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Original Research Article

A Comparison of the Effects of Port Site Infiltration and Ultrasound-Guided Oblique Sub-Costal Transversus Abdominis Plane Block on Analgesic and Respiratory Performance in Patients Undergoing Laparoscopic Chole-Cystectomy

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Abstract

Background: Perioperative analgesic techniques that are reliable and efficient are crucial for improving postoperative healing.

Aims & objectives: For patients undergoing laparoscopic chole-cystectomy, the current research compared the effectiveness of sub-costal TAP block vs. port site infiltration with regard to pain and post-operative respiratory functioning.

Material and Methods: The current investigation was a single-center, hospital-based, randomized, observer-blinded, interventional trial that involved patients undergoing laparoscopic chole-cystectomy under general anesthesia who were between the ages of 18 and 60 and had an ASA Grade I or II. Category 1 (Oblique sub-costal TAP block category) and Category 2 were randomly assigned to each of 120 patients undergoing laparoscopic chole-cystectomy (Port site infiltration)

Results: The average length of the procedure and the average length of the analgesia were comparable between the categories and statistically insignificant. Peak Expiratory Flow Rate (PEFR) was not significantly different between the two categories at baseline (372.70 55.42 vs. 373.50 56.25 l/min; p>0.05), however Category 2's PEFR was significantly lower than Category 1's at 24 hours after surgery (329.42 17.72 vs. 266.42 39.16 l/min; p0.05). Both categories' VAS scores were equivalent during the shift, however Category 1's VAS score at the post-operative time intervals (2, 4, 8, 12, and 24 hours) was considerably lower than Category 2. 22 (18.3%) and 4 (3.3%) of the patients in Categories 1 and 2, respectively, needed rescue analgesics. It was shown that substantially fewer patients in Category 1 than in Category 2 required rescue analgesics. In Category 1 and Category 2, respectively, 4 (5%) and 10 (8.3%) patients experienced nausea and vomiting.

Conclusion: When compared to the port site infiltration Category, the TAP Categories pain and post-operative respiratory functions, as measured by PEFR following laparoscopic chole-cystectomy and VAS score at post-operative time intervals of 2, 4, 8, 12, and 24 hours, were considerably reduced.

Keywords: sub-costal TAP block, port site infiltration, analgesia, laparoscopic chole-cystectomy.

Introduction

Minimally invasive surgery, which encompasses endoscopy and laparoscopy, is one of the significant breakthroughs in the evolution of surgical techniques [1]. The advantages of laparoscopic surgery include lower post-operative discomfort, shorter hospital stays, better cosmetic outcomes, and patient satisfaction. Perioperative analgesic techniques that are reliable and efficient are crucial for improving postoperative healing [2]. The goal of the best analgesic regimens is to increase patient comfort and mobility while reducing the chance of problems that could hinder postoperative recovery. For the comfort of the patient, early mobilization, and a quicker recovery, postoperative pain must be controlled. As opposed to the traditional posterior technique, which gives sensory block from T10 to L1 spinal segment levels, sub-costal transversus abdominis plane (TAP) block can provide sensory block of the T7 to T12 nerves [3]. The use of ultrasound guidance can improve the precision and quality of nerve blockage. After a laparoscopic chole-cystectomy, port-site infiltration with local anesthetics is another efficient way to relieve pain [4]. The present research was conducted at our tertiary care center with that goal in mind because there is a dearth of literature comparing the effectiveness of sub-costal TAP block vs. port site infiltration with respect to pain and post-operative respiratory functions in patients undergoing laparoscopic chole-cystectomy [5].

Material and Methods

The current investigation was an interventional, single-center, hospital-based, randomized, and observer-blinded research that was carried out in central India's anesthesia department with assistance from the surgery department. The research lasted for 18 months. The institutional ethical committee approved the research.

Inclusion criteria: Under general anesthesia, a patient between the ages of 18 and 60 who is an ASA Grade I or II is having a laparoscopic chole-cystectomy.

Exclusion criteria: those undergoing an open chole-cystectomy conversion. ASA Ill and IV grades. infection at the local location. patient with cardiac and pulmonary problems before surgery. local anesthetic allergy (local anesthetic sensitivity test will be performed in all patients preoperatively).

