



COMPARATIVE STUDY TO ASSES ANALGESIC EFFICACY AND OPIOID SPARING EFFECT OF USG GUIDED SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK WITH INTRAPERITONEAL INSTILLATION OF BUPIVACAINE IN PATIENT UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY FOR POSTOPERATIVE PAIN RELIEF.

**Dr. Kashish Khan**

Department of anaesthesia and critical care, Santosh medical college and hospitals Ghaziabad U.P.India.

**Dr. Jahnavi Tomar**

Department of anaesthesia and critical care, Santosh medical college and hospitals Ghaziabad U.P.India.

**Dr. Mahima Lakhanpal**

Department of anaesthesia and critical care, Santosh medical college and hospitals Ghaziabad U.P.India.

**Dr. Suveer Shrama**

Department of anaesthesia and critical care, Santosh medical college and hospitals Ghaziabad U.P.India.

### ABSTRACT

**Background-** Intensity of pain in early post-operative period after laparoscopic cholecystectomy is significant. There are several methods employed in the management of postoperative pain after laparoscopic cholecystectomy such as conventional systemic analgesics, including paracetamol, non-steroidal anti-inflammatory drugs, systemic opioids, and thoracic epidural analgesia with all having its limitations and side effects. **Objective-** The present study aims to compare ultrasound-guided subcostal transversus abdominis (STA) block with intraperitoneal instillation of bupivacaine in reducing postoperative pain, total analgesic consumptions after elective laparoscopic cholecystectomy. **Materials and methods:** 60 adult patients were randomly divided into 2 groups of 30 in each. The selected patients were randomly divided into two groups Group 1, patients received USG guided tap block before surgery. Group 2 patients received 40 ml of 0.25 % bupivacaine after surgery, instillation done by surgeon intraperitoneally at gall bladder bed and under the domes of diaphragm. **Statistical analysis:** In all Quantitative data were expressed in mean and standard deviation. Qualitative data were expressed in proportion and percentages. To find the significant difference between the bivariate samples in independent groups the Unpaired sample t-test and the Mann-Whitney U test was used. Above statistical tools the probability value > .05 was considered as significant level. **Results:** The mean Numerical Rating Scale scores were less in Group 1 than in Group 2 from 1 hours to 24 hours and it was statistically significant. Demand of rescue analgesia was higher in group 2 when compared to group 1 and it was statistically significant. **Conclusion:** TAP block is a better modality for analgesia compared to intraperitoneal instillation in patients undergoing elective laparoscopic cholecystectomy.

**KEYWORDS :** Intraperitoneal levobupivacaine, laparoscopic cholecystectomy, Numerical Rating Scale, subcostal transversus abdominis block, ultrasonography.

### INTRODUCTION

Since the year 1987, laparoscopic cholecystectomy is a normal procedure is considered to be the " Gold Standard" method for the treatment of acute and chronic cholecystitis. Major benefit of using laparoscopy for upper GI surgery is that it would avoid upper abdominal incision. Such upper abdominal incisions otherwise can hinder post-operative pulmonary rehabilitation, cause of surgical wound pain, and thereby increases the total medical cost.<sup>[1-4]</sup> Considering the major benefits, laparoscopic cholecystectomy is being believed to be the treatment of choice for a wide spectrum of gallbladder diseases.<sup>[5-8]</sup> Laparoscopic surgeries are relatively painless and are associated with early recovery and lesser duration of hospital stay, they can cause severe pain, especially in the first 4 h of the immediate post-operative period<sup>[9]</sup>. This may be attributed to the peritoneal irritation caused by the carbon dioxide insufflation pressures, bowel handling by the surgeons or irritation caused by the residual or retained blood. Opioids have been the main mode of analgesia in the perioperative period and are associated with significant side effects, physical dependence, respiratory depression and addiction.<sup>[10]</sup>

