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Original Research Article

COMPARISON OF POSTOPERATIVE MEAN OPIOID CONSUMPTION IN PATIENTS GIVEN TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK VERSUS PLACEBO UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract: *Early postoperative pain from laparoscopic cholecystectomy is moderate. A transverses abdominis plane block (TAP) may be an attractive analgesic strategy for reducing postoperative opioid consumption and side effects. The study aimed to assess postoperative mean opioid utilization in patients administered (TAP) block versus placebo undergoing laparoscopic cholecystectomy. This randomized controlled trial was conducted at the Department of Anesthesiology, Aziz Bhatti Shaheed Teaching Hospital Gujrat, from June 1, 2022, to September 30, 2022. A total of 80 patients undergoing Laparoscopic cholecystectomy fulfilling inclusion criteria were recruited and further divided into two equal groups. TAP block procedure was performed in both groups. In group A, 40 patients received 20 mL of isotonic saline 0.9% bilaterally as a placebo, and in group B, 40 patients had 20 mL of 0.5% bupivacaine. The two groups were compared for the mean consumption dose of opioid analgesia in 24 hours postoperatively. A T-test was applied for statistical differences. (p-Value < 0.05 was taken as significant. Data was collected on specially designed proforma. The total tramadol consumption decreased by 35% in the TAP block group (280.19 ± 56.67mg) compared to the control group (428.79 ± 58.69mg), and the difference was statistically significant (p < 0.001). The mean total pain scores were significantly lower in the TAP block group (46.47 ± 6.17) compared to the control group (60.52 ± 5.67). Thus, it can be concluded from the study that the Tap block is an effective analgesia option for reducing postoperative mean opioid requirement and pain after Laparoscopic cholecystectomy.*

Keywords: Laparoscopic cholecystectomy, transverses abdominis plane block, tramadol, Analgia

Introduction

Patients who have undergone laparoscopic cholecystectomy often experience moderate postoperative discomfort in the early phase after the procedure (Hoofwijk et al., 2015). Those experiencing postoperative pain often feel it the most on the day of surgery and the day after. Following ambulatory surgical operations, it is conceivable that the patient will be unable to be released from the hospital on the same day because of the pain and other symptoms resulting from the surgery and the anesthetic (van Dijk et al., 2015). The usual treatment with opioids is linked to a higher likelihood of experiencing side effects such as sleepiness and nausea. Because of this, a TAP block, which can generate analgesia for up to 24 hours in a row, would be an appealing analgesic alternative to investigate for this population (Franco and Inozemtsev, 2020). The transversus abdominis plane (TAP) block, applied in regional anesthesia, is performed to block the neuro afferents of the anterolateral abdominal wall (Tsai et al., 2017). This is done to provide the desired anesthetic effect. A needle is inserted into the space between the transversus abdominis muscle and the abdominal wall to accomplish this goal. Using ultrasonography (USG) or anatomical landmarks as a guide, a local anesthetic is injected into the fascial plane of the transversus abdominis muscle. The nerves that travel from the thoracic to the lumbar spine are located in a position that necessitates the performance of this treatment. Randomized controlled trials determined that a TAP block effectively provides postoperative analgesia for up to 24 hours after abdominal surgery. These experiments were carried out to provide evidence of the successful completion of the procedure. On the other hand, the efficacy of this approach has been shown mainly for applications involving lower abdominal surgery (Fayezizadeh et al., 2016; Guerra et al., 2019).

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However, the capacity of an umbilical TAP blocker to provide analgesia during an upper abdominal surgical procedure such as a laparoscopic cholecystectomy is currently being called into question (Elamin et al., 2015). The use of a TAP blocker was studied in this population in two published trials. In both of these investigations, the number of participants ranged between 18 and 21. However, one experiment was flawed due to unusual surgical access because all laparoscopic ports were positioned below the umbilicus4. The other study was also flawed due to an inadequate description of blinding and pain levels. These issues contributed to the experiment's failure (Bacal et al., 2019). The results of the trials were affected by both of these elements to varying degrees. Additional research is required to identify whether or not a TAP block effectively treats pain in this population undergoing upper abdominal surgery. As a result, this prospective, double-blind, randomized, and placebo-controlled trial aimed to see how a TAP block affected postoperative mean opioid intake in the first 24 hours and pain levels as a secondary outcome in patients following laparoscopic cholecystectomy.

