied. In fact, effective postoperative analgesia from TAP block is also potential in a wide range of abdominal surgeries including the procedures done through transverse or midline incisions [16-17]. The potential for pain control and opioid spare with this block make it a valuable asset in abdominal surgery, improving patient comfort and postoperative recovery. Proof of analgesic has been reported in several documents and case studies involving the TAP block when performed post operation, but before there is awakening of the patient from anesthetic [14,18]. This has been demonstrated to be effective in controlling postoperative pain and is corroborated by clinical experience and studies. In contrast, some studies and reports could find analgesic benefit of TAP block after induction of anesthesia and before surgical incision [19]. It has also been demonstrated to be effective in treating postoperative pain with similar timing as well and raises the possibility that there is some flexibility related to when TAP blocks are performed and analgesic utility for abdominal surgery [19]. In the work of Dierking et al., [20] concluded that pre-incision or a before-awakening administration of morphine in surgery/herniorrhaphy could not result in any differences between the groups in our demand for morphine and pain scores. This goes to show that for certain types of surgeries the time of block might not factor into differences in pain control at all, and both methods can be equally effective. The TAP block group experienced less postoperative nausea and vomiting (PONV) with a reduction of PONV incidence from 66.5% in the control group to 16% and 29% in the two TAP block groups respectively. This striking decrease in the incidence of PONV demonstrates that the TAP block is effective for prophylaxis against this widely experienced postoperative symptom. Of note, PONV score decreases were higher in the TAP group before surgery compared with after surgery. This implies that preincisional deployment of TAP block has a significantly lower PONV, which corroborates the hypothetical basis for preventing PONV at this time. Sedation scores were significantly lower among patients with early Transversus Abdominis Plane (TAP) blockade (performed 20, as well as the group having lower Sedation Score had less percentage used opioids of TAP block before surgery which was interestingly significant compared to control group ($p<0.05$). In fact, the results of this study underscores the significance of timing while giving TAP block especially in pre-incisional TAP block. It is not only an optimum time for a large reduction of sedation on the first day postoperative after surgery, but also significantly contributed to less use of opioid drugs. These findings demonstrate that TAP blocks may be beneficial in maximizing the postoperative recovery using sedation reduction and opioid sparing. The pain management benefits of TAP block in multimodal analgesia are controversial in literature. Results of various studies are contradictory and inconclusive in respect to its augmentation for postoperative analgesia. For example, TAP block does not add to the intensity of analgesia after cesarean section. Used as an adjuvant to intrathecal morphine in a multimodal regimen, by Joseph et al. [21]. Instead, Bryan Lim and colleagues [22], found that TAP block was a component of a multimodal analgesic protocol, and it reduced morphine consumption after cesarean delivery. These contradictory results explain how the pain relief and patient response are complex. The utility of

TAP block as part of a multimodal providing efficacy is likely to be influenced by the procedure, patient characteristics and agents used in the analgesic-planned strategy. Therefore, additional studies and consideration of these factors may be able to provide more specific recommendations on the role of TAP block in multimodal pain control. Following a hysterectomy, 5–32% of women report chronic discomfort. [23] It was around 8% in the pre-incisional TAP group whereas the other two groups had it around 35%. It was around 35% in the other two groups and 8% in the pre-incisional TAP group in the current study. Lack of sensation of the abdominal wall as a result of TAP block prevents blinding studies well. The third issue was that this trial did not measure morphine consumption sequentially as was needed (0–12, 12–24, 24–30, and 30-48 hours). They have a very good point regarding measuring morphine consumption sequentially over different time periods (e.g., 0-12 hours, 12-24 hours, 24-30 hours, and 30-48 hours). This can give a more detailed understanding of the manner in which analgesic requirements vary during the postoperative period. Within the study you quoted, this sequential analysis of morphine consumption has not been done. To have such a plan in place in subsequent studies would provide valuable information about patients' changing needs for relief over time and help make analgesic plans more appropriately individualized. It's an interesting idea to add to increasing the comprehensiveness of research in postoperative pain management.

CONCLUSION

TAP block is feasible and effective for postoperative analgesia according to the conclusion of this study. The study results clearly show us that when we give the TAP block before incision of surgery (pre-incisional in this case) there is less acute pain and use of analgesics, as well higher degree of calmness than giving it to a patient prior to emergence from anesthesia. These findings highlight the opportunities of adjusting the timing of TAP block administration to improve postoperative analgesia and surgical outcomes.

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