There are several methods employed in the management of pain after laparoscopic cholecystectomy such as conventional systemic analgesics, including paracetamol, non-steroidal anti-inflammatory drugs, thoracic epidural analgesia, low-pressure pneumoperitoneum. Anaesthesiologists play an important role in identifying at-risk patients for long-term opioid use and thereby reducing perioperative and postoperative opioid administration and decreasing related side effects.<sup>[11]</sup> Though opioid-free regimens have been studied earlier, there is sparsity of literature incorporating

regional anaesthesia and blocks. This study was planned to provide analgesia with drugs other than opioids along with TAP blocks for post-operative analgesia with an aim to reduce opioid requirement and its associated adverse effects.

In the present study, we have compared ultrasound-guided subcostal transversus abdominis (STA) block with intraperitoneal instillation of levobupivacaine in reducing postoperative pain, and its analgesic efficacy and total analgesic consumption, in patients after elective laparoscopic cholecystectomy.

### MATERIAL AND METHODS

This is a hospital based prospective, randomized comparative study was conducted between the period of August 2021 and July 2022 at the Department of Anaesthesiology, Santosh Medical College and Hospital, Santosh Deemed to be University, Ghaziabad, UP.

#### Inclusion Criteria:

ASA physical status I -II, Age more than 18 years but less than 65 years, Either sex, BMI more than 18 or less than 35

#### Exclusion Criteria:

Patient's refusal, Pregnancy, Allergy to local anaesthetic, Alcohol or drug abuse, Chronic opioid intake, Consumption of any pain killers within the 24hr before the surgery, Infection at injection site, Coagulation abnormality, Severe psychiatric disorder.

After obtaining approval from institutional ethics committee of Santosh Deemed to be University, Ghaziabad, 60 adult patients were randomly divided into 2 groups of 30 in each.

Group 1: Patients receiving USG guided tap block before surgery performed by trained anaesthetists.

Group 2: Patients receiving 40 ml of 0.25 % bupivacaine after surgery, instillation done by surgeon intraperitoneally at gall bladder bed and under the domes of diaphragm under direct vision.

Pre-anaesthetic examination was done and written informed consent was taken. Routine physical examination of all patients was carried out. Airway examination, MPG grading, mouth opening was also assessed. All routine investigations, appropriate for the surgery were carried out. The patients were instructed to fast overnight and aspiration prophylaxis and were advised with Tab Rantac 150 mg and Tab alprazolam 0.25 mg night before surgery NRS pain score was explained to all the patients and information was given regarding pain scoring system ranging from 0 to 10 for determination of severity. Numerical Rating Scale (NRS): having the anchors of "No Pain" and "Worst Pain" that would be rated from 0 through 10. Intravenous paracetamol is used as first line rescue analgesia, intravenous tramadol as second line rescue analgesia and intravenous fentanyl as third line rescue analgesia.

On arrival to the operation theatre, standard ASA recommended monitoring was done with 5.lead electro cardiogram, non-invasive blood pressure, finger pulse oximetry, and end tidal carbon dioxide (CO2) in all patient. A standardized general anaesthetic regime was employed in all patients, consisting of propofol 3mg/kg, fentanyl 2 µg/kg, and vecuronium 0.1 mg/kg, and intraoperative anaesthesia was maintained with 70% nitrous oxide, 30% oxygen, and 1% isoflurane. At the end of surgery, all patients were given analgesia with paracetamol 15 mg/kg and neuromuscular block was reversed with standard doses of neostigmine and glycopyrrolate.

For Group 1, the STA block was given under ultrasound guidance; the probe was placed below the xiphisternum and moved laterally along the subcostal margin to the anterior axillary line. A 100mm, 22G block needle was then guided just inferior to the right costal margin at the anterior axillary line such that the tip lay between the transversus abdominis and internal oblique muscle within the neurovascular plane. Following aspiration, a volume of 20 ml of 0.25% levobupivacaine was injected, and the same procedure was repeated on the other side. Data were collected in postanaesthetic care unit by another anaesthesiologist who did not know which patient has received STA block or intraperitoneal instillation.

