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Role of Subcostal TAB in Laparoscopic Cholestectomy

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Background: Ultrasound-guided subcostal transverse abdominal plane block techniques prevent procedure complications and provide better postoperative pain and decrease total anaglesic requirement following LAP cholecystectomy. Aim: Our objective in this study to show the effect of subcostal TAB on haemodyanics, sedation score after lap cholecystectomy.
Methods: 80 patients undergoing laparoscopic cholestectomy. Patients divided in to 2 groups. Control group received intraperitoneal instillation of bupivacaine and study received ultrasound-guided subcostal transversus abdominis (STAP) block. Control group received intraperitoneal bupivacaine. At the end of surgery and before the removal of trocars, 40 ml of 0.25% bupivacaine instilled by the surgeon intraperitoneally and study group received USG-STAP block with bupivacaine. Ten minutes before skin incision; a volume of 40 ml of 0.25% bupivacaine and the same procedure repeated on the other side. We evaluated haemodyanics, sedation score after lap cholecystectomy. Results: This was a single -blinded prospective controlled randomized clinical trial that was carried on 80 patients. Study group showed insignificant changes in haemdyanics between two groups. Significant difference in sedation score between 2 groups (at 10 mins, 30 mins, 2, 4, 12, 16 hrs. Conclusion: The study showed that US-TAB block provide more anaglesia, and patients showed more calm and more satisafed.

1. Introduction

In the treatment of biliary lithiasis, laparoscopic cholecystectomy (LC) has largely supplanted open cholecystectomy in recent years. Despite being a minimally invasive procedure, postoperative pain is always a serious issue since it raises hospital stays, perioperative stress, and morbidity [1-3].

Numerous variables contribute to pain during laparoscopic cholecystectomy, including shoulder tip discomfort from diaphragmatic irritation and visceral pain from tissue injury in the anterior abdominal wall during trocar insertion.

One variant of TAP is the ultrasound-guided (USG) subcostal transversus abdominis plane block (STAP), which was initially reported by Hebbard et al., (2010)[4]. According to the findings of a few short trials, LC produced noticeably superior analgesia than port-site infiltration, conventional TAP, and classic opioid analgesia [5, 6].

As an analgesic method, local anesthetics are injected intraperitoneally (IP) around the surgical site. After LC surgery, intraperitoneal infiltration of LA improves the postoperative recovery profile and result and dramatically lowers pain intensity ratings in the early postoperative

period. According to Yadava et al., (2016)[7], pain originates from visceral locations and referred shoulder discomfort (C3, C4) that is brought on by irritation of the diaphragmatic innervations. Pain originates from visceral areas, and shoulder referred pain (C3, C4) is caused by irritation of the diaphragmatic innervations [7].

The purpose of this study was to examine the hemodynamic effects of intraperitoneal bupivacaine injection with ultrasound-guided subcostal transversus abdominis (STAP) block in patients undergoing LC.

2. PATIENT AND METHOD:

Our study was prospective randomized single-blind study carried on 80 patients scheduled for elective LC in General surgery list at Assiut University Hospital.

Inclusion criteria:

Patients aged 20 to 65 who are having elective LC under general anesthesia meet the inclusion requirements.

Criteria for exclusion:

Regional block contraindications, such as diaphragmatic paralysis, coagulopathy, or infection at the location of needle insertion. Randomization

After obtaining an approval from the ethics committee of Assiut University Hospital and an informed written consent from all patients, they allocated randomly by computer-generated random numbers in a single-blind manner using numbered sealed envelopes contain 40 patient in each group.

Group I: Patients received bupivacaine through the intraperitoneal route at the end of surgery.

Group II: Ten minutes before to skin incision, both sides of the USG-STAP block were treated with bupivacaine.

Calculated sample size In order to demonstrate a real difference of 1.0 points in the mean NRS score between the two groups with a type I error of 0.05 and power of 80%, we recruited 36 patients in each group, according to a power analysis based on a prior study [8].

In order to account for patient dropout, we added 40 patients to each group. An 18 G peripheral intravenous cannula was placed as soon as the patient arrived in the operating room, and conventional monitoring procedures such as electrocardiography (ECG), non-invasive blood pressure, and pulse oximetry were used. The patients were also constantly observed.

