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Comparison between the Analgesic Effect of Oblique Subcostal and Lateral Approach of Ultrasound-Guided Transverse Abdominis Blocks for Patients Undergoing Laparoscopic Cholecystectomy: A Randomized Controlled Trial

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ABSTRACT

Background: It is widely recognized that the primary benefits of minimally invasive surgery are reduced postoperative discomfort and faster recovery time for physical activities. **Objectives:** To assess the efficacy of analgesics for preoperative oblique subcostal transverse abdominis blocks (TAP) and lateral TAP blocks for cases undergoing elective laparoscopic cholecystectomy (ELLC). **Patients and methods:** This was a prospective controlled randomized study performed on 48 cases admitted to the day case surgery unit of Menoufia University Hospital for whom an ELLC was scheduled. Cases were randomly divided into 3 equal groups using SPSS. **Results:** There wasn't a significant distinction among the 3 groups regarding HR measurements at any time pre- or postoperatively ($p > 0.05$). There wasn't significant variation among the three groups as regard end tidal CO_2 measurements at any time intraoperatively ($p > 0.05$). There wasn't significant variance among the 3 groups regarding mean arterial blood pressures (MAP) measurements at 30 min intraoperatively, at baseline, 15 min, 4, 6, and 24 h postoperatively ($p > 0.05$). While there was a significant distinction among the three groups regarding MAP measurements at 10, 20 min intraoperatively, 2 h, and 12 h postoperatively ($p<0.05$). **Conclusion:** The utilization of an ultrasound-guided (ESP) block resulted in a greater reduction in postoperative tramadol usage and pain scores compared to the oblique subcostal transversus abdominis plane block following ELLC surgery.

Keywords: Ultrasound-guided TAP, Analgesic effect, ELLC.

INTRODUCTION

Although less invasive than open cholecystectomy, laparoscopic cholecystectomy still causes significant pain within the first twenty-four hours after the operation, particularly in the areas where the trocars are inserted [1,2]. The primary benefits of minimally invasive surgeries are reduced pain following surgery and accelerated recovery of physical function [3]. Regional anesthetic procedures that include injection of a local anesthetic into fascial planes instead of directly surrounding discrete nerves have become more common [4]. Fascial plane blocks in truncal analgesia can serve as a simpler and secure substitute for thoracic, epidural, and paravertebral blocking. In recent decades, the transverse abdominis plane block has become a reliable tool for multimodal analgesia [5]. The performance of TAP blocks can be achieved by many methods, including the lateral, subcostal, and conventional posterior approaches [6].

The goal of this investigation was to assess the analgesic efficiency of preoperative oblique subcostal TAP blocks and lateral TAP blocks for cases undergoing ELLC.

PATIENTS AND METHODS

This was a prospective controlled randomized research study carried out on 48 cases admitted to the Day Case Surgery Unit of Menoufia University Hospital for whom ELLC was scheduled. The cases were divided into 3 groups of equal size, utilizing a randomization process in SPSS. Group 1 received bilateral oblique subcostal transverse abdominis plane blocks; Group 2 received bilateral lateral transverse abdominis plane blocks; and Group 3 received post-surgery morphine by patient-controlled analgesia (PCA).

Sample size calculation

The purpose of this randomized clinical research was to determine if laparoscopic cholecystectomy patients suffer less pain after receiving transverse abdominis blocks guided by ultrasonography administered from an oblique subcostal or lateral approach. Previous research demonstrated that the mean value for the morphine (mg) dose in the recovery room was 0.9 ± 0.7 and 2.3 ± 1 in patients treated by TAP block and systemic analgesics, respectively. This formula was used to determine the sample size needed to investigate the results of the present research with a significant P-value less than 0.05 and a power of ninety-five percent:

$$n \geq \frac{\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2 \left(\sigma_1^2 + \sigma_2^2/r\right)}{\left(\mu_1 - \mu_2\right)^2}$$

$Z_{1-\alpha/2} = 1.96$, $\beta = 0.05$, $r = 2$. So, $n = 8$.

And by adding 100% as a drop-out rate, at least 16 patients were recruited in each of the 2 groups of the TAP block, and 16 patients should be recruited in the group of traditional analgesics, with a minimal total sample size of 48 patients. n is the minimal sample size for the group. $Z_{1-\alpha/2}$ is the standardized value for the corresponding level of confidence. (At ninety-five percent confidence interval, it is 1.96, and at ninety-nine percent confidence interval, or one percent type I error, it is 2.58). Sample size was 48 patients.

