ORIGINAL ARTICLE

Role of Laparoscopic-assisted Transversus Abdominis Plane Block during Elective Laparoscopic Cholecystectomy

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Abstract

Background: In today's era of minimally invasive surgery, early postoperative pain reduction, early recovery, and return to normal activities are also important aspects. This study has been designed to analyze and compare the effect of laparoscopically administered transversus abdominis plane (TAP) block with port-site infiltration of long-acting local anesthetic agent (0.25% bupivacaine) in cases of elective laparoscopic cholecystectomy.

Materials and methods: This is a comparative study carried out at St Joseph Hospital, Ghaziabad, from September 2019 to March 2020 on 154 patients who underwent standard four-port laparoscopic cholecystectomy. Seventy-seven patients in group I received TAP block with 0.25% bupivacaine and seventy-seven patients in group II received 20 mL of 0.25% bupivacaine infiltration over port sites, including 10 mL each at epigastric and umbilical port and 5 mL each at midclavicular line and anterior axillary line ports, respectively. Various parameters were assessed during the intraoperative and postoperative periods. The pain was analyzed using visual analog scoring (VAS) for the first 24 hours at an interval of 3, 6, 12, and 24 hours. A note was made of any additional analgesic requirement.

Results: Postoperative pain at 3, 6, and 12 hours was significantly reduced in group I who received TAP block as compared to those who received port-site infiltration. Hospital stay duration was significantly shorter in group I.

Conclusion: Laparoscopic-assisted TAP block significantly reduces early postoperative pain, shortens hospital stay after elective laparoscopic cholecystectomy, and is a safe and cost-effective method without any extra requirement of specialized equipment and skills.

Keywords: Cholelithiasis, Laparoscopic cholecystectomy, Transversus abdominis plane block.

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Introduction

Laparoscopic cholecystectomy is one of the most commonly performed laparoscopic surgeries. Laparoscopic surgery has provided fast recovery, short hospital stay, early return to work, and minimum scar, but postoperative pain management still remains a concern.[1,2]

Pain after laparoscopic cholecystectomy can occur within hours usually over the port sites or at the right shoulder or it can be a generalized pain. Pain following laparoscopic cholecystectomy is multifactorial. Pain occurring over port sites is due to somatic component whereas pain over right shoulder or diffuse abdominal pain is because of visceral component caused by stretching due to pneumoperitoneum.[1–3] On the basis of this theory, various techniques have been described to reduce this pain. Pain can be mild to severe and even require injectable analgesics, such as diclofenac sodium or opioids. This pain can delay recovery, lengthen hospitalization, and hampers routine activity. Pain killers like opioids and diclofenac sodium have their own adverse effects.[4]

There are numerous studies on the reduction of early postoperative pain following laparoscopic cholecystectomy, including port-site infiltration of local anesthetics, laparoscopically delivered transversus abdominis plane (TAP) block, intraperitoneal instillation of local anesthetics, and various other methods out of which TAP block and port-site infiltration with long-acting local anesthetic agents are commonly used techniques.[1–3]

TAP block is a technique in which a long-acting local anesthetic drug like bupivacaine is administered into the fascial plane between the fibers of internal oblique and transversus abdominis muscle. Somatic nerve from T6 to L1 run in this fascial plane to innervate the anterior abdominal wall layers from skin to parietal peritoneum.[4–9]

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Various techniques of TAP block had been described. In 2001, a blind 'double pop' technique was defined to infiltrate the fascial plane with local anesthetics. Ultrasound-guided TAP block was introduced in 2007, a technique better than blind infiltration but still operator dependent.[5,9] Later laparoscopy-guided infiltration of the fascial plane with long-acting local anesthetics like bupivacaine was introduced. Studies confirmed that laparoscopy-guided infiltration is more accurate as it is done under direct visualization.[7,8]

This study aim is designed to analyze and compare the effects of TAP block with port-site infiltration in cases of elective laparoscopic cholecystectomy.

