Single Injection Paravertebral Block for Major Cancer Breast Surgery

Aditya Kumar, Uma Srivastava, Surekha Saxena, Ashish K. Kannaujia, Namita Saraswat, Abhijeet R Mishra, Sanjeev Sharma

ABSTRACT

Background: Thoracic paravertebral block (TPVB) is an alternative technique of anaesthesia for breast surgery. The purpose of the study was to evaluate the efficacy and safety of the block regarding surgical anaesthesia, postoperative pain and nausea vomiting

Patients & Methods: Single injection PVB was given at the level of T4 with 0.4ml.kg^{-1} of 0.5% bupivacaine in 46 women undergoing major surgery for cancer breast.

Results: Surgical anaesthesia was adequate in 93% of patients. Three patients required analgesic supplement during axillary dissection. In 3 patients conversion to GA was needed because of unsuccessful block. Median time for first analgesic demand was 9 hrs (range 2-24hrs). The verbal analogue pain scores were low during 24hrs with 73% women having scores 3 or below. Only 26% patients needed opioids for postoperative pain relief. Antiemetic medication was required by 9 (19%) patients only. No serious complication of block was seen.

Conclusions: Single injection paravertebral block is a simple, safe and effective technique for major surgery of carcinoma breast. It provides adequate surgical conditions and prolonged postoperative analgesia with low incidence of PONV and complications.

KEYWORDS: Paravertebral block, breast surgery, single injection, bupivacaine

General anaesthesia has been a standard technique for breast surgery. Regional anaesthesia using thoracic paravertebral block (TPVB) has emerged as a suitable alternative to GA as it offers of good surgical anaes-thesia along with prolonged postoperative analgesia.[1,2,3]

The thoracic paravertebral space is a wedge shaped space lying on either side of the vertebral column. The base is formed by the vertebral body, intervertebral disc, intervertebral foramina & its contents. Anterolateral boundary is formed by the parietal pleura and posterior boundary by costo-transverse ligament. The apex is continuous with intercostal space laterally and with subpleural space at the tip of transverse process.

The technique of TPVB involves the injection of local anesthetic drug alongside the thoracic vertebra where the nerve trunks emerge from the intervertebral foramina which results in ipsilateral somatic and sympathetic nerve block of thoracic dermatomes.[4,5,6]

TPVB performed as multiple injections given from C_6-T_7 level has been an established technique for breast surgery.[1,7,8] Few studies produced evidence for the spread of local anaesthetic to adjacent paravertebral spaces above and below the site of injection.[6,9] This observation led to the development of single injection of large volume of local anaesthetic at T_3 or T_4 level for breast surgery with similar operative conditions and good postoperative analgesia as seen after multiple injection technique.[2,10,11]

The aim of present study was to find out the effectiveness and safety of single injection paravertebral block for major surgery of cancer breast with 0.4 ml.kg^{-1} of bupivacaine given at T_4 level.

PATIENTS & METHODS

The study was conducted on 46 women who required major surgery for cancer breast. The surgical procedures included are given in Table 1. The protocol was approved by institutional proforma and ethical committee. The patients of ASA physical status I-III who were willing to be operated under paravertebral block (PVB) were taken into the study after informed written consent. Patients with morbid obesity, spinal deformity and local infection at the site of block were excluded. All the blocks were given in a room adjacent to main operating room with monitoring facility by the attending anesthesiologist. Each patient received oral alprazolam in the morning and diazepam in the night before surgery. Monitoring included pulse oximetry, heart rate, NIBP and ECG. After securing the IV line and applying the monitors the women were sedated with 1-2mg of IV midazolam if

Drs. Aditya Kumar, Uma Srivastava, Professors, Surekha Saxena, Professor & Head, Ashish K Kannaujia, Lecturer, Namita Saraswat, Abhijeet R Mishra, Sanjeev Sharma, Resident, Department of Anaesthesia & Critical Care, SN Medical College Agra-282002, India