Every patient is given the same general anesthetic treatment. Following complete preoxygenation, fentanyl (2 ug/kg) and propofol (1.5-2 mg/kg) were used to produce anesthesia, and the trachea was intubated two to three minutes after cis-atracurium (0.15 mg/kg) was administered intravenously. To keep the end-tidal carbon dioxide ($ETCO_2$) tension between 30 and 35 mmHg, the lungs were manually ventilated with oxygen. Sevoflane, oxygen, and 0.03 mg/kg of cis-atracurium were used to maintain anesthesia.

Following surgery, all patients were given atropine 0.02 mg/kg and neostigmine 0.05 mg/kg

to counteract the remaining neuromuscular blocker. The patient was sent to the post-anesthesia care unit (PACU) following extubation and complete recovery.

Patients in Group I were given intraperitoneal bupivacaine and The surgeon administered 40 ml of 0.25% bupivacaine intraperitoneally at the gallbladder bed and beneath the domes of both diaphragms under direct eyesight at the conclusion of the procedure and prior to the removal of the trocars.

Bupivacaine and USG-STAP block were administered to patients in Group II. Ten minutes prior to the skin incision, the STAP block was administered under ultrasound guidance. The probe was positioned under the xiphisternum and pushed laterally down the subcostal edge to the anterior axillary line.

The tip of a 100 mm, 22G block needle is then positioned between the internal oblique muscle and the transversus abdominis muscle in the neurovascular plane, immediately inferior to the right costal border at the anterior axillary line. After aspiration, 40 milliliters of 0.25% bupivacaine were added, and the process was repeated on the opposite side.

Montorning of Hemodynamic variables (non-invasive arterial blood pressure, heart rate, and oxygen saturation) recorded before anesthesia induction (baseline), after tracheal intubation, after STAP block performance, at start of surgery, and every 15 min until end of surgery. Then they recorded at 10 min, 30 min, 2 h, 4h, 8 h, 12 h, 16 h, and 24 h after surgery in PACU and End tidal CO_2 ($ETCO_2$) recorded immediately after tracheal intubation, after STAP block performance, at start of surgery, and every 15 min until end of surgery.

Postoperative sedation after surgey assesed by Ramsay sedation score with: 0 = awake, oriented; 1= agitated, anxious; 2= awake, cooperative; 3= sleeping, but cooperative; 4= deep sedation, quick reaction to pain stimuli; 5= deep sedation, slow reaction to deep stimuli; 6= deep sedation, no reaction to pain stimuli at 10 min, 30 min, 2 h, 4h, 8 h, 12 h, 16 h, and 24 h. duration of surgey and anesthesia was recorded.

Our Primary outcome variable was haemdyanics changes in patients.

Secondary outcome, Ramsay sedation score and duration of hospital stays.

Statistical analysis:

The mean and standard deviation are used to express quantitative data. The Kolmogorov-Smirnov test is used to determine if the data distribution is normal. The Chi-square test or Fisher's exact test is used when comparing categorical data, while the independent t test is used when comparing the means of quantitative data.

Logistic regression analysis to evaluate the multivariate connection with NLR. Spearman's correlation analysis was used to evaluate the relationship between NLR, age, and postoperative analgesic use. A P-value of less than 0.05 is deemed statistically significant.

3. Results

80 patients of both groups were comparable in terms of demographic data such as age, weight, height, sex, the duration of surgery and duration of anesthesia. No patient was removed from

the study.