Once the patients were included in the research, a proper informed consent was obtained from them, and a full history and physical examination were performed in accordance with the proforma. 240 patients undergoing laparoscopic chole-cystectomy were randomized into the two categories below at random (via sealed envelope):

Category 1: (Oblique sub-costal TAP block category, by anesthesiologists with expertise in ultrasound-guided truncal blocks, under ultrasound guidance)

Category 2: Infiltration at the port (by the operating surgeon at the end of the surgery.)

Bupivacaine and lignocaine were deposited in the aircraft after aspiration (dosage as per body weight). 10 ml on either side of the oblique sub-costal transversus abdominis plane block were infiltrated. Following surgery, port site infiltration was carried out as normal using the same amount of local anesthetic and split equally across the port sites.

A standardized general anesthesia protocol was used, including preoperative (before induction) non-opioid analgesia with injections of paracetamol (15 mg/kg), baseline vitals after attachment of non-invasive

monitors (ECG, non-invasive blood pressure, pulse oximetry, and end-tidal CO_2), and patient induction after pre-oxygenation with injections of fentanyl (1 mcg/kg), propofol (2 mg/kg All patients received an intraoperative injection of 8 mg of dexamethasone. Volume-controlled breathing, isoflurane, and intravenous atracurium (0.1 mg/kg) were used to maintain anesthesia.

The patients were extubated and taken to the post-operative PACU, where the recovery anesthesiologist was informed that local anesthetics had been administered to the patients out of concern for their safety. The recovery anesthesiologist was blinded to the category intervention at this point, and muscle relaxant was reversed by a mixture of Inj. Neostigmine (0.05 mg/kg) and Inj. Glycopyrrolate (0.008 mg/kg). The patients were administered rescue analgesia (postoperatively for VAS 4) while in recovery. Paracetamol was the first rescue analgesic utilized, followed by Tramadol, and Diclofenac was the third. In the first 24 hours following surgery, VAS (Visual Analogue Scale) pain levels were examined.

(At 2 hours, 4 hours, 8 hours, 12 hours, and 24 hours into the shift) PEFR, which was measured preoperatively at the time of assessment (the best of the three readings was taken), postoperatively at the end of 24 hours, and arterial blood gas variables were measured in the first 24 hours to evaluate the change in respiratory function, were used to measure respiratory function.

Results

Among those having a laparoscopic chole-cystectomy. Two categories of 240 patients were randomly selected: Category 1 (Oblique sub-costal TAP block) and Category 2. (Port site infiltration). Patients in Category 1 had a mean age of 41.10± 11.16 years, whereas those in Category 2 had a mean age of 42.33± 9.70 years.

According to the Student t-test ($p>0.05$), there was no statistically significant difference between the categories in terms of mean age, gender, BMI, and ASA grade.

Table 1: General characteristics

General Characteristics	Category 1	Category 2	P value
Age (years)	41.10 ± 11.16	42.33 ± 9.70	>0.05
Gender			>0.05
Male	68 (56.7%)	64 (53.3%)	
Female	52 (43.3%)	56 (46.7%)	
Mean BMI	25.54 ± 4.18	25.43 ± 4.00	>0.05
ASA grade			>0.05
I	80 (66.7%)	86 (71.7%)	
II	40 (33.3%)	34 (28.3%)	

The average operation time in Category and Category B was similar (41.16± 9.14 mins vs. 42.31±9.44 mins). According to the Student t-test, the mean time of analgesia was comparable between the categories and not statistically significant (54.70± 9.78 minutes vs. 56.50± 7.34 minutes; $p>0.05$). Heart rate, systolic and diastolic blood pressure, and oxygen saturation levels were comparable amongst the categories intraoperatively throughout the trial, according to a student t-test ($p>0.05$). Peak Expiratory Flow Rate (PEFR) was not significantly different between the two categories at baseline (372.70± 55.42 vs. 373.50± 56.25 l/min; $p>0.05$), however Category 2's PEFR was significantly lower than Category 1's at 24 hours after surgery (Student t-test: 329.42± 17.72 vs. 266.42±

39.16 l/min; p0.05). Both the baseline partial pressure of carbon dioxide ($PaCO_2$) (40.74±6.39 mmHg vs. 41.36±5.47 mmHg; p>0.05) and the $PaCO_2$ at 24 hours after surgery (44.44±9.41 mmHg vs. 47.14±9.26 mmHg; p>0.05) did not differ significantly between the two categories.

