

Ultra Sound Guided Bilateral Transversus Abdominis Plane Block for Post-Operative Analgesia after Laparoscopic Cholecystectomy

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Abstract:

Introduction: Pain and agitation are the most common side effects after abdominal surgeries which not only affect the recovery of the patient but also increase the hospital stay. Therefore, we decided to conduct a study in which we assess the effect of bilateral Ultra-sound guided Transverse Abdominis Plane (TAP) block used for postoperative pain relief by comparing it with the Intravenous opioids undergoing Laparoscopic Cholecystectomy. This study also assesses the intra operative as well as post-operative hemodynamic stability.

Methodology: 80 patients who were posted for routine laparoscopic cholecystectomy surgeries were equally divided into 2 groups with 40 patients each (Group T and Group G). In group T (TAP block + General anesthesia) we gave bilateral USG TAP block by using 0.5% Bupivacaine 5ml & 2% Lignocaine 5ml after general anesthesia, while in group G (General anesthesia) we didn't give any nerve block after general anesthesia. We observed intraoperative and postoperative analgesic requirements of the patient.

Result: Total analgesic requirements were significantly less in group T as compared to group G both in intraoperative as well as early postoperative period. There was decrease in the time spent by the patient in postoperative anesthesia care unit in group T as compared to group G.

Conclusion: Bilateral TAP block, using 0.5% Bupivacaine & 2% Lignocaine during general anesthesia for Laparoscopic Cholecystectomy will not only decrease the intraoperative and postoperative analgesic requirements but also decrease analgesic drug usage and discomfort. Therefore, we recommend giving TAP block for Laparoscopic Cholecystectomy.

Keywords: Bilateral TAP block, General Anesthesia, Laparoscopic Cholecystectomy.

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Introduction

Post-operative pain management is an important issue that has received a great deal of attention in the medical community. Laparoscopic cholecystectomy is known as a minimally invasive surgical procedure with low pain scores compared with open procedures, & usually standard general anaesthesia is given to patients undergoing laparoscopic cholecystectomy.[1-2] Intravenous patient-controlled analgesia (IV-PCA) have been used for pain control after laparoscopic cholecystectomy, but IV-PCA has the side effects of opioids.[3]

Post-laparoscopic cholecystectomy pain is multifactorial, and therefore multimodal analgesia has been suggested for its treatment. Visceral pain has been the primary source of postoperative pain in laparoscopic cholecystectomy. Somatic or parietal pain in laparoscopic cholecystectomy is less intense than visceral pain, owing to the small

(1–4 cm) abdominal incisions of the trocar site and the limited damage to the abdominal wall but dealing with it could be as a part of multimodal analgesia which transversus abdominis plane (TAP) block can be an effective approach. Ultrasound-guided (USG) TAP block is one of the methods recommended for postoperative pain especially somatic pain control in the abdomen.[4-5]

Transverse Abdominis Plane Block (TAP Block) is most commonly used in clinical practice as a part of the multimodal analgesia therapy after abdominal surgeries.[6] TAP Block produces a sensorial block using local anesthetic infiltrated between transverse abdominis muscle and internal oblique muscle, targeting the spinal nerves innervating this plane.[7-8] The nerves affected during this block are Thoracic intercostals nerves (7-12), Iliioinguinal nerve, Iliohypogastric nerve,

Lumbar nerves (1-3) in the lateral cutaneous branches.[9] Comparatively, laparoscopic surgeries are less painful, but many patients still complain of pain after the operation. Conventional TAP Block is a blind technique where several complications like large bowel puncture and liver injuries have been reported due to non-visualization of the internal structures.[10] These complications have been reduced by the introduction of USG guided TAP block where precise location of the needle, internal structures and diffusion of the local anesthetics can be directly observed. This study evaluates the effects of USG guided TAP block on post-operative pain relief undergoing laparoscopic surgeries.

Methodology

This Prospective, Observational, Controlled study was performed after taking permission from Institutional Ethics Committee of Amaltas Institute of Medical Sciences, Dewas (M.P.) The study was conducted from July 2022 to December 2023 in our hospital. Patients aged between 18 to 60 years, having American Society of Anesthesiologists (ASA) physical status I and II, and undergoing elective Laparoscopic Cholecystectomy (should be less than 2 hours) were included in the study. Patients with ASA status III & above, allergy to local anaesthetic drug, bleeding disorder, surgical time exceeded 2 hours, pregnancy or not willing to attend the study were excluded. After taking written informed consent, 80 patients were randomized using coin method and allocated into two groups (group T or group G). Patients in group T (n = 40) received bilateral USG TAP block by using 0.5% Bupivacaine 5ml & 2% Lignocaine 5ml after administration of general anaesthesia. Group B (n = 30) patients did not receive any nerve block (control group).