Methodology

The Anesthesiology Department of Aziz Bhatti shaheed Hospital in Gujrat, Pakistan, conducted the randomized controlled trial between June 1 and September 30, 2022. This study was given the green light by the hospital's ethical review board and the College of Physicians and Surgeons of Pakistan (CPSP). Patients in the study ranged in age from 18 to 65, all of whom were adults undergoing laparoscopic cholecystectomy and had an ASA physical status of I to III. Patients were excluded from the trial if they satisfied any of the following inclusion/exclusion criteria: body mass index (BMI) of 18 or >35 kg/m2; drug allergy; pregnancy; alcohol or drug misuse; daily opioid usage; everyday opioid use less than 24 hours before surgery; injection site infection. Patients were provided with informational materials and an opportunity to ask trial-related questions over the phone. Everyone who took part in the study gave written consent. In the study group, patients received a TAP block with 20 mL of bupivacaine at a rate of 0.5 mL per kilogram bilaterally. In contrast, in the control group, patients received a TAP block with 20 mL of isotonic saline at a concentration of 0.9% bilaterally (placebo group).

The hospital pharmacy manufactured the research medication into identical boxes, with the contents varying between isotonic saline and bupivacaine. The hospital pharmacy created a computer-generated block randomization list (block size = 10). The boxes were then hermetically sealed and labeled with the project name, the investigator's name, and sequential numbers. A nurse who was neither participating in the study nor charge of the patient's care opened the package and drew the research drug into an unmarked syringe. Nobody knew who was in which group—not the patients, anesthesiologists, or people caring for them after the operation. The anesthetic procedures were performed in the same order on each subject. Midazolam at 0.05 mg/kg I.V., propofol at 2 mg/kg I.V., and atracurium at 0.6 mg/kg I.V. were used for induction and sedation, respectively. An endotracheal tube or a laryngeal mask airway (LMA) was placed, depending on what the attending anesthetist had recommended. Oxygen and sevoflurane were used to keep the patient under anesthesia, and intermittent positive-pressure breathing was used to keep them asleep.

Four ports, three of which were 5 mm in diameter and one of which was 10 mm in diameter and placed supra umbilically, were used to carry out the laparoscopic treatment. During this procedure, pneumoperitoneum was created using a Veress needle technique, and the intraperitoneal pressure was maintained at 12 mm Hg. To do this, the surgeon inserted a port above the patient's umbilicus. Like other port sites, resorbable fascial sutures were utilized to seal the fascia, while non-resorbable skin sutures were used. One of the two researchers performed a TAP block under ultrasound guidance before beginning the surgical procedure on the patient by making an incision in the patient's head. An incision was made in the midaxillary line at the level of the umbilicus using the USG probe. This incision was made in a transverse direction between the iliac crest and the costal boundary. It was possible to see the external oblique, internal oblique muscle, transversus abdominis muscle, and fascia. A needle with a gauge of 22 and measuring 80 millimeters long was positioned anteriorly in the plane of the USG probe. When the hand was placed into the TAP, two milliliters of isotonic saline were administered to verify that the needle was positioned correctly. After the aspiration was negative, 20 mL of the test solution was injected, and a dark oval of injectate could be seen spreading across the TAP. This indicated that the aspiration was negative. In a manner not dissimilar to the last procedure, a second TAP block was carried out on the ipsilateral side.

The pain was measured using the visual analog scale (VAS) by an anesthetic resident who was unaware of the patient's group assignment after they had been transferred to the step-down unit following surgery. Whenever their VAS value was higher than 3, they were administered 0.5 mg/kg of tramadol intravenously; this was done every 10 minutes until their VAS score was lower than 3. The sum of tramadol consumed throughout 24 hours was calculated. This information was entered into a

proforma that had been constructed beforehand. A computer was used to analyze the data. SPSS 21, the Statistical Package for the Social Sciences, was used to study. Mean and standard deviation was supplied for each age group, and the number of opioids used for analgesia. In the presentation, the genders were separated into different categories of frequency and percentages. Mean opioid doses were compared between the two study groups using the t-test to see if there was a statistically significant difference (p-value 0.5).

