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ULTRASOUND GUIDED BILATERAL SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK VS PORT SITE INFILTRATION IN LAPROSCOPIC CHOLECYSTECTOMY FOR POST OPERATIVE PAIN RELIEF: A RANDOMISED CONTROL TRIAL

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ABSTRACT

Background: Patients experience severe pain after laparoscopic cholecystectomy mostly due to incision on anterior abdominal wall. This pain can be reduced by various methods like anterior abdominal wall blocks, port site infiltration, or systemic analgesics. This study aimed at comparing the efficacy of analgesia of ultrasound-guided bilateral subcostal transversus abdominis plane (TAP) block given after induction with port-site infiltration after surgery for analgesia post operatively after laparoscopic cholecystectomy.

Methods: Patients posted for elective laparoscopic cholecystectomy under general anaesthesia were taken in the study. A total of 100 patients were involved. They were divided into two groups of 50 each. One group received ultrasound-guided bilateral subcostal TAP block (T) with 0.25% ropivacaine 15 ml each side after induction or port-site infiltration with 0.25% ropivacaine 5 ml each at 4 ports (P) at the end of the surgery before extubation. All patients received paracetamol 1 g intravenous 8th hourly. Tramadol 1 mg/kg intravenous bolus were the first line of rescue analgesia and is not to be repeated before 6 hours and diclofenac 1 mg/kg intravenous infusion was used as second-line rescue analgesics when VISUAL ANALOGUE SCORE (VAS) ≥3, or when the patient complained of pain. VAS was assessed at 0,1, 2, 3, 4, 5, 6 and 12 hours after surgery, total duration of analgesia and total dose of analgesics in 24 h were recorded.

Results: Duration of analgesia was significantly longer in group T as compared to group P ($p<0.01$). Mean duration of analgesia in group T was 490± 80 mins whereas that in group P was 170± 62.1min. Mean tramadol required was 49 ± 30 mg and 140 ± 50.1 mg, respectively. Mean VAS at 0, 1, 2, 3, 6, 12 and 24 h was significantly lower in Group T.

Conclusion: Ultrasound-guided bilateral subcostal TAP block provides longer duration and superior quality of post-operative analgesia after laparoscopic cholecystectomy compared to port-site infiltration. It also reduced intraoperative analgesic requirement significantly.

KEYWORDS : Transversus Abdominis Plane block, laproscopic cholecystectomy, ropivacaine

INTRODUCTION

Laparoscopic cholecystectomy is the most common surgery performed in our hospital for the treatment of symptomatic gallbladder diseases such as cholecystitis and cholelithiasis. Effective analgesia during intra-operative period helps better hemodynamic control and is prerequisite for early ambulation in post-operative period. Nausea and vomiting (PONV) and excessive sedation is commonly associated with the use of opioid in post-operative period. A newer regional nerve block technique, transverse abdominis plane block, is being utilised as an effective tool to optimize postoperative pain control both during intra and post-operative period. The present study compares the efficacy of the bilateral subcostal TAP block and local infiltration of the port site for the management of post-operative pain control.

ANATOMY

The innermost muscular layer of the anterolateral abdominal wall is the transverse abdominis muscle. Fascial plane superficial to this muscle is known as transverse abdominis plane. The intercostal nerves, subcostal nerves, and L1 segmental nerves communicate to form the upper and lower TAP plexuses, innervating the anterior abdominal wall. TAP blockade includes anesthetization of the upper (subcostal or intercostal) TAP plexus, as well as the lower TAP plexus[1].

The subcostal approach to the TAP block ideally anesthetizes the intercostal nerves T6–T9. The lateral TAP block is approached in the midaxillary line between the thoracic cage and iliac crest, utilising the plane between the internal oblique and transversus abdominis muscles, infiltrating the intercostal nerves T10– T11 and the subcostal nerve T12. The L1 segmental nerves in the TAP are not covered by the lateral TAP block and require an anterior TAP block medial to the anterior superior iliac spine. TAP blocks provide somatic analgesia of the abdominal wall including the parietal peritoneum.

MATERIAL AND METHODS

Participants: The study was done in IGIMS, Patna and was approved by the Institutional ethical committee. 50 ASA I/II adult of age group 18-55years, posted for elective laparoscopic cholecystectomy were included in the study.

Keeping a power at 80% and alpha error at 0.05, a sample size of 23 would be required in each group. Hence, we recruited 25 patients in each group to compensate for the dropouts if any.

Patient not giving consent for the study, having allergy to local anaesthetic, ASA III and above, patients with infection at the site of injection, chronic pain syndromes, prolonged opioid medication, coagulopathy were excluded from the study. Those cases who converted to open procedure were also not included in the study.

Both patients and the anaesthetist involved in the post-operative data collection were blinded to the treatment group. An informed written consent was obtained from each patient and procedure completely explained.

Randomization: A sealed envelope randomization system was employed to allocate patients to receive either TAP block (group T) ($n = 25$) or local anaesthetic infiltration at port site (group P) ($n = 25$).

Intervention: Standard general anaesthesia regime was followed which consisted of induction with propofol (2.5 mg/kg), fentanyl (3 mcg/kg), and vecuronium (0.1 mg/kg), followed by maintenance with sevoflurane, nitrous oxide, oxygen and vecuronium.

Intraoperative monitors included electrocardiogram, non-invasive blood pressure, pulse oximeter and end-tidal carbon dioxide. Vitals signs were maintained stable throughout intraoperative period. All patients received intraoperatively injection paracetamol 1gm and diclofenac 75mg.