Materials and Methods

This is a comparative study conducted at St Joseph Hospital, Ghaziabad from October 2019 to March 2020. All cases of symptomatic cholelithiasis aged between 18 years and 65 years and American Society of Anesthesiologists (ASA) class I and II were included in the study and underwent elective laparoscopic cholecystectomy. Patients of ASA class III, IV, and V and patients with coagulopathies, liver or renal failure, choledocholithiasis, intraoperative drain placement, post-ERCP, surgery duration more than two hours, previous upper abdominal surgeries, conversion to open cholecystectomy, and difficult extraction of gallbladder were excluded from the study. A total of 154 patients participated in the study and were randomized into two groups of 77 patients each using a computerized random number table. Informed consent was obtained from the patients. All patients underwent standard four-port laparoscopic cholecystectomy performed by a single team of surgeons experienced in laparoscopic surgeries. Pneumoperitoneum was maintained at 12 to 14 mmHg. The gallbladder was delivered through epigastric port in all patients. Group I received TAP block under laparoscopy guidance in which TAP block using 0.25% bupivacaine was instilled using a 23-gauge needle at following 4 points, bilateral subcostal infiltration between anterior axillary line and midclavicular line (10 mL each), and bilaterally just above the iliac crest in midaxillary line (15 mL each). Direct visualization of needle and the bulge with the laparoscope confirmed the proper instillation of drug in the plane containing thin fibers of transversus abdominis muscle (Fig. 1). Group II patients received 20 mL 0.25% bupivacaine divided into 6 mL each for umbilical and epigastric port and 4 mL each for right midclavicular line and anterior axillary line port, respectively, and infiltrated in the subcutaneous plane before closure. All patients in both groups received 50 mg tramadol injection in the immediate postoperative period as standard protocol.

Pain intensity was recorded by the same team using a visual analogue scoring (VAS) system at intervals of 3, 6, 12, 24, and 48 hours, respectively. Intramuscular diclofenac sodium 75 mg was used as rescue analgesia for patients with VAS score >5.

Data analysis was performed using the Statistical Package for Social Sciences Version 17.0 software (SPSS Inc.; Chicago, IL, USA). A p-value <0.05 was considered statistically significant.

Results

A total of 154 patients underwent laparoscopic cholecystectomy out of which 136 were females. The average age of patients was 38.84 ± 2.67 years. There was no significant difference seen in the duration of surgery and time taken for return to normal activity in both the groups. Mean hospital stay was significantly less for group I patients as compared with group II (Table 1).

The mean VAS score of patients in group I at 3, 6, and 12 hours was significantly low as compared with group II, and the requirement of rescue analgesia was also significantly less in group I. At 24 and 48 hours, there was no significant difference in pain intensity in both the groups (Table 2).

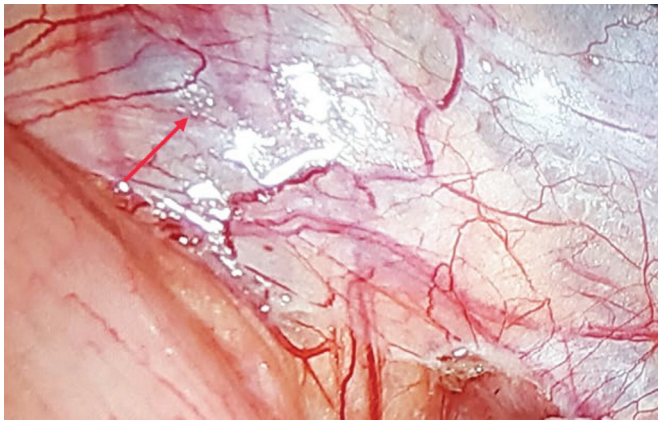

Fig. 1: Laparoscopic-assisted TAP block

Discussion

Laparoscopic cholecystectomy is the gold standard procedure for symptomatic cholelithiasis and most commonly performed laparoscopic procedure worldwide.[1] Though the pain, discomfort, and duration of stay after minimally invasive procedure are less as compared to open technique, but early postoperative pain after laparoscopic cholecystectomy is still prevalent and it may increase patient stay and discomfort following surgery.[1–3]

There are various factors responsible for the pain after laparoscopic cholecystectomy. It may arise from incision site (somatic pain), from gallbladder bed (visceral pain), or may be due to stretching caused by pneumoperitoneum.[2]