Table 2: Operative parameters

Operative parameters	Category 1 (Mean ± SD)	Category 2 (Mean ± SD)	P value
Mean duration of Surgery (mins)	41.16 ± 9.14	42.31 ± 9.44	>0.05
Duration of Analgesia (mins)	54.70 ± 9.20	56.50 ± 7.33	>0.05
PEFR			
Initial	372.70 ± 55.42	373.50 ± 56.25	>0.05
Post op 24 hours	329.42 ± 17.72	266.42 ± 39.16	<0.05
$PaCO_2$ (mmHg)			>0.05
Initial	40.74 ± 6.36	41.36 ± 5.47	
Post op 24 hours	44.44 ± 9.41	47.14 ± 9.26	

The VAS scores on shift were comparable between the two categories, but according to a Student t-test, Category 1's VAS scores at the post-operative time intervals (2 hours, 4 hours, 8 hours, 12 hours, and 24 hours) were substantially lower than Category 2's (p 0.05).

Table 3: Comparison of VAS score at various postoperative time intervals

VAS	Category 1 (Mean ± SD)	Category 2 (Mean ± SD)	p value
On shift	1.86 ± 0.30	1.26 ± 0.28	>0.05
2 hours	1.29 ± 0.33	2.41 ± 0.46	<0.05
4 hours	1.25 ± 0.30	2.29 ± 0.33	<0.05
8 hours	1.29 ± 0.33	2.33 ± 0.46	<0.05
12 hours	1.31 ± 0.32	2.31 ± 0.43	<0.05
24 hours	1.33 ± 0.33	2.32 ± 0.36	<0.05

22 (18.3%) and 4 (3.3%) of the patients in Categories 1 and 2, respectively, needed rescue analgesics. According to the Chi-Square test (p0.05), it was shown that a considerably less proportion of patients in Category 1 needed rescue analgesics than in Category 2.

Table 4: Distribution of Rescue Analgesic

Requirement of Rescue Analgesic	Category 1 (%)	Category 2 (%)	p Value
Yes	4(3.3%)	22 (18.3%)	<0.05
No	116 (96.7%)	98 (81.7%)	

In Category 1 and Category 2, respectively, 4 (5%) and 10 (8.3%) patients experienced nausea and vomiting. The incidence of nausea and vomiting was lower in Category 1 than in Category 2, although according to the Chi Square test, this difference was not statistically significant (p>0.05).

Table 5: Post-operative complications

Post-operative complications	Category 1 (%)	Category 2 (%)	p Value
Nausea and Vomiting	6 (5%)	10 (8.3%)	>0.05
No complications	114 (95%)	110 (91.7%)	