Three subcostal and one periumbilical port sites were constant in all cases. TAP block was given by an expert single anaesthetist after intubation. Port-site infiltration was done by the operating surgeon at the end of surgery.

The block was performed under ultrasound guidance (Sono ADAPT™, SonoMB technology, FUJIFILM Sonosite USG machine). The Linear array probe was placed in the midline of the abdomen 2 cm below the xiphisternum and moved right laterally along the subcostal margin to the anterior axillary line. The transversus abdominis muscle was identified lying beneath and extending lateral to the rectus abdominis muscle. A 100-mm, 22-G Sonotap block needle(pujunck) was then guided, in plane, to a point 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 fascial plane. Following aspiration, 15ml of 0.25% ropivacaine was deposited within the plane. Similarly, 15ml of drug was injected in the transverse abdominis plane on the left side. Port-site infiltration was performed postoperatively in the usual manner using the same quantities and the dose of local anaesthetic was divided equally between port sites, using 30 ml (15ml on either side) of 0.25% ropivacaine (Neon) using sterile technique. Postoperative period pain was assessed using a standard 10 cm visual analogue scale (VAS) in every one hour for 6hrs or on patient's call and then at 12th hour. Time for the first request of postoperative analgesic when VAS >3 (duration of analgesia) was noted and rescue analgesic with intravascular injection of tramadol 1mg/kg was given and was not repeated before 6hours. Second rescue analgesic injection diclofenac 1mg/kg iv. Time for first analgesic request and VAS at first analgesic request were recorded. For the study purpose the duration of analgesia was taken as the time from block administration to the time at which patient complained of pain or VAS was ≥3. Total doses of rescue analgesics required in the first 24 h were recorded. Complications such as bleeding from surgical site, hematoma, nausea, vomiting and allergic reactions was also observed.

RESULTS

A total of 50 patients were included in the study and were randomized in two groups of 25 each. Both groups were found to be comparable with respect to ASA status, age, sex weight and duration of surgery. VAS was used to assess the pain in two groups. A score of ≥3 was used as cut off to give analgesic dose.

VAS score was used for assessing the pain severity. TAP block was effective in preventing pain, as none of the patient showed VAS score ≥3 in TAP group till 3 hours post-surgery, whereas 10 patients out of 25 has VAS score ≥3 three hours post-surgery.

The duration of analgesia was found to be (490±80) minutes in the TAP group, whereas it was only (170± 62.1) minutes in the port infiltration group. Total consumption tramadol was found to be (49±30) mg in the TAP group and (140±50.1) mg in port infiltration group during 1st 24 hours in postoperative period.

Table 1. Patient characteristics and standardized doses of drugs used

Patient characteristics	Group P	Group T	P-value Chi-Square
Age	34±3	39±4	0.23
Sex	2:3	1:5	0.06
Weight	77±5	78±4	0.5
BMI	28±1.9	31±0.9	0.34

Table 2 showing the duration of analgesia time and total opioid consumption in 24 hours

	Group P	Group-T	P-Value student t-test
Analgesia time (min)	170±62.1	490±80	<0.01
Tramadol consumption in 24 hours	140±50.1	49±30	<0.01

Table 3. Showing proportion of patients having VAS score ≥3 in post operative period

Time	Group P	Group T	P-value chi-square
0hr	0/25	0/25	
1hr	0/25	0/25	
2hr	5/25	0/25	0.01
3hr	10/25	0/25	<0.01
4hr	25/25	1/25	<0.01
5hr	25/25	5/25	<0.01
6hr	25/25	7/25	<0.01
12hr	25/25	25/25	

DISCUSSION

Good control of pain in the postoperative period helps in better rehabilitation and early mobilization of patient and improved patient satisfaction. With the use of TAP block, the opioid consumption and associated nausea and vomiting also decreases, thus smoothening the recovery.

Our results showed the increase in analgesia time in patients who were administered TAP block, which are consistent with the study conducted by Bisgaard[2] and Suseela et al[3] where they found analgesia time to be 2-3 hours in port site infiltration and 12-48 hours in the patients who received TAP block.

With the help of USG, drug is accurately deposited between the muscles in TAP block. This site is less vascular as compare to the tissue infiltration at the port site.[7] As the drug is absorbed slowly from less vascular site, analgesia time increases. USG clearly demarcates the anatomy and helps in infiltrating the drug with more success rate and also reduces the volume of drug needed for effective block.

Because analgesia provided with the local anaesthetics is not associated with side effects like sedation, it makes patient more comfortable in the post-operative period.

Tolchard et al[4] have shown significant decrease in fentanyl requirement in the group receiving STA block in post-operative period in patients undergoing laparoscopic cholecystectomy. Saxena et al[5] have also showed similar results, where the fentanyl requirement was less in patients receiving TAP block, after laparoscopic cholecystectomy. In study by Kadam VR[6] mean fentanyl consumption in the recovery room was significantly higher in port infiltration group as compare to TAP group. Saxena et al used numeric rating scale for pain assessing pain severity. They observed low NRS scores in patients receiving TAP block. They observed the requirement of fentanyl to be half in the TAP block.

CONCLUSION

The present study provides evidence that bilateral transverse abdominis block increases the analgesia time, reduces the opioid consumption and makes the post-operative period pain free and helps patient mobilise early after laparoscopic cholecystectomy.

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