For Group 2, at the end of surgery and before the removal of trocars, 40 ml of 0.25% levobupivacaine diluted in normal saline was instilled by the surgeon intraperitoneally at gallbladder bed and under domes of both diaphragms under direct vision. The pressure of the gas insufflation was kept within 10–12 mm Hg in all patients. At the end of surgery, CO2 was evacuated, and intraperitoneal anaesthetic solution was left in situ.

**Data analysis:**

In the present study, we have evaluated the analgesic efficacy and opioid-sparing effect of subcostal transversus abdominis plane block in laparoscopic cholecystectomy when compared with intraperitoneal instillation of bupivacaine for postoperative pain relief, the observation and results were analysed. The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe the data descriptive statistics frequency analysis, percentage analysis was used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in independent

groups the Unpaired sample t-test and the Mann-Whitney U test was used. The significance between the groups for categorical data Chi-Square test was used. In all the above statistical tools the probability value > .05 was considered as significant level.

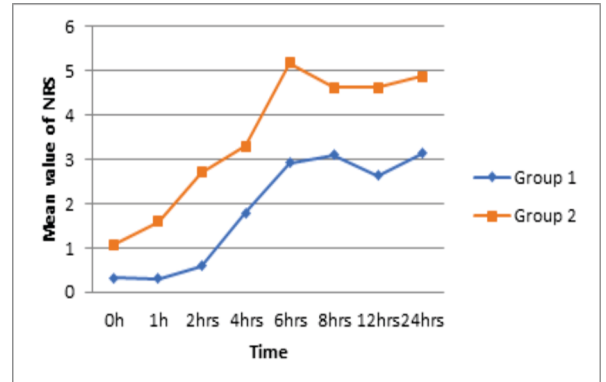
**RESULTS:**

Table 1 shows the distribution according to NRS score for abdominal pain and for data analysis mann whitney u test is used. Both the two groups experienced a gradual reduction in pain after laparoscopic cholecystectomy, as evidenced by NRS scores and the need of analgesics. This difference was reported from 0 hour till 24 hours post-operatively. At 0 post-operative hour, the mean NRS score for pain of group 1 and 2 was 0.33±1.06 and 1.07±1.6 respectively, there was no statistical significance as p value was 0.079. NRS at 1 hour, the mean NRS score for abdominal pain of group 1 and 2 was 0.3 ±1.15 and 1.6±1.75 respectively. At 2hrs the mean NRS score was 0.6±1.358 and 2.7±2.1 for group 1 and group 2 respectively. At 4hrs the mean NRS score was 1.8±1.54 and 3.3±1.84 for group 1 and group 2 respectively. At 6 hrs mean NRS score was 2.93±1.89 and 5.17±1.26 respectively for group 1 and group 2. At 12hrs mean NRS score was 2.63±1.94 and 4.63±1.71 for group 1 and group 2 respectively. And at 24hrs the mean NRS score was 3.13±1.55 and 4.87±1.7 respectively for group 1 and group 2. Though NRS score was lower in group 1 than group 2 from 1 hours to 24 hours and it was statistically significant as p values are 0.003,0.0004,0.003, <0.0001,0.0002,0.0002 and 0.0002 at 1, 2, 4,6,8,12 and 24hrs.

Table 2 demonstrate rescue analgesia received by patients of both the groups at 6, 12 and 24 hours. In group 1, 3 (10.00%) patients received and 27 (90.00%) not received rescue analgesia at 6hrs. in group 2, 8 (26.67%) patients received and 22 (73.33%) not received analgesia at 6hrs. In group 1, 1 (3.33%) received and 29 (96.67) patients not received analgesia at 12 hrs. In group 2, 4(13.33%) received and 26(86.67%) not received analgesia at 12hrs. In group 1 0(0.00%) patient received and 30(100%) patients not received analgesia at 24hrs. In group 2, 6 (20.00) patients received and 24 (80.00%) not received analgesia at 24hrs. The data is statistically significant as p value at 6hrs is 0.007, at 12hrs 0.012 and at 24hrs is 0.023.