Table (1): Personal data of the studied groups

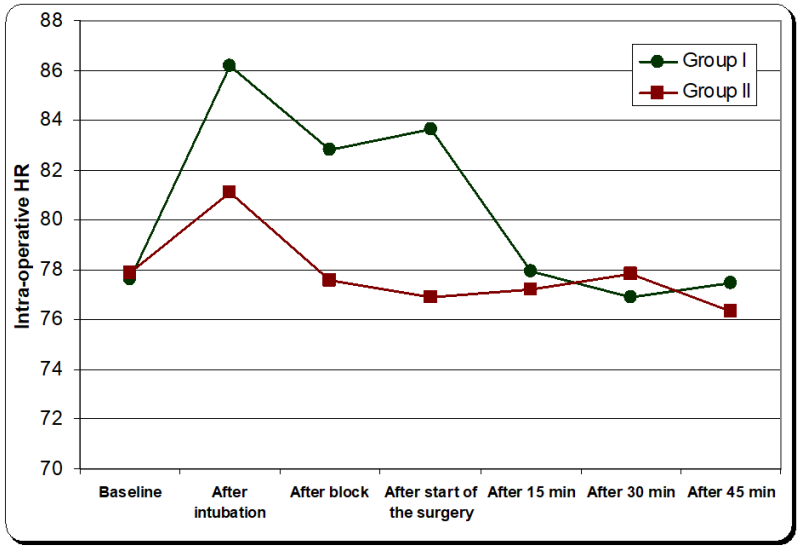
Personal data	Group I (n= 40)		Group II (n= 40)		P-value
	No.	%	No.	%	
Sex:					
Male	11	27.5%	16	40.0%	0.237
Female	29	72.5%	24	60.0%	
Age: (years)					
Mean ± SD	36.88 ± 9.32		37.70 ± 8.68		0.683
Range	22.0-57.0		25.0-53.0		
BMI:					
Mean ± SD	30.38 ± 2.89		30.85 ± 2.88		0.463
Range	26.0-35.0		26.0-36.0		
ASA:					
I	19	47.5%	22	55.0%	0.502
II	21	52.5%	18	45.0%	
Duration of anesthesia: (min)					
Mean ± SD	64.87 ± 11.79		62.00 ± 6.68		0.184
Duration of surgery: (min)					
Mean ± SD	45.25 ± 4.93		44.88 ± 3.49		0.696

Comment:

There is no significant differenece between age and sex in group I and group II. There is no significant differenece between Duration of anesthesia and Duration of surgery in group I and group II

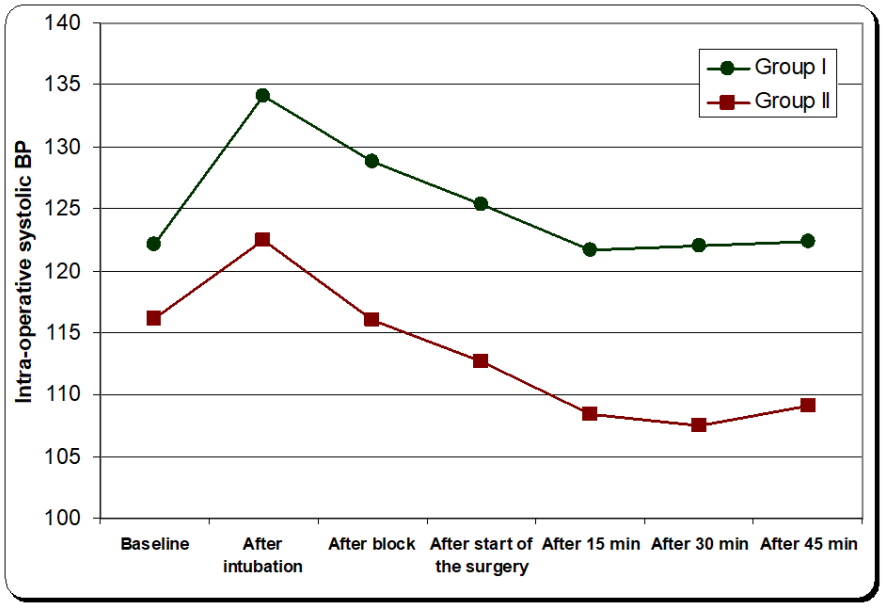
Intra-operative heart rate

There is no significant difference in heart rate a long surgey duration except after block and after start of surgey but this was of no clinical significant as values were within normal HR range (baseline, after intubation,, after 15 min, after 30 min, after 45 min) in group I and group II.