Inclusion criteria: The cases who were eligible for the study were over the age of twenty-one and had ASA

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physical status I or II. They were scheduled to have ELLC.

Exclusion criteria: Uncooperative cases, those with known allergies to any of the research medications, people who used opioids for pain relief, substance abuse (drugs or alcohol), potential risks include infection, either systemic or at the injection site, being pregnant, having a clotting disorder, or being on anticoagulant medication.

METHODS

Preoperative evaluation for all cases involved full history-taking, revision of the available information, a full clinical examination, and laboratory investigation. On arrival at the operation room, standard monitoring was associated with all patients (pulse oximetry, ECG 3 leads, and non-invasive arterial blood pressure (BP). Capnography was attached after the induction of anesthesia. An intravenous access was secured utilizing a 20-gauge cannula. The induction of general anesthesia was achieved by utilizing a dosage for sleep of fentanyl of one microgram per kilogram (IV), propofol of two milligrams per kilogram (IV), and atracurium of half a milligram per kilogram (IV) to facilitate tracheal intubation. During the procedure, general anesthesia was maintained by maintaining lung ventilation using pressure-controlled mode with isoflurane (MAC 0.8:1.2) in combination with oxygen and air. During the maintenance of the anesthesia, it was administered intravenously (three-five milligrams) of morphine to stabilize the patients' hemodynamics if their blood pressure or HR rose more than twenty percent from the baseline. One gram of paracetamol and four grams of ondansetron were administered intravenously to each patient fifteen minutes prior to the finish of the surgical procedure.

Group 1: Following the administration of general anesthesia, oblique subcostal TAP blocks were performed using Sonosite's linear high frequency probe and a fourteen and fifteen MHz ultrasound transducer. The area of the puncture and the ultrasonography probe were prepared using aseptic techniques. Betadine was used for skin disinfection. The rectus abdominis and underlying transversus abdominis muscles were located in close proximity to the costal margin and xiphoid process. A 17-gauge echogenic ultrasound needle was inserted approximately two to three centimeters medial to the probe after an in-plane image was acquired. Twenty milliliters of bupivacaine, 0.25 percent, were gradually given once the needle tip was seen to be in the plane. A negative aspiration was performed along the oblique subcostal line, which extends inferolaterally from the xiphoid towards the anterior section of the iliac crest, and several punctures were used to inject the medication [7]. The identical procedure was followed in order to carry out the contralateral side block.

Group 2: Firstly, skin preparation was performed using betadine. Bilateral lateral TAP block was performed while the patient in supine position, and a linear transducer was placed in a transverse plane at the midaxillary line, the transversus abdominis, internal oblique, & external oblique muscles was seen on the ultrasound image. Twenty milliliters of 0.25 percent bupivacaine was injected on each side using a 17-gauge echogenic needle that was advanced posteriorly to the patient. . The transversus abdominis & internal oblique muscles were targeted for local anesthetic distribution using a needle that was advanced posteriorly to the patient [8].

Skin incisions were made in both groups 1 and 2, fifteen minutes following the TAP block.

Group 3: After the end of the operation and when patient was discharged to the ward, the PCA device was utilized to maintain the analgesia. It was programmed to deliver a 1.5-milligram morphine bolus without a basic rate and with a fifteen-minute lock-out period. For the next twenty-four hours, the total amount of morphine administered was recorded.

Measurements

Intraoperative: oxygen saturation, mean arterial blood pressure, HR, end-tidal carbon dioxide, and total intraoperative analgesic consumption were measured. and recorded every ten minutes until the end of the surgery.

Postoperative

Hemodynamics (HR, MAP SpO_2, and respiratory rate) were recorded, 15 min after extubating, then after 2, 4, 6, 12, and 24 hours, anesthesia recovery time. VAS pain score, postoperative anesthesia care unit (PACU) stay, patient satisfaction (satisfied or not satisfied), time of first ambulation, days of hospitalization, post-surgery complications, and total amount of opioid administration in the first twenty-four hours after operation were recorded.

Ethical approval:

The study was authorized by Menoufia University's Faculty of Medicine Ethics Committee. Each participant received a full summary of the study's aims prior to completing an informed consent form. The Helsinki Declaration was observed at all stages of the study.