**Table 1:**

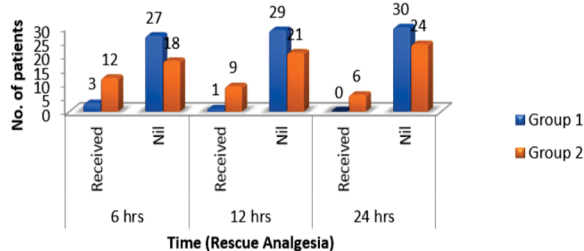
Time	NRS		p value
	Group 1 (Mean±SD)	Group 2 (Mean±SD)	
0h	0.33±1.06	1.07±1.6	0.079
1h	0.3±1.15	1.6±1.75	0.003
2hrs	0.6±1.38	2.7±2.1	0.0004
4hrs	1.8±1.54	3.3±1.84	0.003
6hrs	2.93±1.89	5.17±1.26	<0.0001
8hrs	3.1±1.52	4.63±1.56	0.0002
12hrs	2.63±1.94	4.63±1.71	0.0002
24hrs	3.13±1.55	4.87±1.7	0.0002



**Mann Whitney U test**

Table 2 :

Time		Rescue Analgesia				p value
		Group 1		Group 2		
		N	%	N	%	
6 hrs	Received	3	10.00	12	40.00	0.007
	Nil	27	90.00	18	60.00	
12 hrs	Received	1	3.33	9	30.00	0.012
	Nil	29	96.67	21	70.00	
24 hrs	Received	0	0.00	6	20.00	0.023
	Nil	30	100.00	24	80.00	



### Chi square & Fisher exact test

### DISCUSSION:

TAP blocks are associated with not only improved postoperative outcomes, but also associated with reduction on perioperative stress, reduction in opioid consumption, lesser adverse effects and minimal requirement of analgesia. Considering the gap identified with the use of USG guided TAP block with intraperitoneal instillation of bupivacaine for pain relief after laparoscopic cholecystectomy, the present study was conducted to compare the postoperative pain-relieving efficacy and their opioids sparing effects.

In the present study we have involved a total of 60 patients underwent laparoscopic cholecystectomy and randomly divided into two groups of 30 in each group. Where group 2 patient receiving intraperitoneal bupivacaine and group 1 patients receiving bilateral subcostal TAP block. Patients in group 1 as well as group 2 were found to be comparable with respect to their post operative NRS score at 0, 1 2, 4, 6, 8, 12, 24 hours. The technique of using transversus abdominis block is relatively new in the management of postoperative pain by injecting local anaesthetic that blocks the sensory nerves in the layers after abdominal surgeries<sup>[5]</sup>. Initially, TAP block used to be performed with landmark based double pop technique, which depended solely on the palpated sensation without a visual guide, its diffusion of local anaesthetics into additional body parts, which could result in subsequent motor nerve paralysis and even severe complication such as liver damage. Hence, ultrasound was used in this study, which ensured proper visualisation of anatomical structures as well as needle advancement.<sup>[6,7]</sup>

Our study shows similar results with Hariom Khandelwal<sup>[12]</sup> where statistical analysis proved that transversus abdominis block group had lower pain scores and less analgesic requirements in the first 6 h as compared to intraperitoneal group, but shoulder pain was less in local port instillation group but was not statistically significant.

In a recent study ramanarayana et al<sup>[13]</sup> concluded that integration of Erector spinae block into intravenous opioid-free analgesic regimen using lignocaine and magnesium provides better postoperative pain relief with lower VAS scores, increased duration of analgesia and reduced opioid consumption as compared to the routine conventional opioid anaesthesia.