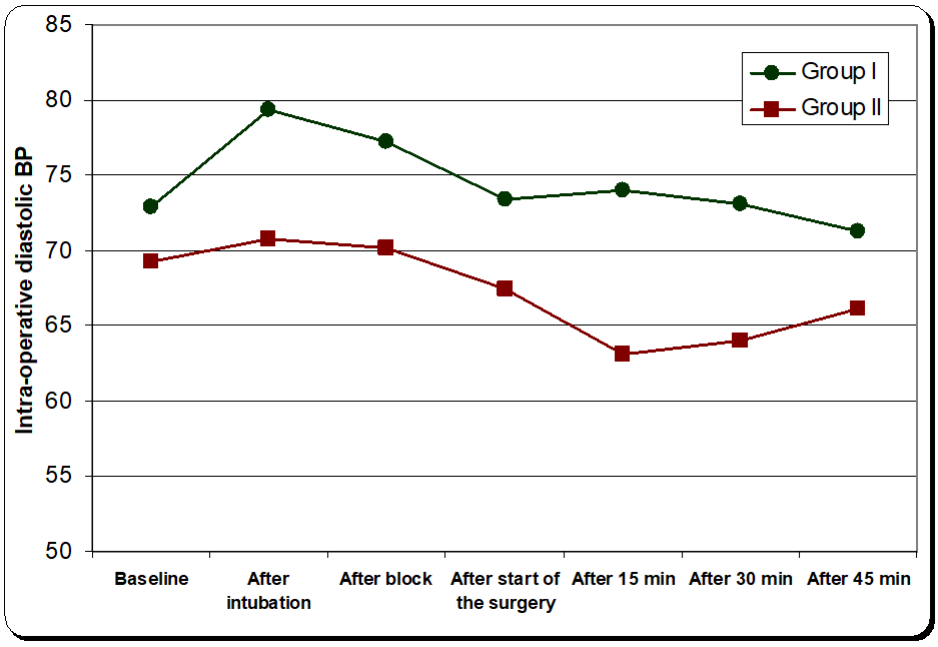
Intra-operative systolic blood pressure

There is significant decrease in values of systolic blood pressure in TAB group than intrapeationeal group (after intubation, after start of the surgery, after 15 min, after 30 min, after 45 min) in group I and group II.



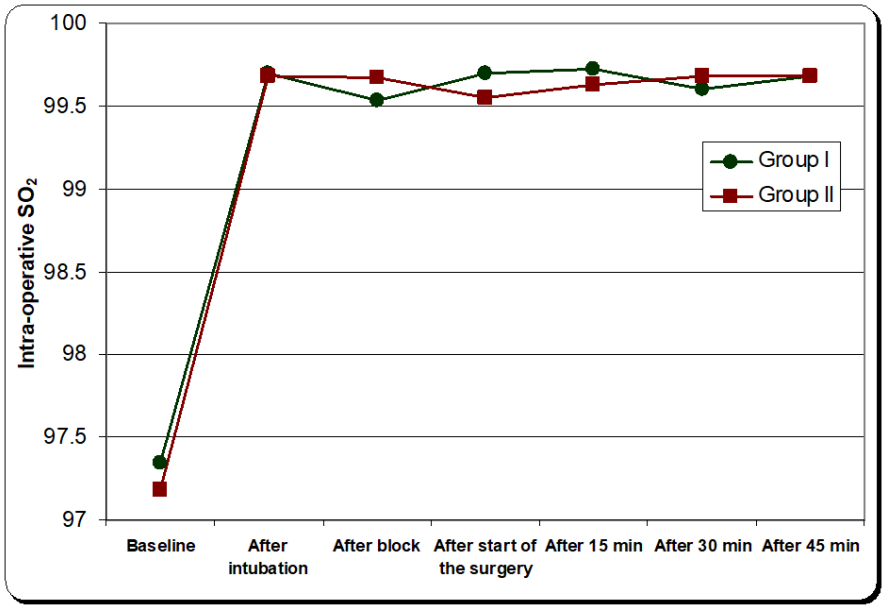
Intra-operative diastolic blood pressure

There is significant decrease in diasystolic blood pressure in TAB group than intrapeationeal group (after intubation, after start of the surgery, after 15 min, after 30 min, after 45 min) in group I and group II.



