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Original Contribution

Evaluation of ultrasound-guided erector spinae plane block for postoperative analgesia in laparoscopic cholecystectomy: A prospective, randomized, controlled clinical trial

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ABSTRACT

Study objective: Laparoscopic cholecystectomy (LC) is a commonly performed minimally invasive procedure that has led to a decrease in procedure-related mortality and morbidity. However, LC requires analgesia that blocks both visceral and somatic nerve fibers. In this study, we evaluated the effectiveness of Erector Spinae Plane Block (ESPB) for postoperative analgesia management in LC.
Design: Single-blinded, prospective, randomized, efficiency study.
Setting: Tertiary university hospital, postoperative recovery room & ward.
Patients: 36 patients (ASA I-II) were recruited in two equal groups (block and control group). Following exclusion, 30 patients were included in final analysis.
Interventions: Standard multimodal analgesia was performed in Group C (control) while ESPB block was also performed in Group B (block).
Measurements: Pain intensity between groups were compared using Numeric Rating Scores (NRS). Also, tramadol consumption and additional rescue analgesic requirement were measured.
Main results: NRS was lower in Group B during the first 3 h. There was no difference in NRS scores at other hours. Tramadol consumption was lower in Group B during the first 12 h. Less rescue analgesia was required in Group.
Conclusion: Bilateral ultrasound guided ESPB leads to effective analgesia and a decrease in analgesia requirement in first 12 h in patients undergoing LC.

1. Introduction

Laparoscopic cholecystectomy (LC) is a commonly performed minimally invasive procedure. The type and mechanism of pain in LC is different from that of open cholecystectomy [1,2]. In addition to somatic pain from the trocar entry incisions, peritoneal distention and diaphragm irritation due to high intra-abdominal pressure and CO2 insufflations lead to visceral pain [3–5].

Prevention and management of surgery related pain is important in LC, as with all other surgeries. Apart from non-steroid anti-inflammatory agents and intravenous opioids, local anesthetic infiltration of incision sites, preemptive analgesia methods and regional anesthesia techniques plan a role in multimodal analgesia [6–9]. Regional anesthesia techniques studied and considered part of multimodal anesthesia include transversus abdominis plane block (TAP), oblique subcostal transversus abdominis plane block (OSTAP or STAP) and paravertebral block [7,9,10]. Apart from paravertebral block, these techniques only effect somatic pain and can therefore be inadequate in some cases [11].

Erector Spinae Plane Block (ESPB) – first recently described for the treatment of thoracic neuropathic pain, is a peri-paravertebral regional anesthesia technique that has since been reported as an effective technique for prevention of postoperative pain in various surgeries [6,12–14]. In ESPB, local anesthetic is reported to be administered in to the interfascial plane between the transverse process of the vertebra and the erector spinae muscles, spreading to multiple paravertebral spaces. Case reports have reported that ESPB effects both the ventral and dorsal rami and leading to blockage of both visceral and somatic pain [15,16]. There are no clinical trials regarding ESPB and only a few case reports have been documented so far [6,12,17,18,23].

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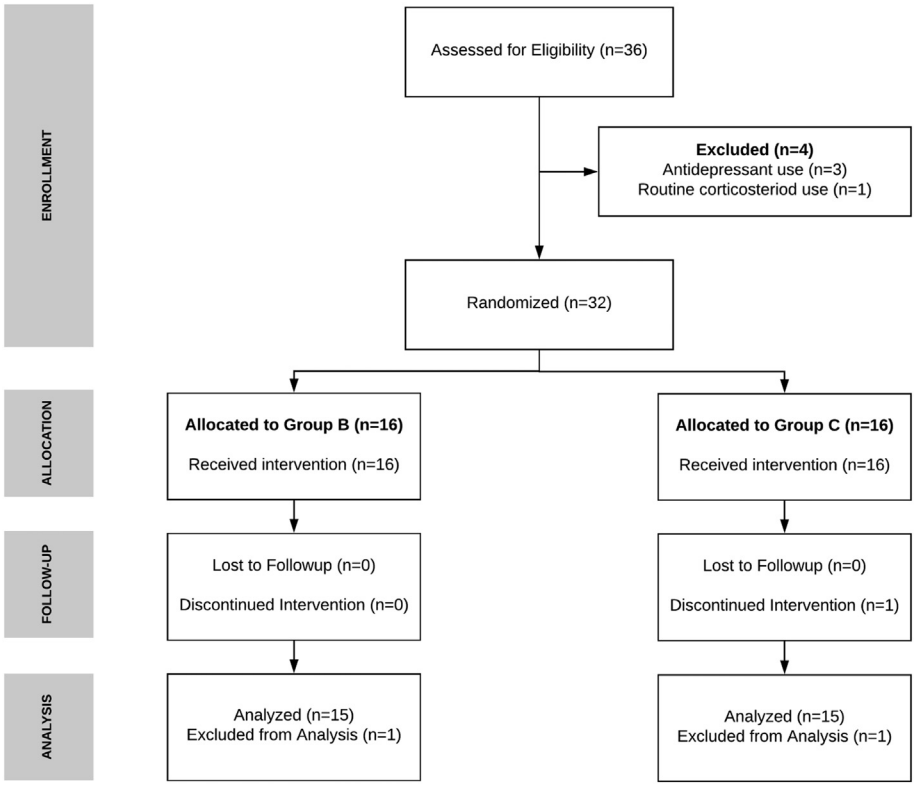