Statistical analysis: To review the collected data, SPSS version 26.0 was utilized. Mean±SD were employed to display quantitative data, which were compared by one-way-ANOVA test. Using the Shapiro-Wilk test, which assumes normalcy at $P > 0.05$, quantitative data were examined for normality. Qualitative data were presented as frequency and percentage and were compared by chi^2 test. A statistically significant P-value was defined as less than 0.05.

RESULTS

There was no significant difference between the 3 groups regarding age, sex or BMI **(Table 1).**

Table (1): Sociodemographic and baseline clinical characteristics of the studied patients (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value
Age (years)	Mean ± SD	48.3 ± 15.8	49.1 ± 15.9	52.6 ± 13.8	0.689@
Gender	Male Female	8 (50 %) 8 (50 %)	4 (25 %) 12 (75 %)	2 (12.5 %) 14 (87.5 %)	0.059#
BMI (kg/m^2)	Mean ± SD	28.5 ± 4.1	28.6 ± 2.9	29.8 ± 3.5	0.533@

@: One-Way-ANOVA test #: Chi squared test. G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was no significant difference between the 3 groups regarding HR measurements at any time pre- or postoperatively **(Table 2).**

Table (2): Heart rate measurements of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value@
At baseline	Mean ± SD	85.4 ± 13.8	82.1 ± 10.8	82.8 ± 13.4	0.741
At 10 min. intraoperatively	Mean ± SD	85.4 ± 13.8	85.7 ± 8.7	88.1 ± 12.1	0.784
At 20 min. intraoperatively	Mean ± SD	83.9 ± 11.4	84.1 ± 6.5	86.3 ± 11.4	0.764
At 30 min. intraoperatively	Mean ± SD	83.4 ± 13.7	84.1 ± 5.4	88.3 ± 11.4	0.304
At 40 min. intraoperatively	Mean ± SD	83.9 ± 3.7	84.8 ± 2.4	87.3 ± 8.3	0.196
At 50 min. intraoperatively	Mean ± SD	84.4 ± 8.3	85.1 ± 5.5	88.3 ± 10.2	0.368
At 60 min. intraoperatively	Mean ± SD	85.7 ± 5.5	84.3 ± 7.4	86.3 ± 7.4	0.699
At 15 min. postoperatively	Mean ± SD	86.2 ± 13.3	84.4 ± 4.6	82.8 ± 13.4	0.411
At 2h. postoperatively	Mean ± SD	83.1 ± 8.9	84.3 ± 3.6	87.6 ± 11.9	0.338
At 4h. postoperatively	Mean ± SD	82.7 ± 10.4	85.5 ± 5.1	85.5 ± 8.7	0.553
At 6h. postoperatively	Mean ± SD	83.0 ± 9.5	85.9 ± 4.1	85.8 ± 10.3	0.551
At 12h. postoperatively	Mean ± SD	84.6 ± 9.9	83.3 ± 6.3	86.6 ± 10.6	0.588
At 24h. postoperatively	Mean ± SD	84.4 ± 7.5	83.3 ± 6.9	85.6 ± 6.6	0.650

@: One-Way-ANOVA test, G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was no significant difference between the 3 groups regarding end tidal CO_2 measurements at any time intraoperatively **(Table 3).**

Table (3): End tidal CO_2 measurements of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value@
At baseline	Mean ± SD	38.3 ± 3.3	38.6 ± 2.0	39.1 ± 4.3	0.787
At 10 min. intraoperatively	Mean ± SD	38.9 ± 3.0	39.0 ± 2.1	40.0 ± 3.8	0.518
At 20 min. intraoperatively	Mean ± SD	38.2 ± 3.0	38.8 ± 2.4	39.4 ± 3.8	0.569
At 30 min. intraoperatively	Mean ± SD	38.9 ± 2.8	39.2 ± 2.6	39.9 ± 4.1	0.661
At 40 min. intraoperatively	Mean ± SD	38.8 ± 2.3	39.1 ± 3.4	40.1 ± 1.3	0.311
At 50 min. intraoperatively	Mean ± SD	39.3 ± 1.0	38.7 ± 2.5	39.6 ± 3.4	0.589
At 60 min. intraoperatively	Mean ± SD	38.7 ± 3.2	39.0 ± 1.4	39.0 ± 3.7	0.946