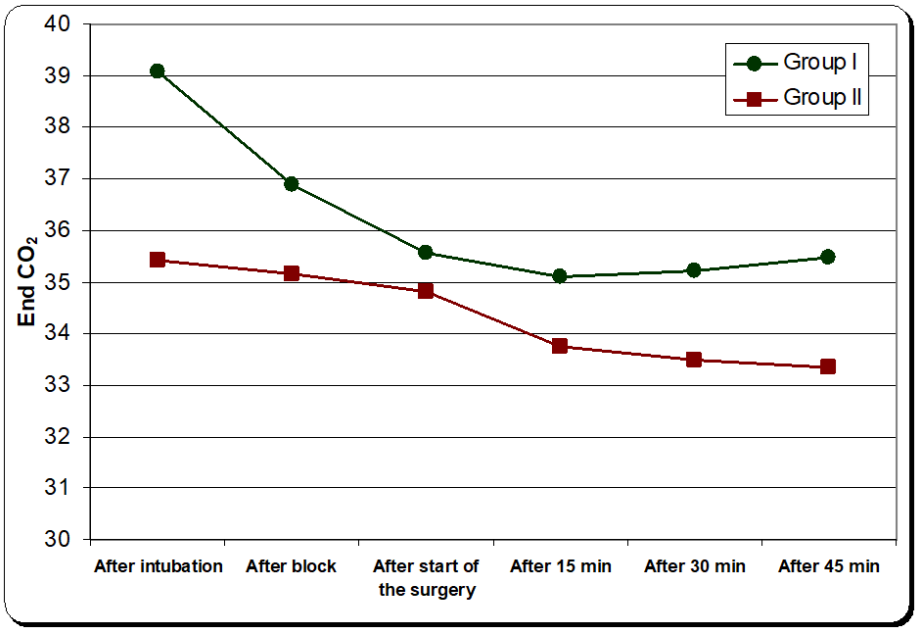
Intra-operative SO_2

There is no significant difference SO_2 (baseline, after intubation, after start of the surgery, after 15 min, after 30 min, after 45 min) in group I and group II.



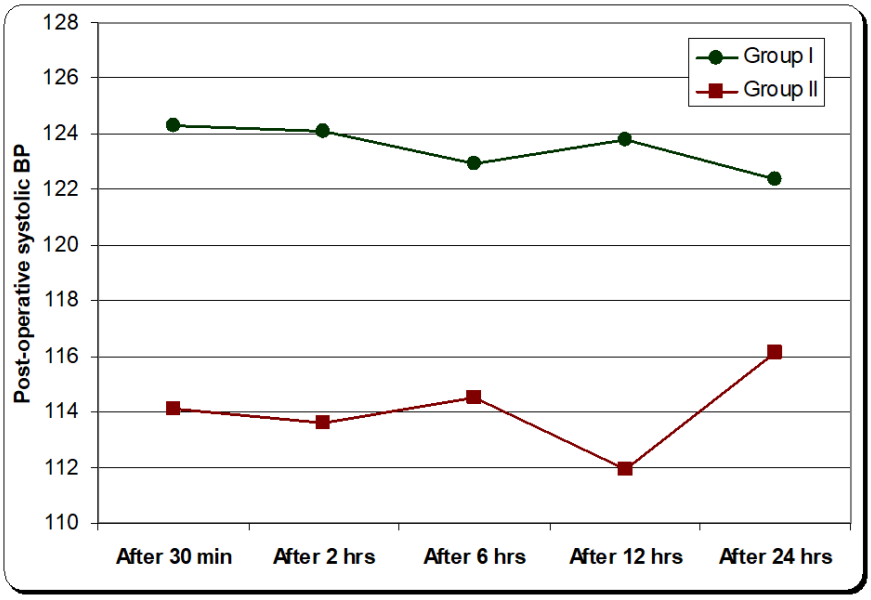
End CO_2

There is no significant differenece end-tidal CO_2 (baseline, after intubation, after start of the surgery, after 15 min, after 30 min, after 45 min) in group I and group II.