Results

A total of 88 patients participated in the research. Each group missed four patients because they did not all meet the extubating criterion right after surgery. The remaining 80 patients were split evenly between two groups: those receiving a TAP block with bupivacaine and those receiving a control group of normal saline. Ages in Group A were, on average, 42.65 ± 12.50, while in Group B, they were 40.28 ± 14.6. There were no significant differences between the groups for age, height, weight, BMI, or the proportion of males and females (Table 1).

Table 1 Demographic parameters of both groups

Parameters	Group A (placebo)	Group B (TAP)
Age (Years)	42.65 ± 12.50	40.28 ± 14.6
Gender (male/female)	34/16	32/18
weight (Kilograms)	64.32± 9.88	62.68 ± 9.81
Height (Meters)	1.44 ± 0.05	1.39 ± 0.07
BMI (kg/m2)	24.58 ± 2.21	23.17 ± 2.90

Mean total tramadol intake in the first 24 hours after surgery was significantly different between the two groups, with the control group taking 428.79 ± 58.69 mg and the TAP block group taking 280.19 ± 56.67 mg (P <0.001). Patients who had a TAP block with bupivacaine reported significantly decreased overall pain (46.47 ± 6.17) compared to the control group (60.52 ± 5.67) after the first 24 hours (P <0.001). (Table 2).

Table 2 Comparison of Mean opioid consumption and pain score between the groups.

Parameters	Group A (Placebo)	Group B(TAP)	p-value
Mean tramadol use	428.79 ± 58.69	280.19 ± 56.67	<0.001
Mean Pain Score	60.52 ± 5.67	46.47 ± 6.17	<0.001

Tramadol consumption in the TAP block group was lower than in the control group for 2 hours, and this effect lasted up to 16 hours. After that, the tramadol consumption started to increase in the TAP group as compared to the placebo group up to 24 hours (18, 20, 22, 24 hours) (Table 3, Figure 1)

Table 3 Comparison of hourly use of mean opioid use between the groups:

Hours	Group A (Placebo)		Group B (TAP)	
	mean	S.D.	mean	SD
0	52.55	13.75	28.67	22.68
2	53.87	12.73	20.45	18.65
4	47.58	14.57	16.47	14.56
6	44.28	11.51	16.37	14.46
8	43.99	12.54	17.68	18.56
10	36.58	12.67	22.67	18.48
12	34.85	15.43	20.67	19.66
14	30.22	16.89	16.54	18.66
16	24.65	17.46	17.88	17.56
18	18.2	14.79	24.27	16.66
20	17.42	13.33	28.67	21.93
22	13.76	14.38	26.22	14.21
24	9.74	10.26	24.24	13.65

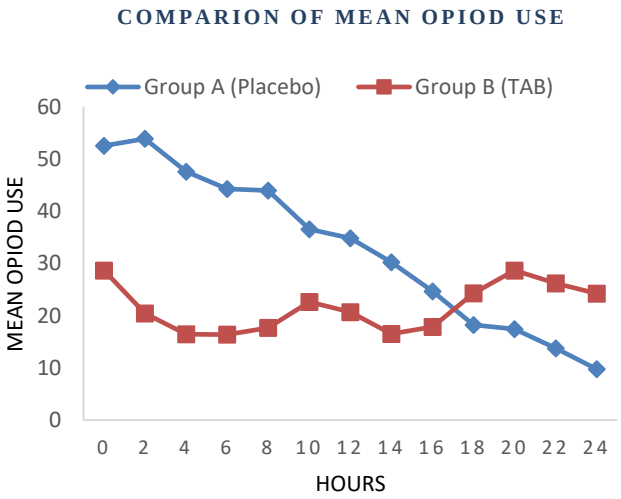

Figure 1 shows the graphical representation of every two hourly use of mean opioid use between the groups