Many studies and researches had been conducted in the last 30 years for the pain management after laparoscopic cholecystectomy. Various methods like infiltration of local

Table 1: Patients characteristics, other intraoperative and postoperative factors

Intraoperative factors	*TAP block group (group I) n = 77*	*Bupivacaine group (group II) n = 77*	*p value*
Mean age (years)	39.54 ± 3.23	38.48.2 ± 2.55	0.89 (NS)
Sex			
Male	8 (10.38%)	10 (12.98%)	0.94 (NS)
Female	69 (89.62%)	67 (87.02%)	0.85 (NS)
Mean duration of surgery (minutes)	50.45 ± 3.6	52.63 ± 4.5	0.78 (NS)
Mean duration of stay in hospital (days)	1.55 ± 0.56	2.2 ± 0.68	0.022(HS)
Return to routine activities (days)	3.23 ± 1.56	3.55 ± 1.07	0.21(NS)

TAP, transversus abdominis plane block; NS, nonsignificant; HS, highly significant

Table 2: Comparative analysis of postoperative pain using VAS (visual analog scoring) and requirement of rescue analgesia

Time interval (hr)	*TAP block group (group I)*	*Bupivacaine group (group II)*	*p value*
3	1.38 ± 0.23	3.83 ± 0.76	<0.001(HS)
6	2.12 ± 0.54	3.45 ± 0.30	<0.001 (HS)
12	2.01 ± 0.87	3.67 ± 1.20	<0.001 (HS)
24	2.65 ± 1.53	2.14 ± 1.11	0.65 (NS)
48	1.56 ± 0.56	1.69 ± 0.79	0.89 (NS)
Requirement of rescue analgesia (n)	12	22	0.012 (HS)

TAP, transversus abdominis plane block; NS, nonsignificant; HS, highly significant

anesthetic at port sites, intraperitoneal instillation at gallbladder bed, and TAP block were used for early postoperative pain control.[3,8,10] Many studies have shown a significant reduction in postoperative pain after infiltration at incision sites whereas few studies had shown no statistical difference in pain or duration of stay.[5–16]

In our study, we have analyzed and compared the effect of laparoscopically delivered TAP block with port-site infiltration of 0.25% bupivacaine in reduction of early postoperative pain, early recovery, and return to routine activity after elective laparoscopic cholecystectomy. Our results had shown significant reduction in early postoperative pain specifically at 3, 6 and 12 hours in the group receiving TAP block; however, there was no significant difference at 24 and 48 hours in both the groups. Subsequently, the need for additional analgesia was significantly less in patients receiving TAP block. The hospital stay in TAP block group was shorter and statistically significant.

TAP block was introduced in 2001 as a blind technique for pain relief following abdominal surgeries. Later ultrasound-guided TAP block was introduced, and in 2009, El-Dawlatly et al. conducted a study that showed significant pain relief and decreased analgesic requirement post-laparoscopic cholecystectomy in patients receiving ultrasound-guided TAP block.[6] In 2011, Chetwood et al. described laparoscopically delivered TAP block in cases of laparoscopic nephrectomy[7] and Magee et al. described laparoscopic TAP block in laparoscopic cholecystectomy with promising results and significant relief in postoperative pain.[11] Zaghiyan et al. described the superiority of laparoscopic TAP block over ultrasound-guided TAP block.[13]

Studies by Elamin et al. and Tihan et al. also described the efficiency and superiority of laparoscopic TAP block over port-site infiltration of local anesthetic agent.[8,16]

Few studies and a meta-analysis also showed no significant difference in postoperative pain reduction following laparoscopic TAP block and periportal infiltration in cases of laparoscopic cholecystectomy.[10,12,15]

Another advantage of laparoscopic TAP block is that it can be safely given by the operating surgeon and does not require any additional equipment.

Thus with significant early postoperative pain reduction and shorter hospital stay, laparoscopically delivered TAP can be good alternative for postoperative pain relief in elective laparoscopic cholecystectomy; however, its efficiency needs to be explored in emergency settings.

Conclusion

Laparoscopically delivered TAP block is a safe and efficient method for early postoperative pain relief in cases of laparoscopic cholecystectomy that can be safely performed by an operating surgeon without additional requirement of specialized equipment and skills.

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