Post-operative systolic blood pressure

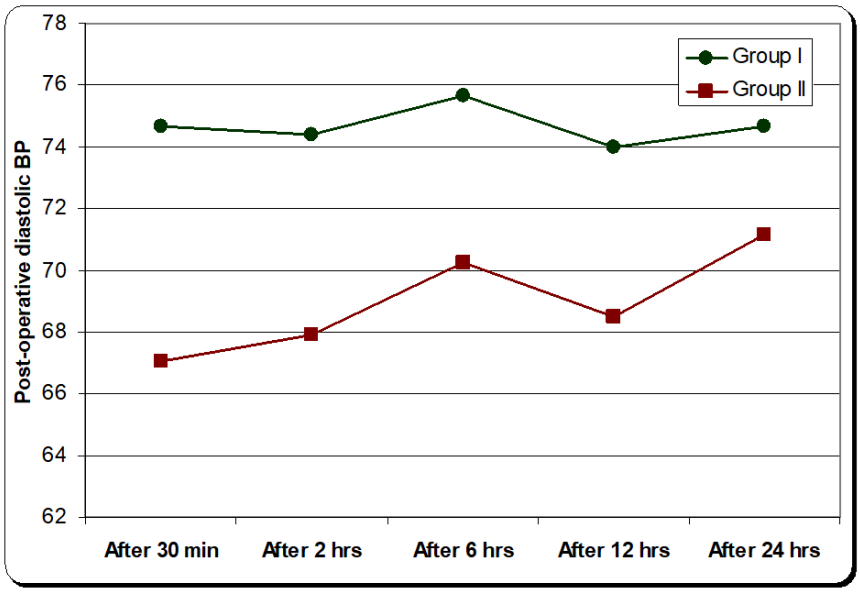
There is significant decrease in values of Post-operative systolic blood as there were in TAB block group than Intrapreationeal group pressure, after 30 min, after 2 hrs, after 6 hrs, after 12 hrs, after 24 hrs) in group I and group II.



Post-operative diastolic blood pressure

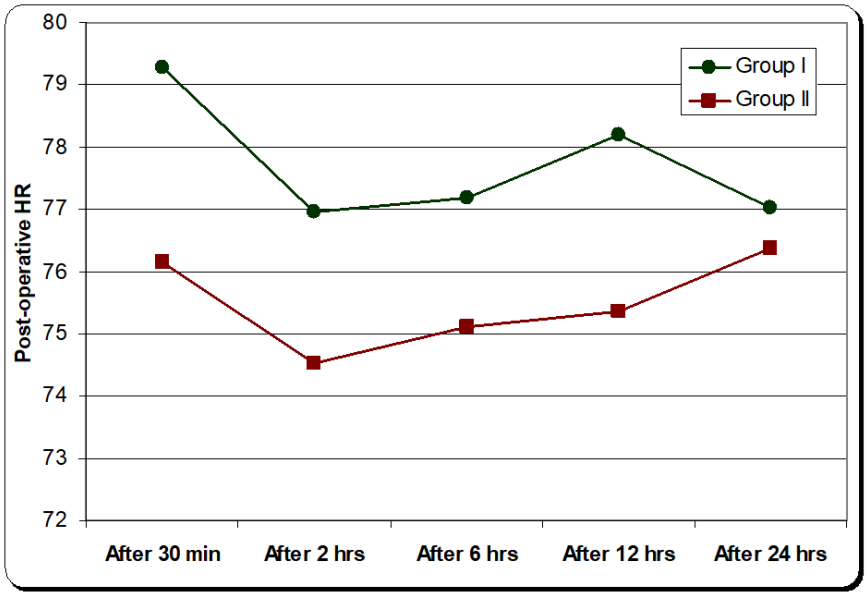
There is statistical significant decrease in diastolic blood pressure in group II than group I

(P<0.05).but of no clinical significant as all values within normal diastolic blood pressure.



Post-operative heart rate

There is no significant difference Post-operative heart rate (after 30 min, after 2 hrs, after 6 hrs, after 12 hrs, after 24 hrs) in group I and group II.



Post-operative SO_2

There is no significant difference Post-operative SO_2 (after 30 min, after 2 hrs, after 6 hrs, after 12 hrs, after 24 hrs) in group I and group II.