The patients were advised a fasting period of at least 6 hrs. Before surgery. In the preoperative room, Intravenous access was secured. On arrival in the operating room, standard monitors including ECG, Non-invasive blood pressure and Pulse oximetry were applied and baseline values were recorded. All patients were given intravenously 0.2mg Inj. Glycopyrrolate, 1mg Inj. Midazolam before the induction of anaesthesia. General anaesthesia was induced following 3 min of preoxygenation with fentanyl 2 µg/kg and 1.5-2mg Inj. Propofol given until response to verbal commands was lost. Vecuronium bromide 0.1 mg/kg was provided intravenously to assist tracheal intubation. Following induction of general anaesthesia, the TAP block was given on Group T. Using USG guided technique, we have to identify the 3 layers of muscle in the lateral side of abdomen (i.e. External oblique, Internal oblique &

transversus oblique muscle). In between the internal oblique & transversus oblique, we kept our needle & put the mixture of local anaesthetic drug. For local anaesthetic mixture, we gave 0.5% Bupivacaine 5ml & 2% Lignocaine 5ml. Now repeat the whole procedure on other of abdomen also.

Anaesthesia was maintained with 1% Isoflurane & 33% Oxygen and 66% Nitrous oxide. Positive pressure ventilation was initiated with a tidal volume of 8 mL/ kg with an adjusted respiratory rate to maintain end-tidal carbon dioxide between 35 and 40 mmHg. The surgery was commenced 10 min later to allow for the full effect of the block. When the surgeon began the skin suturing at the end of the surgery, isoflurane administration was discontinued and the fresh gas flow rate was increased to 6 L/min of oxygen only. At the beginning of spontaneous breathing by the patient, the reversal of neuromuscular blockade was done with a standard dose of Neostigmine and Glycopyrrolate. The trachea was extubated when the patient spontaneously breathed with tidal volume 5–8 mL/kg and could respond to a verbal request. In the PACU, the quality of recovery was assessed using modified Aldrete scoring on arrival and then every 15 min until 60 min. On the same schedule, pain intensity was assessed using the pain Visual Analogue Scale (VAS), and the time taken for the first request of analgesia was noted (period from the PACU arrival to the first request made by the patient for rescue analgesics). Both for intraoperative & postoperative analgesia, we use Inj. Tramadol for mild to moderate pain and Inj. Fentanyl for severe pain. For any increase from 15%-20% in heart rate & blood pressure, we gave rescue analgesia. Patients having any complications like PONV, anxiety, etc. were noted.

Result:

This study included 60 patients by the Coin sampling method. Patient's demographic data were statistical non-significant with a p-value of more than 0.1. Mean age of patients were 34±0.8 years, Mean weight of patients were of 68±0.1 kgs, & Mean height of patients were 159±0.4cms. We had observed the analgesic requirement in both the groups, by measuring intraoperative & postoperative hemodynamic variation as well as postoperative VAS score. In table 1, we compared the mean heart rate during intraoperative & postoperative period. 0 hours is considered as time of induction. On comparing 2 groups, there was a very well differentiation of heart rate between 2 groups. As in group T, heart rate was very well maintained within normal range, with statistical significant (p-value < 0.003).

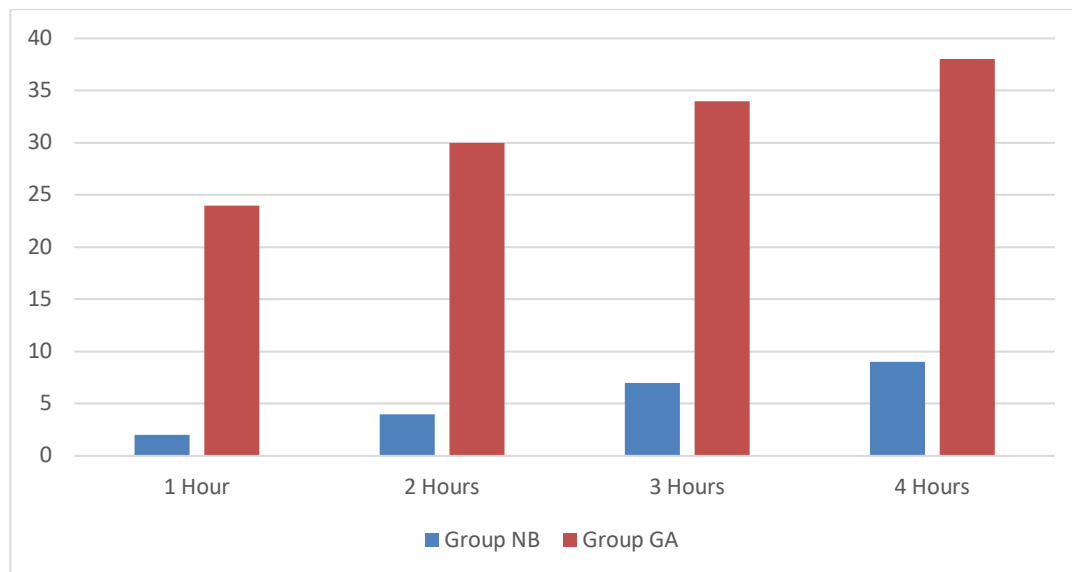


Figure 1:

In Figure 2, we compared the mean blood pressure during intraoperative & postoperative period. 0 hours is considered as time of induction. On comparing 2 groups, there was a significant difference in mean blood pressure between 2 groups.

In group T, at different time interval blood pressure was not fluctuating from normal range, and it was statistically significant also (p-value < 0.003). In table 3, we compared the analgesic requirement of patients both in intraoperative as well as postoperative period. 0 hour is considered as time of induction & time of nerve blocks. During intraoperative period, only 3 patients required analgesic supplement in T group while a total of 28 patients required analgesic supplements in group G.

And if we compared postoperative analgesic requirement, almost all 40 patients requires analgesic drug in group G while in group T, approx. 50% of the patients doesn't required analgesic drug upto 6 hours of surgery. Certain patients don't feel any pain upto 24 hours of surgery. We gave Inj. Tramadol for mild (VAS > 3) to moderate (VAS 3-6) pain & Inj. Fentanyl for severe (VAS < 7) pain during postoperative period.

For intraoperative period, we gave Inj. Tramadol as analgesic supplement. During postoperative period, patients of group G was having moderate to severe pain while patients of group T had only mild pain. 12 patients of group G had PONV while only 1 patient of group T had the same.

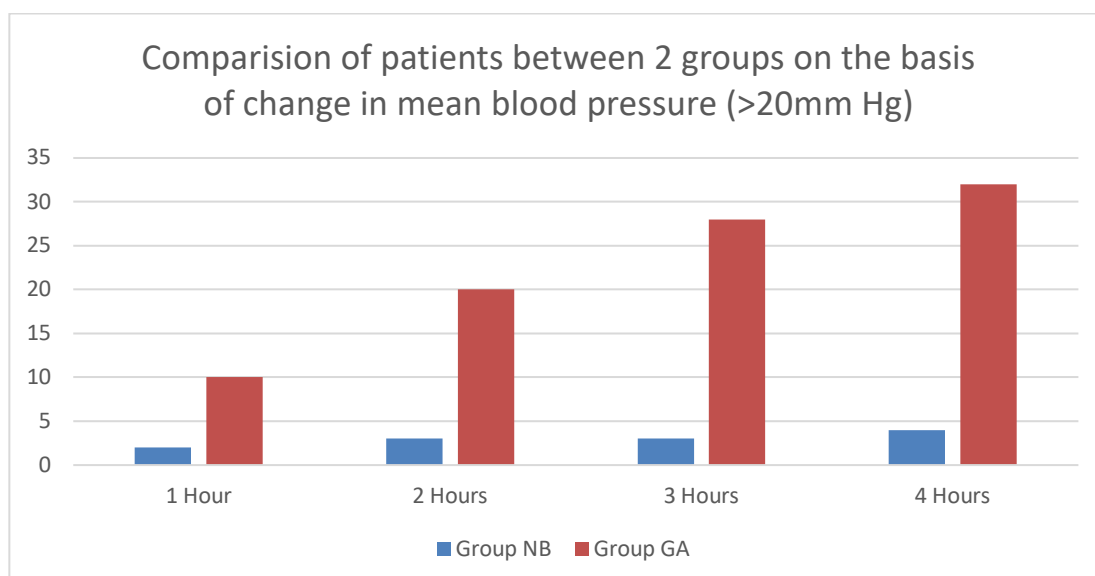


Figure 2: Comparison of patients between 2 groups on the basis of change in mean blood pressure (>20mm Hg)