In our current study we have observed that with the use of TAP block and on comparison with the intraperitoneal instillation of bupivacaine showed a significant difference in the NRS

scores. Results of our present study in good correlation with the recent study conducted by Suseela I<sup>[14]</sup> and her colleagues in the year 2018, where the authors demonstrated that administration of 20 ml of 0.25% bupivacaine and reduced the NRS pain score was observed in the patients under the TAP block on comparison with the bupivacaine administered patients.

Our study has shown similar results with a study of Tolchard et al.<sup>[15]</sup> who demonstrated better pain scores and reduced opioid consumption in the first 4 h in STA group when compared with port-site infiltration of local anesthetic.

In a study Soffin EM emphasize preoperative identification of patients at risk for long-term opioid use and suggest organizational, clinical, and research strategies that can be led by anesthesiologists to reduce opioid use.<sup>[11]</sup>

In our study, demand for rescue analgesia was higher in group 2 when compared to group 1 at 6, 12, and 24 hours post operatively. The data is statistically significant. Intravenous paracetamol 1 gm was used as primary rescue analgesic; its consumption was found to be high in group 2 in comparison to group 1 for 24 hours after surgery. Intravenous tramadol was used as a second line of rescue analgesics, its consumption was also found to be high in group 2 in comparison to group 1 for 24 hrs after surgery. Intravenous fentanyl was used as a third line of rescue analgesia and its consumption was also not found in any group after 24hrs after surgery. In a similar study conducted by P. Petersen et al on the beneficial effect of TAP block after laparoscopic cholecystectomy, patients who received TAP block in addition to a basic analgesic regimen with acetaminophen and ibuprofen after a laparoscopic cholecystectomy had reduced pain scores during coughing and even reduced morphine consumption in the first 2 hrs after surgery.<sup>[12]</sup>

Therefore, the use of ultrasound guided TAP block would be much better to over the postoperative pain and shorten the rescue time with minimum or without any complications after laparoscopic cholecystectomy.

### CONCLUSION:

Based on the observations and results of this study, ultrasound guided bilateral subcostal TAP block provided superior analgesia, less complication, and markedly decreased the analgesia and opioids requirement comparison to patients who received intraperitoneal instillation of bupivacaine, for 24 hrs after a laparoscopic cholecystectomy. TAP block is relatively simple to perform didn't cause any significant complications, so it can be a useful analgesic modality for pain relief after a laparoscopic cholecystectomy.

### REFERENCES:

- Guarino MP, Cocca S, Altomare A, Emerenziani S, Cicala M. Ursodeoxycholic acid therapy in gallbladder disease, a story not yet completed. *World J Gastroenterol*. 2013 Aug 21;19(31):5029-34. doi: 10.3748/wjg.v19.i31.5029. PMID: 23964136; PMCID: PMC3746374.
- Kelkar KV. Post-operative pulmonary complications after non-cardiothoracic surgery. *Indian J Anaesth*. 2015 Sep;59(9):599-605. doi: 10.4103/0019-5049.165857. PMID: 26556919; PMCID: PMC4613407.
- Norman G, Goh EL, Dumville JC, Shi C, Liu Z, Chiverton L, Stankiewicz M, Reid A. Negative pressure wound therapy for surgical wounds healing by primary closure. *Cochrane Database Syst Rev*. 2020 Jun 15;6(6):CD009261. doi: 10.1002/14651858.CD009261.pub6. Update in: *Cochrane Database Syst Rev*. 2022 Apr 26;4:CD009261. PMID: 32542647; PMCID: PMC7389520.
- Patman, S., Bartley, A., Ferraz, A. et al. Physiotherapy in upper abdominal surgery – what is current practice in Australia?. *Arch Physiother* 7, 11 (2017). https://doi.org/10.1186/s40945-017-0039-3
- Taki-Eldin A, Badawy AE. OUTCOME OF LAPAROSCOPIC CHOLECYSTECTOMY IN PATIENTS WITH GALLSTONE DISEASE AT A SECONDARY LEVEL CARE HOSPITAL. *Arq Bras Cir Dig*. 2018 Jun 21;31(1):e1347. doi: 10.1590/0102-672020180001e1347. PMID: 29947681; PMCID: PMC6049991.
- Hernández-Palazón J, Tortosa JA, Nuño de la Rosa V, Giménez-Viudes J, Ramírez G, Robles R. Intraperitoneal application of bupivacaine plus morphine for pain relief after laparoscopic cholecystectomy. *Eur J Anaesthesiol*. 2003 Nov;20(11):891-6. doi: 10.1017/s0265021503001431. PMID: 14649341.

