



Original Contribution

Comparison of posterior and subcostal approaches to ultrasound-guided transverse abdominis plane block for postoperative analgesia in laparoscopic cholecystectomy



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Abstract

Study Objective: To evaluate the effectiveness of subcostal TAP block and to compare its efficacy with that of posterior TAP block in decreasing postoperative pain in patients undergoing laparoscopic cholecystectomy during general anesthesia.

Design: Prospective, randomized, double-blind study.

Setting: Academic medical center.

Patients: 60 adult, ASA physical status 1 and 2 patients of both genders, aged 18–60 years, scheduled for elective laparoscopic cholecystectomy.

Interventions: Patients were randomized to three groups of 20 patients each. Group 1 patients received standard general anesthesia (control group); Group 2 patients received an ultrasound-guided posterior TAP block using 15 mL of 0.375% ropivacaine on each side; and Group 3 patients underwent a subcostal TAP block with 15 mL of 0.375% ropivacaine on each side.

Measurements: The presence and severity of pain during rest and movement, as well as nausea or vomiting and sedation, were assessed in all patients postoperatively on PACU admission, then at 2, 4, 6, 8, 12, and 24-hour intervals. Patients with a visual analog score (VAS) greater than 4, or those requesting analgesic were given intravenous tramadol 2 mg/kg as an initial dose; subsequent 1 mg/kg doses of tramadol, if needed, were given.

Results: Patients who received a subcostal TAP block had significantly lower pain scores at rest and on movement than the control group at all times postoperatively. Although, in the initial postoperative measurement times, the subcostal and posterior TAP groups had comparable pain scores, after 4 hours these scores were significantly lower in patients who had received the subcostal TAP block.

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Conclusion: For incisions mainly involving the supra-umbilical region, subcostal TAP block may be a better alternative than the posterior approach for providing postoperative analgesia.

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1. Introduction

In recent years, there has been growing interest in the use of peripheral regional anesthesia such as transversus abdominis plane (TAP) blocks as an alternative to high-dose intravenous (IV) analgesics for managing pain after abdominal surgeries [1,4].

The TAP block, first described in 2001 by Rafi [5], involves blocking the sensory afferent nerves that supply the anterior abdominal wall including the skin, muscles, and parietal peritoneum. The blind technique of administering this block may be associated with inappropriate block and injury to the abdominal viscera [6]. As a result, over the years there has been growing interest in the use of ultrasound for identifying this plane, thus providing better localization and improving accuracy [6].

The conventional method of giving a TAP block using ultrasound guidance has been the posterior TAP block. The ultrasound probe is placed in a plane transverse to the lateral abdominal wall in the anterior axillary line, between the lower costal margin and iliac crest. At this site, the TAP is identified and the drug is injected by direct vision [7,9]. However, there have been reports that the posterior TAP block mainly provides analgesia below the T10 dermatomal level, and is thus more suitable for abdominal incisions below the umbilicus [8,10,11]. Hebbard [10] described a new technique called the subcostal TAP block, which involves the use of ultrasound to deposit local anesthetic in a more cephalad position, with the probe being placed immediately inferior to the costal margin on the anterior abdominal wall. The drug is injected at this location, immediately lateral to the linea semilunaris in the TAP. Subcostal TAP blocks have produced more effective analgesia for incisions in the supra-umbilical region [12].

Although studies have shown the usefulness of posterior TAP block in decreasing postlaparoscopic cholecystectomy pain [6,13], the effectiveness of the subcostal TAP block in the same setting was yet to be determined. In this study, the effectiveness of the subcostal TAP block was evaluated and compared with the posterior TAP block in decreasing postoperative pain in patients undergoing laparoscopic cholecystectomy during general anesthesia.

2. Materials and methods

This prospective, randomized, double-blinded study was conducted after approval by the Institutional Ethics Committee of the PostGraduate Institute of Medical Education

and Research (PGIMER), Chandigarh, India. After written, informed consent was obtained, 60 ASA physical status 1 and 2 patients of both genders, aged 18-60 years, scheduled to undergo elective laparoscopic cholecystectomy were enrolled in the study. Patients with a history of substance abuse, psychiatric illness, opioid tolerance, renal dysfunction, coagulopathies, pregnancy, or allergy to any of the drugs used in the study were excluded.

All patients were evaluated a day before surgery and told about the visual analog scale (VAS) for pain, where 0=no pain and 10=worst imaginable pain [4]. Postoperatively, nausea was assessed by the categorical scoring system for nausea (0=none, 1=mild, 2=moderate, 3=severe) [4]. Any patient who failed to understand these scoring systems was excluded from the study.

Patients were premedicated with alprazolam 0.25 mg and ranitidine 150 mg orally the night before and two hours before surgery. Randomization of patients was done by computer-generated, coded, sealed envelope assignment. Patients were then allocated to one of three groups of 20 patients each: Group I patients received standard general anesthesia, whereas Groups II and III patients received ultrasound-guided posterior and subcostal TAP blocks, respectively, using 15 mL of 0.375% ropivacaine on each side in addition to general anesthesia.

In the operating room, patients were monitored for heart rate (HR), blood pressure (BP), continuous electrocardiogram (ECG), arterial oxygen saturation (SpO₂), end-tidal carbon dioxide (ETCO₂), and temperature using multi-channel monitors. General anesthesia in all groups followed a standard technique. After preoxygenation with 100% oxygen for three minutes, anesthesia was induced with IV morphine 0.1 mg/kg and propofol 2-3 mg/kg. Vecuronium bromide 0.1 mg/kg was used to facilitate tracheal intubation and anesthesia was maintained with 66% nitrous oxide in oxygen supplemented with isoflurane (1% - 2%). At the end of surgery, residual neuromuscular blockade was reversed with IV neostigmine 50 µg/kg and IV glycopyrrolate 10 µg/kg. All patients received IV ondansetron 0.1 mg/kg prior to completion of the surgery.

Ultrasound-guided bilateral posterior or subcostal TAP blocks were performed in Groups II and III, respectively, prior to extubation of the trachea. To perform the blocks, abdominal skin was prepared with 5% povidone iodine solution and covered with sterile drapes. For posterior TAP block, a high-frequency (5 - 10 MHz) ultrasound probe (Sonosite, Inc., Bothell, WA, USA) was placed transversely along the anterolateral abdominal wall on one side at the level of the anterior axillary line, between the iliac crest and the subcostal margin, to identify the external oblique,

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