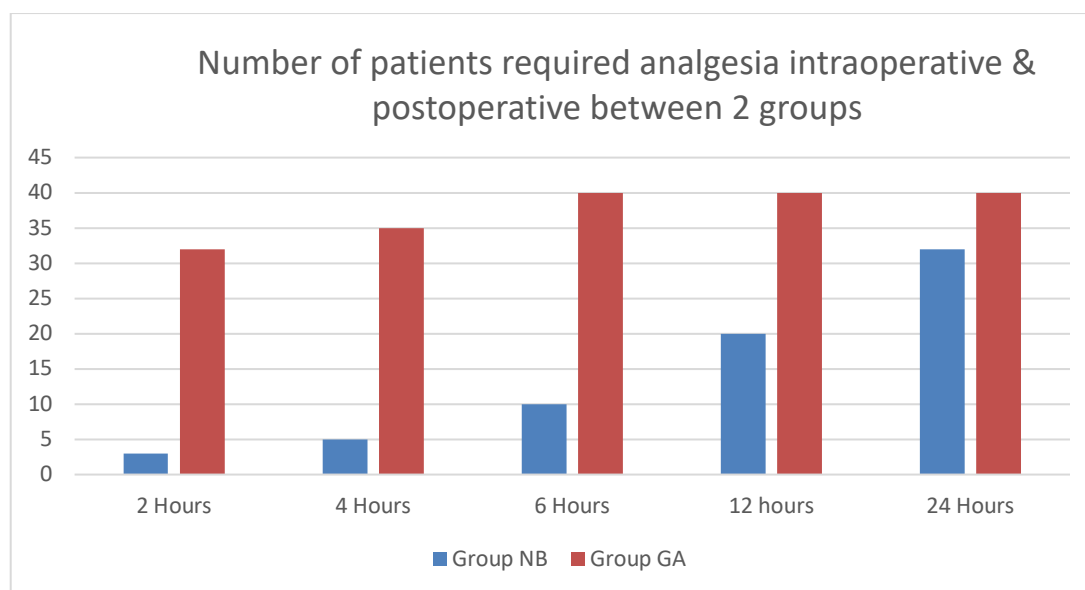


Figure 3: Number of patients required analgesia intraoperative & postoperative between 2 groups

Discussion:

During Laparoscopic abdominal surgeries, the most common side effect is patient's discomfort along with in-traoperative as well as post-operative pain. Abdominal surgical procedures can be associated with incidence of pain, bleeding and increased hospital stay, thereby delaying recovery. Multiple interventions are applied to the patient before, during and after surgery for the above reason's & the commonest be the combined use of Narcotic and NSAIDS. However, they can be associated with GIT and Neurological Side effects, which may cause patient's discomfort. With this background, we decided to conduct a study in which we gave bilateral TAP block along with general anaesthesia for laparoscopic abdominal surgeries. These blocks not only provide the intra-operative hemodynamic stability but also decrease the post-operative overdose of intravenous analgesic drugs.

The TAP block has been described as an effective regional anaesthetic method for various surgical procedures. This study shows that USG guidance block enables the exact placement of local anaesthetic drug between internal oblique abdominal muscle and Transversus abdominal muscle, resulting in superior analgesia when compared with standard general anaesthetic alone. We used USG guided technique (instead of landmark technique) for giving TAP block which will avoid certain complications like colonic puncture, nerve injury, or unpredictable spread of local anaesthetic drugs[11-15] Some rare complications can also be occurred like inadvertent puncture of the liver during giving TAP block[16].

By USG guidance, we direct visualize all anatomical structures, the needle, and the spread of local anaesthetic drug solution which may be associated with an increased margin of safety and

optimal block qualities. Hebbard describes an in-plane ultrasound technique in which a linear ultrasound probe is positioned subcostal and perpendicular to the abdominal wall and a needle insertion point near the xyphoid process [17]. Walter and colleagues used an ultrasonographic approach superior to the iliac crest and a needle insertion point in the area of the triangle of Petit [18].

We also used USG guided an in-plane technique and our puncture area was between the 12th rib and the iliac crest, which is cranial of the triangle of Petit. In our study, we didn't compare the USG with a blind technique because previous descriptions of TAP blockade were weak and the main focus of our study was the description of the USG guided technique and its efficacy. Along with this, there could be high chance of administration of local anaesthetic drug in adjacent anatomical structures during abdominal wall blocks if we use blind technique [19].

The TAP block provides excellent analgesia, & systemic opioid demand was significantly decreased when compared with standard general anaesthetic [20-22].

The TAP block is a regional anaesthetic technique in which large volumes of local anaesthetic drug are administered bilaterally [20-22], upto an extent that a so-called 'flank bulge sign' is visible [23]. Pharmacokinetic data during these techniques have never been measured, but recent studies indicate that administration of local anaesthetic drug between fascia layers is associated with fast absorption kinetics and high plasma levels of local anaesthetic drug [24]. So, it is always advised to use USG guided TAP block for any abdominal surgeries for better intraoperative & postoperative analgesia.

Conclusion

The ultrasound-guided TAP block provides exact placement of the local anaesthetic drug between the internal oblique muscle and Transversus abdominal muscle which helps in significant decrease of systemic analgesics (opioids) demand when compared with a standard general anaesthetic.

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