7. Wei L, Hong Q, Lin X, Chen Y, Yang F, Li F, Chen Y. Effect of comprehensive high-quality nursing care on postoperative complications, degree of pain, and nursing satisfaction in gallstone patients during perioperative period. *Am J Transl Res.* 2021 Apr 15;13(4):2678-2685. PMID: 34017428; PMCID: PMC8129269.
8. Gul G, Bilgic T, Aydin MA. Evaluation of the Effects of Preoperative Dexamethasone Administration on Postoperative Patient Comfort in Laparoscopic Cholecystectomy. *Cureus.* 2020 May 5;12(5):e7968. doi: 10.7759/cureus.7968. PMID: 32523825; PMCID: PMC7273424.
9. Ekstein P, Szold A, Sagie B, Werbin N, Klausner JM, Weinbroum AA. Laparoscopic surgery may be associated with severe pain and high analgesia requirements in the immediate postoperative period. *Ann Surg* 2006;243:41-6.
10. Spahn V, Del Vecchio G, Rodriguez-Gaztelumendi A, Temp J, Labuz D, Klöner M, et al. Opioid receptor signaling, analgesic and side effects induced by a computationally designed pH-dependent agonist. *Sci Rep* 2018;8:8965.
11. Soffin EM, Lee BH, Kumar KK, Wu CL. The prescription opioid crisis: Role of the anaesthesiologist in reducing opioid use and misuse. *Br J Anaesth* 2019;122:198-208.
12. Khandelwal H, Parag K, Singh A, Anand N, Govil N. Comparison of Subcostal Transversus Abdominis Block with Intraperitoneal Instillation of Levobupivacaine for Pain Relief after Laparoscopic Cholecystectomy: A Prospective Study. *Anesth Essays Res.* 2019 Jan-Mar;13(1):144-148. doi: 10.4103/aer.AER\_3\_19. PMID: 31031495; PMCID: PMC6444963.
13. Ragupathy R, Prabhu SCG, Thiagarajan D, Anto V. Opioid-free anaesthesia for laparoscopic surgeries - A prospective non-randomised study in a tertiary care hospital. *Indian J Anaesth.* 2022 Mar;66(3):207-212. doi: 10.4103/ija.ija\_785\_21. Epub 2022 Mar 24. PMID: 35497703; PMCID: PMC9053893.
14. Suseela I, Anandan K, Aravind A, Kaniyil S. Comparison of ultrasound-guided bilateral subcostal transversus abdominis plane block and port-site infiltration with bupivacaine in laparoscopic cholecystectomy. *Indian J Anaesth.* 2018 Jul;62(7):497-501. doi: 10.4103/ija.IJA\_55\_18. PMID: 30078851; PMCID: PMC6053890.
15. Tolchard S, Davies R, Martindale S. Efficacy of the subcostal transversus abdominis plane block in laparoscopic cholecystectomy: Comparison with conventional port-site infiltration. *J Anaesthesiol Clin Pharmacol* 2012; 28:33943.
16. Petersen PL, Stjernholm P, Kristiansen VB, Torup H, Hansen EG, Mitchell AU, et al. The beneficial effect of transversus abdominis plane block after laparoscopic cholecystectomy in day-case surgery: a randomized clinical trial. *Anesth Analg.* 2012;115(3):527-33.