Correspondence: Dr Aditya Kumar, E-mail : dradikumar@rediffmail.com

needed. The patients were positioned in the lateral position with side to be blocked upward. The paravertebral block was given according to guidelines described by Eason and Wyatt (1979).[4] The spinous process of T_4 vertebra was identified and marked. A 23G Quincke's spinal needle was introduced at 90º to the skin in all planes, 3cm from anatomical midline at the cephalad end of the vertebral spine of T_4. The needle was advanced till it touched the transverse process of the vertebra or rib. The needle was withdrawn and then advanced cephalad to walk off the transverse process or the rib for a distance of 1.5-2cm. Resistance to injection was tested until loss of resistance, when the needle passed the costo transverse ligament into the paravertebral space. After careful aspiration 0.4 $ml.kg^{-1}$ of 0.5% bupivacaine was injected in paravertebral space in small aliquots with repeated aspiration test.

After completion of injection, the patients were turned to supine position and sensations were tested by pinprick. After ensuring adequate anaesthesia, the patients were transferred to main operation room (OR) for surgery. All the patients received sedation with propofol by continuous infusion titrated to the level of mild to moderate sedation and arousable on command. If the patients had pain at the time of incision or during surgery 1.5-2$\mu g.kg^{-1}$ of fentanyl was given and surgery was allowed. If the surgery was not possible, the block was rated as unsuccessful and general anaesthesia was given. After the completion of surgery, the patients were transferred to postoperative ward. Postoperative analgesic medications were based on assessment of each patient's need. Every patient was enquired about pain at 1,3,6,12 and 24 hrs after surgery using verbal analog scale of 0-10 where 0=no pain and 10 = worst pain. If patient demanded analgesia, diclofenac 75mg was given and if this provided insufficient pain relief after 30 min, butorphanol 1mg IV was given. Persistent nausea and vomiting was treated with ondansetron. Satisfaction with the anaesthetic technique was enquired on 2nd postoperative day from the patients as satisfactory or unsatisfactory. Any complications of the block such as contralateral spread, pneumothorax, intravascular injection or local anaesthetic toxicity etc were also noted.

RESULTS

Time taken to perform the block ranged from 9-15 minutes. The onset of sensory block occurred in 7-10 minutes after injection with surgical anaesthesia ensuing in 20-30 minutes. Transverse process was encountered at a depth of 2- 3.5 cm and paravertebral space at 3.5-4.5 cm from the skin. Demographic data and other data are given in Table 1. The commonest surgical procedure done was modified radical mastectomy.

Block was successful in 43 (93%) patients. Out of 46 patients, 40 patients (87%) were not given any analgesic during surgery and three patients (6.5 %) required fentanyl at the time of axillary lymph node dissection. In 3 (6.5 %) patients conversion to general anaesthesia was needed. (Unsuccessful block) (table 2). Median duration for first dose of analgesic was 9 hours after operation. Ten (22%) patients did not demand any analgesic for 24 hrs after operation. 24 patients (52%) required only single dose of diclofenac while 12 (28%) patients needed additional opioid (butorphanol) for incisional pain relief. (Table 2). Seven patients needed analgesic within three hours of surgery. VAS pain scores remained low in majority of the patients during 24 hours with approximately 73 % patients having pain scores below 3. The frequency of PONV was very low and only 9 (19%) patients were given antiemetic medication. In general the patients were satisfied with anaesthesia mainly because of less nausea & vomiting as well as less pain. The surgeons were also satisfied with the operating conditions.

