Journal of Clinical Anesthesia (2016) **33**, 414–421

ELSEVIER

Journal of Clinical Anesthesia

Original Contribution

Ultrasound-guided single- vs double-level thoracic paravertebral block for postoperative analgesia in total mastectomy with axillary clearance☆,☆☆

Rajesh Kasimahanti MD (Senior Resident)[a], Suman Arora MD (Professor)[a,*], Nidhi Bhatia MD, DNB (Associate Professor)[a], Gurpreet Singh MS (Professor)[b]

[a]*Department of Anesthesia and Intensive Care, PGIMER, Chandigarh, India*
[b]*Department of General Surgery, PGIMER, Chandigarh, India*

Received 20 November 2014; revised 29 October 2015; accepted 20 January 2016

Keywords:
Paravertebral block;
Breast surgery;
Postoperative analgesia

Abstract

Objectives: Thoracic paravertebral block (TPVB) for breast surgery reduces acute and chronic postoperative pain. Using ultrasound for administering the block makes it easier, with its administration at multiple levels decreasing the number of unblocked segments. We conducted this study to evaluate the efficacy and safety of single- vs double-level ultrasound-guided TPVB in patients undergoing total mastectomy with axillary clearance under general anesthesia.

Design: This is a prospective, randomized study.

Setting: Recovery room and operation theater.

Patients: Sixty ASA I and II patients, aged 18 to 60 years, who were scheduled to undergo total mastectomy with axillary clearance under general anesthesia were enrolled in the study.

Interventions: Patients received either single- (group S) or double-level (group D) ultrasound-guided TPVB at T4 or at T2 and T5 levels, respectively, using 0.3 mL/kg of 0.5% ropivacaine.

Measurements: Primary outcome measure was 24-hour analgesic consumption, and secondary outcomes included number of segments blocked, postoperative pain scores, time to first request for rescue analgesic, and any side effects.

Results: The mean total amount of rescue analgesic given in group S was 175.3 ± 70 mg and in group D was 115.7 ± 48 mg ($P = .002$). Median number of segments showing less sensation to pinprick was 3 in group S and 4 in group D ($P < .001$). The mean time to first request for rescue analgesic was 533 ± 124 minutes in group S and was 611 ± 214 minutes in group D ($P = .118$).

Conclusion: Patients receiving double-level TPVB had significantly less 24-hour analgesic consumption in the postoperative period than those in the single-level TPVB group. This could be due to decreased pain sensation to pinprick in significantly greater number of segments in the double-level TPVB group.

☆ Funding or research contracts: None.
☆☆ Conflicts of interest: None.
* Corresponding author. Tel.: +91 9914209528.
E-mail addresses: rajeshkasimahanti@gmail.com (R. Kasimahanti), drsumanarora@hotmail.com (S. Arora), nidhi.bhatia75@gmail.com (N. bhatia), gsinghpgi@gmail.com (G. Singh).

http://dx.doi.org/10.1016/j.jclinane.2016.01.027
0952-8180/

1. Introduction

Breast surgeries done for malignancy are known to be associated with considerable postoperative pain, nausea, vomiting (PONV) and restricted shoulder movement [1]. In recent times, there has been a growing interest in the use of thoracic paravertebral block (TPVB) to combat this pain. TPVB appears promising because it has been shown to be efficacious in reducing postoperative pain, decreasing opioid consumption with reduction in PONV, drowsiness, and risk of respiratory depression, while being cost-effective [2–4]. TPVB has also being reported to decrease the incidence of chronic postsurgical pain and tumor recurrence [5]. Presently, ultrasound is being increasingly used as a guidance tool for administering TPVB, thus making the performance easier and decreasing the incidence of complications, such as vascular puncture, nerve injury, and pneumothorax, associated with blind techniques [6,7]. For providing perioperative analgesia, TPVB can be administered by various techniques including either a single-level injection, multiple-level injections, or continuous catheter techniques [8,9]. The single-level injection technique is known to be associated with decreased patient discomfort, block time, and rate of needle-related complications. On the other hand, multiple-level TPVB decreases the incidence of unblocked segments and the risk of massive intravascular or intrathecal injection of local anesthetic (LA), because the total dose is divided into several injections [10].