Discussion

The frequency of myocardial ischemia can be reduced by providing appropriate postoperative analgesia, which also lowers the neuro-endocrine stress response and postoperative respiratory problems [6]. In the neuro-fascial plane between the internal oblique and the transversus abdominis muscle, local anesthetic is injected using the localized anesthetic technique known as TAP block to block the abdominal neural afferents. Unreliable unilateral supraumbilical analgesia is produced by the ultrasound-guided sub-costal transversus abdominis (STA) block, a recently described variant of the TAP [7]. According to the Student t-test used in this investigation, there was no statistically significant difference between the categories in terms of mean age, gender, BMI, or ASA grade (p>0.05). This is comparable to investigations done by Abdelmaboud MA, Bhalekar P, and others. In the Abdelmaboud MA research, no statistically significant differences were detected between the research categories in terms of age, sex, BMI, or the length of the surgery when assessing the clinical value of TAP block as analgesic after lower abdominal procedures in morbidly obese patients [8-10]. According to Bhalekar P et alinvestigation .'s into whether sub-costal TAP block lessens the need for rescue analgesics after laparoscopic chole-cystectomy, both categories had equivalent mean ages, sex distributions, mean weights, ASA physical statuses, and surgical times. Peak expiratory flow rate (PEFR) did not differ significantly between the two categories at baseline (372.70 ±55.42 vs. 373.50 ± 56.25 l/min; p>0.05), but Student t-test results showed that PEFR significantly decreased in Category 2 compared to Category 1 at 24 hours after surgery (329.42 ±17.72 vs. 266.42 ± 39.16 l/min; p0.05), indicating that TAP block is This is comparable to the studies of Basaran B et al. and Abdelmaboud MA. The PEFR between the two categories at baseline was not significantly different, however at 2, 6, and 12 hours after surgery, category C (the control category) had a significantly lower PEFR than category T (the TAP category). In a randomized, double-blind research, Basaran B et al. found that the OSTAP category had improved FVC values at 2 (p=0.029) and 24 (p=0.019) hours. Values for FEV1/FVC and PEFR were comparable between categories [11-14] . In our research, the VAS scores at the start of the shift were comparable between the two categories, but the VAS scores at the post-operative time points (2 hours, 4 hours, 8 hours, 12 hours, and 24 hours) were substantially lower in Category 1 than in Category 2 according to the Student t-test (p 0.05). According to studies by Abdelmaboud MA, Basaran B et al., Bhalekar P et al., and Saliminia A et al., this is the case. According to a research by Bhalekar P et al., patients in Category B (the sub-costal TAP category) had significantly lower mean VAS scores at rest and on coughing than patients in Category A throughout the first 24 hours following operation (control category). The sub-costal TAP category had lower VAS scores than the control category at 1 hour (3.44 vs. 5.17), 6 hour (3.94 vs. 6.44), 12 hour (1.94 vs. 3.39), and 24 hour (1.94 vs. 3.39), according to Saliminia A et alresearch .'s on the effectiveness of transverse abdominis plane block in reducing postoperative pain in laparoscopic chole-cystectomy (0.83 vs. 1.44). In the current research, it was shown that 2 (3.3%) and 11 (18.3%) patients in Categories 1 and 2 needed rescue analgesics, respectively (Inj. Paracetamol, Inj. Tramadol, Inj. Diclofenac) [15-18]. According to the Chi-Square test (p0.05), it was shown that a considerably less proportion of patients in Category 1 needed rescue analgesics than in Category 2. Studies by Abdelmaboud MA, Erbabacan E et al., El Dawlatly AA et al., Ra YS et al., Ghisi D et al., Chen CK et al., Bhalekar P et al., Carrie C et al., Sharma P et al., and Basaran B et al., Bhanulakshmi M. After lower abdominal surgery, Erbabacan E.

et alresearch .'s comparing TAP block with IV patient-controlled analgesia (PCA) utilizing opioids found that TAP block was better to IV-PCA because it begins its analgesic impact sooner and lessens the systemic effects of the morphine used in PCA. Research on the effectiveness of the sub-costal TAP block by Tolchard, S. Patients in the sub-costal TAP category required morphine and tramadol in 1/21 (4.8%) and 6/21 (28.6%) patients, respectively, whereas control category required morphine and tramadol in 3/22 (13.6%) and 8/22 (36.4%) patients postoperatively, which was not statistically significant. This was in comparison with conventional port site infiltration in laparoscopic chole-cystectomy. In our research, it was shown that 6 (5%) and 10 (8.3%) patients in Categories 1 and 2, respectively, had nausea and vomiting [19,20]. The incidence of nausea and vomiting was lower in Category 1 than in Category 2, although according to the Chi Square test, this difference was not statistically significant ($p>0.05$). This result was in line with investigations by Basaran B et al. and Abdelmaboud MA. Unwanted postoperative outcomes include patient suffering, anguish, confusion, and heart issues, as well as extended hospital stays and costs, are all linked to poorly managed pain. It has been demonstrated that adequate surgical pain management helps high-risk patients experience less perioperative morbidity from acute coronary events and thrombotic events. Local anesthetic (LA) inhibition of pain impulses provides efficient analgesia for abdominal surgery, either alone or in combination with other analgesics with the development of accurate target identification systems for ultrasonic imaging [21-22].

Conclusion

The hospital-based, randomized, observer-blinded, interventional research found that adding a sub-costal TAP block to a standard multimodal analgesic regimen, as opposed to port site infiltration, provided superior postoperative analgesia with regard to pain and post-operative respiratory functions measured by PEFR after laparoscopic chole-cystectomy. Additionally, VAS score at post-operative time intervals (2,4,8,12, and 24 hours) was significantly lower in TAP.

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