Table 1
Patients Data

Age(yrs)	45(35-65)
Weight(kg)	54(48-74)
ASA Status I,II,III	22,17,7
Duration of Surgery(min)	60 (45-150)
Type of Surgery	
Ø Modified Radical Mastectomy	20
Ø Simple Mastectomy	12
Ø Mastectomy with Axillary lymph node dissection	8
Ø Wide local Excision with or without axillary lymph node dissection	6

Data are mean (range) or number of patients

Table 2
Study Data

Block Successful (no & %)	43(93%)
Conversion to GA (no & %)	3(6.52 %)
Pain during axillary lymph node dissection (no & %)	3(6.52 %)
VAS (Mean +SD) at	
1hr	2.57 ± 1.07
3hrs	2.92 ± 1.60
6hrs	3.02 ± 0.94
12hrs	3.80 ± 2.10
24hrs	4.04 ± 1.60
Time for 1st analgesia (hrs)	9(2-24)
Analgesic need in 24hrs (Nil / NSAIDS / opioids)	10/24/12
Antiemetic medication	9(19%)

DISCUSSION

The results of this study indicate that single injection PVB along with sedation provided adequate surgical

conditions for various types of operations of cancer breast with low incidence of conversion to general anaesthesia. The technique provided additional benefit of postoperative analgesia and low incidence of PONV. In 87% (40/46) of patients surgery was completed without any supplementary analgesic. Three patients required additional fentanyl at the time of axillary lymph node dissection. Pain during dissection in axilla is reported[2] and might be due to incomplete block of T_1 & T_2 dermatomes because of inadequate cephalad spread of local anaesthetic.[4] In common with other regional anaesthesia techniques PVB is also associated with failure in about 5-10% of cases.[1,10,12] Our success rate compares favorably with these reports. The failure was mainly due to technical difficulty in accurately identifying the space.[9]

Postoperative incisional pain of major breast surgery is usually severe thus generally requires opioids.[2,7] In the present study, consumption of opioids was reduced considerably and only 28 % cases needed opioids. Many previous authors have documented significant reduction in opioids requirement in women operated under paravertebral block.[1,2,3,12] Half the patients (52%) required only single injection of diclofenac whereas 22% patients did not demand any analgesic in 24 hours postoperatively. Also the verbal analogue pain scores were consistently low in most of the patients for 24 hrs.

The incidence of PONV after breast surgery done under GA is usually quite high. In our patients the incidence of PONV was very low. Only 19% patients required rescue antiemetic, a finding in agreement with previous studies.[2,3,7,8]

The frequency of complication was extremely low in present study. One patient had sensory block of 2 dermatomes on the opposite side. This could be due to spread of local anesthetic by crossing anterior surface of vertebra or through intervertebral foramina. No patient had complication of pleural puncture, pneumothorax, dural puncture, local anaesthetic toxicity or intravenous injection. This study comprised only 46 patients which may be a small number to accurately find the incidence of complications, although studies with larger number of patients have also reported low frequency of technique related complications.[1,3,10,11]

A variety of regional anaesthesia techniques have been described in the literature as alternative to GA for breast surgery. These include field block, local infilteration, intercostal nerve block, thoracic epidural block and thoracic PVB. We opted for TPVB as this technique is simple, safe and easy to learn. TPVB has been considered a suitable and ideal alternative to GA for breast surgery.[1,9,12,13] Its benefits include extensive anaesthesia for operative procedure, prolonged postoperative pain relief, less PONV, early oral intake and same day discharge from the hospital.[1,2,3,7,8,11,12] Additional benefits are less hemodynamic disturbances[3], preservation of spontaneous breathing, attenuation of surgical stress response[12] and less chances of development of chronic post-mastectomy pain syndrome.[17]

There are several methods for TPVB, but multiple injections at C_6-T_7 level and single injection at T_4 level with lateral approach are most popular. Although no published report has compared single and multiple injection methods, adequate surgical condition and postoperative analgesia has been found following both the techniques.[9,7,12,14] For current trial we chose single injection at T_4 level as it causes less discomfort to patient15 and has less chances of puncture related complications.[10,11,15]

To summarize, the present study demonstrated that single injection PVB is a simple, safe and effective technique for surgery of carcinoma of breast. The technique is easy to learn, has low failure rate and causes minimal block related complications. It provides prolonged postoperative analgesia with less PONV. The complications and failures can be minimized by clear understanding of the anatomy and selection of a more lateral approach (as in our study). The use of nerve stimulator or ultrasound can further reduce failures and complications.[8,16]

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