Discussion

Patients who had TAP blocks as part of their multimodal postoperative analgesic regimen required far less tramadol up to 16 hours postoperatively and felt significantly less pain, according to the results of

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a randomized, double-blind, controlled experiment. Due mainly to the TAP block, overall tramadol consumption in the first 24 hours following surgery was reduced by 35%. TAP block studies have helped various surgical specialties, including prostatectomy, extensive bowel resection, open or lap appendicectomy, C-sections, whole abdominal hysterectomy, cholecystectomies, hepatic and renal surgeries, and abdominoplasties (Bacal et al., 2019). In this research, we included only those who met the criteria for laparoscopic cholecystectomy as an elective procedure. Because of the patient's discomfort and abdominal distention, an epidural was once thought to be somewhat contraindicated for these surgeries because the incision typically went above the umbilicus. It was also believed that neuraxial sympathectomy-induced hemodynamic instability was a relative contraindication for epidurals in the same way coagulopathies were. Since less manipulation and dissection of organs were necessary, patients reported less visceral pain throughout these procedures. As a result, TAP block is a practical strategy for dealing with the discomfort that follows surgery. A poorly vascularized plane may cause prolonged pain alleviation following a TAP block. This causes a decrease in the body's ability to process and eliminate drugs (Baciarello et al., 2018; Boules et al., 2020; Park and Lee, 2022).

TAP blocking effectively reduces pain after laparoscopic cholecystectomy in two randomized controlled trials. Both studies had methodological flaws that needed to be addressed. With the application of a TAP block, El-Dawlatly et al. four were able to demonstrate a significant reduction in the quantity of perioperative fentanyl administration as well as the amount of 24-hour morphine consumption. The study did not, unfortunately, take into account pain ratings or side effects in its analysis. During the laparoscopic procedure, all ports were positioned below the umbilicus. As a result, the study cannot definitively say whether or not a TAP block is helpful for the most common type of cholecystectomy, performed laparoscopically through holes in the upper abdominal region (El-Dawlatly et al., 2009). Ra et al. found that after delivering a TAP block, ketorolac and fentanyl were utilized less frequently. Additionally, the treatment group reported significantly decreased pain 24 hours after receiving the treatment. There is a lack of clarity on whether or not pain ratings were taken and whether the subjects were at rest or actively moving around, and the study does not explain the randomization and blinding techniques (Ra et al., 2010).

In a separate piece of research, Mrunalini P. et al. came to conclusions that were very comparable to ours. Similar to the findings of our trial, which showed a decrease of 35 percent in the mean opioid usage following laparoscopic cholecystectomy, the TAP groups had a reduction in their mean opioid use of 36 percent in just 24 hours. The decrease in pain was found to follow a similar pattern in this other trial as in our own. Compared to the group receiving the control treatment, those receiving the TAP block experienced much less overall pain, as seen by significantly lower mean total pain scores (48.07 ± 6.76) (Mrunalini et al., 2014).

Because patients were transferred from the step-down unit to the ward after twenty-four hours, postoperative pain assessment and painkiller consumption were limited to those first twenty-four hours. We don't know how well or how often the block could suppress abdominal wall sensations because it was done after induction of general anesthesia. Lack of funding prevented the use of ultrasound guidance. Even though it is straightforward, practical, bears a low risk of complications, and has a high success rate when performed using modern procedures, the TAP block is not utilized nearly as frequently as it should be. One of the many benefits of using ultrasound guidance for a TAP block is that it results in a higher success rate and fewer problems. Direct visualization of the needle, the anatomical structures, and accurate and speedy administration of the medicine into the target spot are benefits of using ultrasound guidance.

Conclusion

After laparoscopic cholecystectomy, the TAP block was found to be beneficial in reducing postoperative mean opioid demand and pain levels, as was the conclusion reached by the study. Additional research is necessary to evaluate the pharmacokinetic profile of local anesthetics after the delivery of the TAP block and determine the best concentration and procedure-specific volumes.

Conflict of interest

The authors declared the absence of a conflict of interest.

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