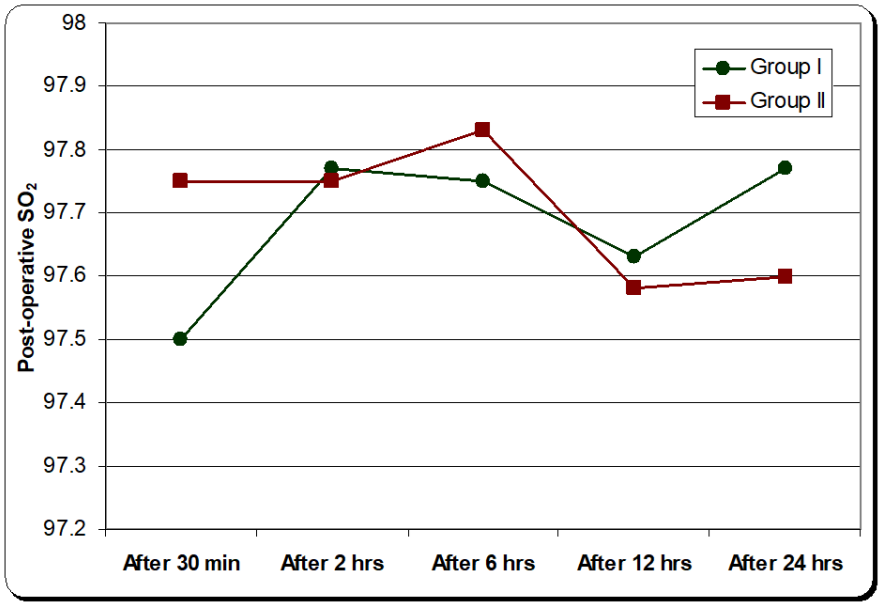


Table (2): Sedation score

Sedation score	Group I (n= 40)	Group II (n= 40)	P-value[1]
	Mean ± SD	Mean ± SD	
After 10 min	1.28 ± 0.45	2.03 ± 0.16	0.000*
After 30 min	1.97 ± 0.28	2.28 ± 0.45	0.001*
P-value[2]	0.000*	0.004*	
After 2 hrs	2.88 ± 0.52	2.53 ± 0.64	0.009*
P-value[2]	0.000*	0.000*	
After 4 hrs	3.45 ± 0.55	2.95 ± 0.60	0.000*
P-value[2]	0.000*	0.000*	
After 8 hrs	3.12 ± 0.52	2.98 ± 0.70	0.278
P-value[2]	0.000*	0.000*	
After 12 hrs	2.97 ± 0.70	3.30 ± 0.76	0.049*
P-value[2]	0.000*	0.000*	
After 16 hrs	2.35 ± 0.53	2.82 ± 0.59	0.000*
P-value[2]	0.000*	0.000*	
After 24 hrs	1.95 ± 0.22	2.00 ± 0.00	0.156
P-value[2]	0.000*	0.656	
P-value[3]	0.000*	0.000*	

Comment:

There is significant differenece at Sedation score (After 10 min, after 30 min, after 2 hrs, after

4 hrs, after 8 hrs, after 12 hrs, after 16 hrs, after 24 hrs) in group I and group II.

The Sedation score in group I, patients were agitated and anxious before receving analgesic but Sedation score in group II, patients were clam, sleeping and cooperative before receiving analgesic.

4. Discussion:

Our study showed that subcostal TAP block provide better NRS at rest, severity of shoulder pain and during cough. Also showed decrease in total anaglesic requirement and longer rescue of anaglesia.

In 2018, Vladimir Vrsajkov et al, in this study showed that using tramdol as an adjvant to bupivacaine in subcostal TAB block vs using tramadol intravenous postoperative [9]. In his study, Vladimir Vrsajkov et al. demonstrated that subcostal transversus abdominis plane block considerably decreased postoperative pain levels across all postoperative time periods when compared to normal analgesia. The subcostal transversus abdominis plane consumed considerably less tramadol (24.29 ± 47.54 g) than the conventional analgesia group (270.2 ± 81.9 g) ($p = 0.000$) [9].

In 2022, Serhat Ozciftci et al. conducted a research in which three groups of patients received unilateral subcostal TAB, bilateral subcostal TAB, and no block in the control group.According to his research, right unilateral TAP block is just as efficient as bilateral TAP block in providing postoperative analgesia following laparoscopic cholecystectomy [10].

In 2019, Canan Yılmaz et al, in his study showed Comparison of Ultrasound-Guided Subcostal Transversus Abdominis Plane Block and Quadratus Lumborum Block in laparoscopic cholecystectomy. In this study there was no siginifant difference in VAS score between two groups [11].

In September 2020, Ahmed Medhat Ahmed et al, in his study showed the effect of adding ketamine as an adjvant in ultrasound Guided Subcostal Transversus Abdominis Plane Block After Laparoscopic Cholecystectomy For Postoperative Analgesia. This study results in statistically insignificant in the following: longer period until first opioid requirement and prolonged block duration, less opioid requirement, early ambulation and the patient is being more satisfied [12].