Fig. 1. CONSORT diagram of study.

The aim of this study was to evaluate the effect of ESPB on postoperative pain in LC, which leads to both visceral and somatic pain.

2. Material & method

2.1. Study design

This single blinded, prospective, randomized, efficiency study was performed after Local Ethics Committee approval and in accordance with the principles outlined in the Declaration of Helsinki. The study was registered with clinicaltrials.gov (Registration No: NCT03391167) and CONSORT checklist was used for enrollment and allocation of patients. (Fig. 1) Recruitment was performed between February 2018 and April 2018. All patients gave written informed consent for inclusion into this study.

Patients aged between 18 and 65 years, scheduled to undergo LC with an American Society of Anesthesiology physical status classification score of 1 or 2 were included in the study. Written informed consent for general anesthesia and all procedures were obtained from all patients. Patients that refused enrollment or later requested removal for the study, those who were unable to give informed consent and patients with either contraindications for regional anesthesia, known allergy to local anesthetics, bleeding diathesis, use of anticoagulants or corticosteroids, inability to operate patient controlled analgesia (PCA) system, psychiatric disorders or use of psychiatric medications, conversion to open cholecystectomy and excessively long surgical times (> 90 min) were not included in the study.

2.2. Patient grouping and randomization

The study was planned to include two groups of 15 patients each: control group (Group C) and ESPB group (Group B). Upon ward admission, a random ID was assigned to each patient. Simple randomization in the operating room was performed using the closed envelope method to determine which group the patient would be included in. The random ID assigned to each patient was used when collecting all patient data in the ward postoperatively. This data was therefore collected blindly. The anesthesiologist performing the simple randomization also performed the block but did not play any role in the collection of postoperative data or its analysis.

2.3. Anesthesia application

General anesthesia and surgical technique was the same for both groups. Standard monitoring procedures included pulse oximetry, electrocardiography, and noninvasive arterial pressure were performed prior to anesthesia. Baseline heart rates, systolic and diastolic blood pressures, and mean arterial pressures were recorded before anesthesia. All patients were premedicated with IV midazolam 1–2 mg and antibiotic prophylaxis, according to the hospital's protocol. Induction was performed using propofol 2–3 mg kg^{-1}, fentanyl 100 µg and rocuronium bromide 0.6 mg kg^{-1}. 0.6 MAC sevoflurane and 0.08 µg/kg/min remifentanil infusion was used for anesthesia maintenance. Remifentanil dosage was adjusted according to hemodynamic parameters, up to 2 µg/kg/min. Standard perioperative intravenous analgesia protocol included paracetamol 1 g, tenoxicam 20 mg in LC. After completion of surgery, patients were extubated when adequate muscle strength was established, and transferred to the recovery room.

Local anesthesia was not applied to wounds or nebulized intraperitoneally. Pneumoperitoneum was evacuated in all patients at the end of surgery.

2.4. Application of ESPB

All blocks were preformed under sedoanalgesia and before general anesthesia induction. Following routine monitoring and premedication the patients were placed in the sitting position. ESPB was performed under ultrasonographic guidance using a linear 6- to 10-MHz ultrasound probe (Mindray DP 9900 plus; Mindray Bio-Medical Electronics, Shenzhen, China). The linear ultrasound transducer was placed in a