To date, there has been no clinical study in literature comparing the perioperative analgesic efficacy of single-level with double-level TPVB. So, the present study was planned with the aim of evaluating the postoperative analgesic efficacy and safety of ultrasound-guided single-level vs double-level TPVB in patients undergoing total mastectomy with axillary clearance (TMAC) under general anesthesia (GA). We hypothesized that double-level TPVB would increase the spread of LA solution, resulting in lesser analgesic consumption in the postoperative period.

2. Material and methods

This prospective, randomized study was carried out in a public tertiary care hospital in India. The Consolidated Standards of Reporting Trials (CONSORT) guidelines were followed. Institute ethics committee approval was obtained (ref: 8834/PG-2Trg/2011/16774). The trial is registered with the Clinical Trial Registry of India (URL: http://www.ctri.in, registration number: CTRI/2014/06/004701). After obtaining written, informed consent, 60 ASA I and II patients in the age group of 18 to 60 years, scheduled to undergo TMAC under GA, were enrolled in the study. Patients with local infection, coagulopathy, extreme obesity, allergy to LAs, decreased pulmonary reserve, cardiac disorders, renal dysfunction, preexisting neurological deficits, psychiatric illnesses, and widespread metastatic disease were excluded from the study. All patients were evaluated preoperatively to assess the fitness for GA and explained about 11-point numeric rating scale (NRS) for pain, where 0 stands for "no pain" and 10 stands for "worst imaginable pain." Postoperative nausea and vomiting was assessed using a 3-point scale system (0, no nausea, vomiting; 1, nausea present but no vomiting; 2, vomiting present with or without nausea). Patients who failed to understand the scoring systems were excluded from the study design.

All patients were fasted overnight and premedicated with tablet alprazolam 0.25 mg and tablet ranitidine 150 mg orally the night before and 2 hours before surgery. Using computer-generated random number table, patients were randomly allocated to receive either single-level, unilateral ultrasound-guided TPVB at T4 level using 0.3 mL/kg of 0.5% ropivacaine (group S, n = 30) or double-level, unilateral ultrasound-guided TPVB at T2 and T5 level using a total volume of 0.3 mL/kg of 0.5% ropivacaine, divided into equal halves for each site (group D, n = 30). Group allocation was concealed by the use of coded, opaque, sealed envelopes.

On the day of surgery, patients were shifted to the preoperative room and monitored for heart rate (HR), noninvasive blood pressure (NIBP), electrocardiogram, and arterial oxygen saturation (Spo_2) using multichannel monitors (GE Dash 5000; GE healthcare, Helsinki, Finland). In all patients, after establishing an intravenous access and taking universal antiseptic precautions, 1 of the 2 investigators performed either single- or double-level TPVB in sitting position, using high-frequency (5-10 MHz) ultrasound probe (SonoSite Inc., Bothell, WA). The probe was placed vertically in a saggital, paramedian plane, parallel to the spinous process, at the predetermined level and the paravertebral space (PVS) was identified. After infiltrating the skin with LA (2% lignocaine), a 22-gauge Quincke's tip spinal needle was advanced into the PVS under ultrasound guidance, using an in-plane technique (Figs. 1 and 2). Once the tip of the needle was in a position between the superior costotransverse ligament and the pleura, the drug was administered after negative aspiration and observed for downward movement of pleura. The same procedure was repeated at the second level for the double-level group.

For 20 minutes after block administration, all patients were observed for pinprick sensation every 5 minutes in the T1 to T8 dermatomal distribution by an independent observer who was blinded to the initial procedure. The total number of dermatomes that had less pain to pinprick was noted. If the sensation did not decrease at least in 1 segment, it was considered as block failure. After 20 minutes of TPVB administration, patients were shifted to the operating room.

In the operating room, all the patients were monitored for HR, NIBP, electrocardiogram, Spo_2, end-tidal carbon dioxide ($Etco_2$), and temperature using multichannel monitors (Datex-Ohmeda S/5 Avance; GE healthcare, Helsinki, Finland). In both groups, GA was administered using a standard anesthetic