@: One-Way-ANOVA test G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was no significant difference between the 3 groups regarding O_2 saturation (%) measurements intraoperatively, at baseline, 24 h postoperatively. While there was a significant difference between the 3 groups regarding O_2 saturation (%) measurements 15 min, 2h, 4h, 6h, and 12 h postoperatively that showed a significant decrease in G3 in which PCA was used, compared to G1 and G2 **(Table 4).**

Table (4): O_2 saturation (%) measurements of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value@
At baseline	Mean ± SD	98.0 ± 1.9	97.1 ± 1.7	96.6 ± 1.4	0.076
At 10 min. intraoperatively	Mean ± SD	99.8 ± 0.4	99.6 ± 0.7	99.8 ± 0.4	0.518
At 20 min. intraoperatively	Mean ± SD	99.8 ± 0.4	99.6 ± 0.7	99.8 ± 0.4	0.518
At 30 min. intraoperatively	Mean ± SD	99.8 ± 0.4	99.6 ± 0.7	99.8 ± 0.4	0.368
At 40 min. intraoperatively	Mean ± SD	99.7 ± 0.2	99.8 ± 0.4	99.8 ± 0.2	0.518
At 50 min. intraoperatively	Mean ± SD	99.8 ± 0.3	99.7 ± 0.8	99.6 ± 0.3	0.561
At 60 min. intraoperatively	Mean ± SD	99.5 ± 0.3	99.6 ± 0.7	99.9 ± 0.6	0.121
At 15 min. postoperatively	Mean ± SD	97.3 ± 1.7	97.1 ± 1.7	95.4 ± 2.5	**0.021**
At 2h. postoperatively	Mean ± SD	97.3 ± 1.6	97.1 ± 1.7	95.4 ± 2.5	**0.020**
At 4h. postoperatively	Mean ± SD	97.3 ± 1.5	97.4 ± 1.7	95.9 ± 2.1	**0.044**
At 6h. postoperatively	Mean ± SD	97.4 ± 1.5	97.5 ± 1.6	95.9 ± 2.1	**0.025**
At 12h. postoperatively	Mean ± SD	97.5 ± 1.4	97.1 ± 1.7	95.4 ± 2.5	**0.009**
At 24h. postoperatively	Mean ± SD	97.1 ± 1.2	97.2 ± 1.8	95.9 ± 2.1	0.085

@: One-Way-ANOVA test G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was no significant difference between the 3 groups regarding MAP measurements at 30 min intraoperatively, at baseline, 15 min, 4, 6, 24 h postoperatively. While there was a significant difference between the 3 groups regarding MAP measurements at 10, 20 min intraoperatively, 2h, and 12 h postoperatively **(Table 5).**

Table (5): MAP measurements of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value@
At baseline	Mean ± SD	83.1 ± 5.8	86.8 ± 1.7	86.6 ± 4.3	**0.030**
At 10 min. intraoperatively	Mean ± SD	77.1 ± 13.6	80.5 ± 10.7	89.2 ± 4.5	**0.006**
At 20 min. intraoperatively	Mean ± SD	86.8 ± 7.2	86.5 ± 3.5	90.9 ± 4.8	**0.044**
At 30 min. intraoperatively	Mean ± SD	88.3 ± 8.9	91.9 ± 6.6	87.4 ± 3.8	0.148
At 40 min. intraoperatively	Mean ± SD	88.1 ± 2.7	91.7 ± 9.3	87.3 ± 2.8	0.086
At 50 min. intraoperatively	Mean ± SD	88.5 ± 5.9	91.5 ± 5.2	87.5 ± 3.8	0.076
At 60 min. intraoperatively	Mean ± SD	88.0 ± 5.8	92.0 ± 3.9	86.9 ± 8.2	0.061
At 15 min. postoperatively	Mean ± SD	85.3 ± 4.6	89.3 ± 6.3	88.5 ± 5.1	0.096
At 2h. postoperatively	Mean ± SD	85.1 ± 7.2	87.6 ± 5.7	90.8 ± 4.9	**0.038**
At 4h. postoperatively	Mean ± SD	85.9 ± 6.4	89.1 ± 5.1	87.3 ± 3.7	0.215
At 6h. postoperatively	Mean ± SD	87.8 ± 6.9	88.8 ± 4.7	88.4 ± 5.0	0.876
At 12h. postoperatively	Mean ± SD	88.6 ± 6.3	93.4 ± 6.1	89.4 ± 4.6	**0.049**
At 24h. postoperatively	Mean ± SD	88.6 ± 5.6	90.7 ± 4.8	87.8 ± 4.0	0.232

@: One-Way-ANOVA test G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was no significant difference between the 3 groups regarding RR measurements at any time postoperatively **(Table 6)**.