According to a 2018 research by Prashant Bhalekar et al., patients who received subcostal transverses abdominis plane block (TAPB) under ultrasound guidance experienced analgesia following laparoscopic cholecystectomy more effectively than those who did not. According to a research by Prashant Bhalekar, the group that got subcostal TAB had a considerably lower percentage of patients who needed paracetamol ($P < 0.002$) and nalbuphine ($P < 0.001$) as rescue analgesics than the group that received 0.9% normal saline (20 mL on each side) after finishing [13].

5. Conclusion:

The study showed that usage of subcostal TAP block provide better analgesia.

References

[1] Ji W, Li L-T, Li J-S. Role of laparoscopic subtotal cholecystectomy in the treatment of complicated cholecystitis. Hepatobiliary & pancreatic diseases international: HBPD INT. 2006;5(4):584-9.

[2] Cuschieri A. Laparoscopic cholecystectomy. Journal of the Royal College of Surgeons of Edinburgh. 1999;44(3):187-92.

[3] Berggren U, Gordh T, Grama D, Haglund U, Rastad J, Arvidsson D. Laparoscopic versus open cholecystectomy: hospitalization, sick leave, analgesia and trauma responses. Journal of British Surgery. 1994;81(9):1362-5.

[4] Hebbard PD, Barrington MJ, Vasey C. Ultrasound-guided continuous oblique subcostal transversus abdominis plane blockade: description of anatomy and clinical technique. Regional Anesthesia & Pain Medicine. 2010;35(5):436-41--41.

[5] Chen C-M, Chen J-S, Tsai W-C, Hsu H-C, Chen K-H, Lin C-H. Effectiveness of device-assisted ultrasound-guided steroid injection for treating plantar fasciitis. American Journal of Physical Medicine & Rehabilitation. 2013;92(7):597-605.

[6] Bhatia N, Arora S, Jyotsna W, Kaur G. Comparison of posterior and subcostal approaches to ultrasound-guided transverse abdominis plane block for postoperative analgesia in laparoscopic cholecystectomy. Journal of clinical anesthesia. 2014;26(4):294-9.

[7] Yadava A, Rajput SK, Katiyar S, Jain RK. A comparison of intraperitoneal bupivacaine-tramadol with bupivacaine-magnesium sulphate for pain relief after laparoscopic cholecystectomy: A prospective, randomised study. Indian Journal of Anaesthesia. 2016;60(10):757-62.

[8] Machin D, Campbell MJ, Tan SB, Tan SH. Sample sizes for clinical, laboratory and epidemiology studies. John Wiley & Sons. 2018:85-9.

[9] Vrsajkov V, Mančić N, Mihajlović D, Milićević ST, Uvelin A, Vrsajkov JP. Subcostal transversus abdominis plane block can improve analgesia after laparoscopic cholecystectomy. Revista Brasileira de Anestesiologia. 2018;68:149-53.

[10] Ozciftci S, Sahiner Y, Sahiner IT, Akkaya T. Is right unilateral transversus abdominis plane (TAP) block successful in postoperative analgesia in laparoscopic cholecystectomy? International journal of clinical practice. 2022;2022(1):2668215.

[11] Yılmaz C, Baytar Ç, Karasu D, Topal S. Comparison of Ultrasound-Guided Subcostal Transversus Abdominis Plane Block and Quadratus Lumborum Block in Laparoscopic Cholecystectomy: A Prospective, Randomized, Controlled Clinical Study. Pain Research and Management. 2019;2019(1):2815301.

[12] Ahmed AM. Ultrasound Guided Subcostal Transversus Abdominis Plane Block For Postoperative Analgesia After Laparoscopic Cholecystectomy (comparative Study Between Bubivacaine Versus Bubivacaine-Ketamine). Al-Azhar International Medical Journal. 2020;1(9):242-7.

[13] Bhalekar P, Gosavi R, Mutha S, Mahajan V, Phalgune D. Efficacy of ultrasound-guided subcostal transversus abdominis plane block for analgesia after laparoscopic cholecystectomy. The Indian Anaesthetists Forum. 2018;19(2):73-7.