Table (6): Respiratory rate measurements of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value@
At 15 min. postoperatively	Mean ± SD	14.6 ± 1.9	15.2 ± 1.8	15.4 ± 1.9	0.391
At 2h. postoperatively	Mean ± SD	14.5 ± 2.6	14.8 ± 1.7	15.1 ± 1.5	0.677
At 4h. postoperatively	Mean ± SD	14.4 ± 2.0	15.2 ± 2.5	14.8 ± 1.8	0.558
At 6h. postoperatively	Mean ± SD	14.3 ± 3.2	14.1 ± 1.6	14.4 ± 1.4	0.923
At 12h. postoperatively	Mean ± SD	14.3 ± 1.6	14.3 ± 1.8	14.4 ± 1.5	0.932
At 24h. postoperatively	Mean ± SD	14.3 ± 2.2	14.2 ± 1.6	14.1 ± 1.3	0.979

@: One-Way-ANOVA test G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was a significant difference between the 3 groups regarding VAS measurements at all times postoperatively that showed increase in the scoring of G3 more than G1and G2 **(Table 7).**

Table (7): VAS score measurements of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value@
At 15 min. postoperatively	Mean ± SD	1.3 ± 0.9	1.5 ± 1.2	2.4 ± 1.6	0.024
At 1h. postoperatively	Mean ± SD	1.3 ± 0.9	1.5 ± 1.2	2.4 ± 1.6	0.028
At 2h. postoperatively	Mean ± SD	1.8 ± 0.9	2.1 ± 1.0	3.4 ± 2.3	0.012
At 3h. postoperatively	Mean ± SD	1.9 ± 0.8	2.2 ± 1.0	3.1 ± 1.8	0.031
At 4h. postoperatively	Mean ± SD	2.3 ± 0.6	2.4 ± 1.0	3.2 ± 1.6	0.043
At 5h. postoperatively	Mean ± SD	2.6 ± 1.0	2.9 ± 1.1	4.0 ± 1.4	0.005
At 6h. postoperatively	Mean ± SD	2.8 ± 1.1	3.5 ± 1.1	4.1 ± 1.5	0.019
At 7h. postoperatively	Mean ± SD	3.0 ± 1.2	3.8 ± 1.3	4.5 ± 1.5	0.012
At 8h. postoperatively	Mean ± SD	3.4 ± 1.3	3.9 ± 1.3	4.9 ± 1.5	0.011
At 11h. postoperatively	Mean ± SD	3.6 ± 1.3	4.1 ± 1.5	5.3 ± 1.7	0.009
At 20 h. postoperatively	Mean ± SD	4.7 ± 1.1	5.3 ± 1.4	6.1 ± 1.9	0.041
At 24h. postoperatively	Mean ± SD	5.1 ± 1.2	5.2 ± 1.3	6.6 ± 1.3	0.002

@: One-Way-ANOVA test G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

There was no significant difference between the 3 groups regarding the time to first ambulation and patient satisfaction, while there was a significant difference between the 3 groups regarding the anesthesia recovery time; the longest time was in G3 then G2 and the shortest time was in G1, and total opioid consumption (mg morphine) showed significant increase in G3 compared to G1 and G2 **(Table 8).**

Table (8): Outcome-related data of the studied group (N=48).

		G1 (n =16)	G2 (n=16)	G3 (n=16)	P value
Anesthesia recovery time (min)	Mean ± SD	11.4 ± 3.4	12.2 ± 2.8	22.9 ± 5.2	<0.001@
Time of first ambulation (h)	Mean ± SD	3.6 ± 7.6	1.6 ± 0.8	3.6 ± 0.7	0.357@
Total opioid consumption (mg morphine)	Mean ± SD	9.9 ± 3.0	9.9 ± 2.4	20.9 ± 2.2	<0.001@
Patient satisfaction	Satisfied Not satisfied	15 (93.8%) 1 (6.3%)	15 (93.8%) 1 (6.3%)	14 (87.5%) 2 (12.5%)	0.761#

@: One-Way-ANOVA test #: Chi squared test G1: oblique subcostal TAP block group, G2: lateral TAP block group, G3: PCA group

DISCUSSION

Opioid medication is the standard method for pain relief following ELLC; however, this drug has side effects that include slowing respiratory depression and constipation [9].

The main results of our study were the following:

The findings of this study demonstrated that the overall perioperative morphine consumption for cases undergoing ELLC in the lateral and oblique subcostal TAP block groups was reduced more than in the PCA morphine group, and the oblique subcostal group was more effective. The current study also revealed that the oblique subcostal and lateral TAP block groups were associated with lower VAS scores than the group of PCA who underwent laparoscopic cholecystectomy.

The oblique subcostal TAP block exhibits potential as a beneficial technique in the management of acute pain and as an element of multimodal approaches to pain relief. Studies have indicated that the block is particularly efficient in relieving pain in persons following surgery in the upper abdomen [10,11].

In the study conducted by **Breazu *et al.***[11], they examined 60 adult cases classified as ASA I/II who were scheduled for ELLC. These cases were randomly assigned to one of two groups: Group A (OSTAP placebo) got a bilateral OSTAP block with sterile normal saline before the operation, whereas Group B (OSTAP bupivacaine) received the identical quantities of 0.25 percent bupivacaine. There was a notable variance in the mean dose of opioids used during surgery among the 2 groups. Additionally, there was a statistically significant variation in the average amount of opioids consumed within twenty-four hours among the groups [11].

The group treated with OSTAP had a lower level of fentanyl demand compared to the one that received fentanyl as a postoperative analgesic, according to **Shin *et al.*** [12].

Regarding laparoscopic surgeries, the analgesic benefits of transverse abdominis plane blocks on opioid consumption and discomfort following surgery are likely to be technique- and trocar insertion site-dependent [13]. The variations in the dermatomal and sensory block spread of the posterior and subcostal TAP blocks, as well as nerve innervation on the port site incisions for ELLC, may account for the observed variation in the analgesic effects. The subcostal TAP block extended most cephalad to T8, while the posterior TAP block extended most sensorily to T10. Due to port site incisions are performed across the umbilicus and are innervated by nerves from T6 to L1 in the neurovascular plane of the abdominal wall, subcostal transverse abdominis plane block appears to be more successful than posterior transverse abdominis plane block for ELLC. [14,15].

The discrepancy in analgesic effects might be attributed to nerve innervation on port site incisions for laparoscopic cholecystectomy, as well as discrepancies in the dermatomal and sensory block spreads of subcostal and posterior TAP blocks. Subcostal and posterior TAP blocks had the greatest cephalad dermatomal and sensory block propagation to T8 and T10, respectively. As a result, subcostal TAP block appears to be more successful than posterior TAP block for laparoscopic cholecystectomy since port site incisions are made above the umbilicus and therefore innervated by nerves from T6 to L1 at the neurovascular plane of the abdominal wall [16,17].

In our study, there wasn't significant variation among the three groups with regard to patient satisfaction. Similar outcomes were found by **Ghisi *et al.*** [18].

Regarding the heart rate, respiratory rate and end tidal CO 2, we found no significant difference between the 3 groups, either at baseline, intraoperatively or postoperatively. Also, there was no significant difference between the 3 groups regarding O_2 saturation measurements intraoperatively, at baseline, 24 h postoperatively while there was a significant difference at 15 min, 2h, 4h, 6h, and 12 h postoperatively. Regarding MAP measurements, there was no significant difference between the 3 groups at 30 min intraoperatively, at baseline, 15 min, and 4, 6, 24 h postoperatively while there was a significant difference at 10, 20 min intraoperatively, 2h, and 12 h postoperatively.

A previous study evaluating the efficacy of OSTAP in patients undergoing laparoscopic cholecystectomy done by **Abdelmaboud *et al.*** [19], found that with respect to MAP, HR, oxygen saturation, and RR, there were no significant variances among the two groups except at 10 and 20 minutes postoperatively, where they were significantly reduced in the transverse abdominis plane block group than the control group. Additionally, $PaCO_2$ was found to show a significant increase in control compared to the TAP block group at 2 and 6 h, but there weren't significant variances among the two groups at 12 and 24 h [19].

CONCLUSION

Ultrasound-guided oblique subcostal TAP and lateral TAP blocks are superior to PCA morphine as an analgesic technique, providing patient satisfaction, lower postoperative pain, and reduced morphine consumption, making them a preferred pre-emptive method for postoperative pain relief.

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