Original Article

Multiple levels paravertebral block versus morphine patient-controlled analgesia for postoperative analgesia following breast cancer surgery with unilateral lumpectomy, and axillary lymph nodes dissection

ABSTRACT

Background: Postoperative pain after breast cancer surgery is not uncommon. Narcotic based analgesia is commonly used for postoperative pain management. However, the side-effects and complications of systemic narcotics is a significant disadvantage. Different locoregional anesthetic techniques have been tried including, single and multiple levels paravertebral block (PVB), which seems to have a significant reduction in immediate postoperative pain with fewer side-effects. The aim of this study was to compare unilateral multiple level PVB versus morphine patient-controlled analgesia (PCA) for pain relief after breast cancer surgery with unilateral lumpectomy and axillary lymph nodes dissection.

Materials and Methods: Forty patients scheduled for breast cancer surgery were randomized to receive either preoperative unilateral multiple injections PVB at five thoracic dermatomes (group P, 20 patients) or postoperative intravenous PCA with morphine (group M, 20 patients) for postoperative pain control. Numerical pain scale, mean arterial pressure, heart rate, Time to first analgesic demand, 24-h morphine consumption side-effects and length of hospital stay were recorded.

Results: PVB resulted in a significantly more postoperative analgesia, maintained hemodynamic, more significant reduction in nausea and vomiting, and shorter hospital stay compared with PCA patients.

Conclusion: Multiple levels PVB is an effective regional anesthetic technique for postoperative pain management, it provides superior analgesia with less narcotics consumption, and fewer side-effects compared with PCA morphine for patients with breast cancer who undergo unilateral lumpectomy, with axillary lymph nodes dissection.

Key words: Block; breast; cancer; morphine; paravertebral

Introduction

Postoperative pain after breast cancer surgery is unavoidable, it is associated with increased morbidity, prolonged hospital stay, increased healthcare cost and patient suffering.[1,2] It's also a risk factor in the development of chronic persistent pain.

Narcotics based analgesia, used to be the mainstay of postoperative pain management, however, opioid-related side-effects, and the increased risk of cancer recurrence has raised the temptation to look for alternative options for pain control.[3]

Access this article online	
Website: www.saudija.org	Quick Response Code
DOI: 10.4103/1658-354X.169468	

How to cite this article: Fallatah S, Mousa WF. Multiple levels paravertebral block versus morphine patient-controlled analgesia for postoperative analgesia following breast cancer surgery with unilateral lumpectomy, and axillary lymph nodes dissection. Saudi J Anaesth 2016;10:13-7.

Summayah Fallatah, Mousa WF

Department of Anesthesia, Surgical ICU and Pain Medicine, College of Medicine, University of Dammam, Al Khober, Saudi Arabia

Address for correspondence: Dr. Summayah Fallatah, Department of Anesthesia, Surgical ICU and Pain Medicine, College of Medicine, University of Dammam, P.O. Box 40081, Al Khober 31952, Saudi Arabia. E-mail: drfallatahs05@gmail.com

Paravertebral block (PVB) is a popular analgesic technique that has been proven successful for postoperative pain management in different surgical procedures, such as thoracotomies,[4,5] abdominal herniorrhaphy,[6] and lithotripsy,[7] with no opioid-related side-effects.

The aim of this study is to compare PVB to patient-controlled analgesia (PCA) morphine, in term of postoperative pain control, the incidence of side-effects and length of hospital stay. In patients with breast cancer who will undergo a unilateral lumpectomy, with axillary lymph nodes dissection.

Materials and Methods

This prospective randomized study was conducted after approval by the Local Ethical Committee and patients written informed consent; 40 female patients scheduled for unilateral breast lumpectomy with axillary lymph node dissection under general anesthesia (GA) were enrolled in this study. Inclusion criteria included age 20-70 years, American Society of Anesthesiologists (ASA) physical status I, II, and III, body mass index <35 kg/m^2. Exclusion criteria included infection at the site of injections, anatomic deformities of the thoracic spine, coagulation disorders, and allergy against local anesthetics or morphine.

Patients were randomly allocated using a computer generated random numbers to receive either preoperative unilateral multiple injections PVB at five thoracic dermatomes (group P) or postoperative intravenous PCA with morphine (group M) for postoperative pain control. Patients were evaluated for eligibility the day before the procedure by an investigator who do not control or know the future patients group assignment and both of PVB and PCA were explained to the patients.

In the operating room, intravenous access was secured, and midazolam (0.02 mg/kg) was given to all patients. Standard ASA monitors were applied including pulse oximetry, noninvasive blood pressure, and electrocardiogram. The same experienced anesthetist performed all the blocks for patients in group P. Group P patients were placed in the sitting position, leaning forward. After skin disinfection using chlorhexidine solution, spinous processes were identified and at parasagittal plan at 2.5 cm, skin wheel is raised using 1% lidocaine and a 20-gauge tuohy needle connected to tubing that is connected to a syringe containing the local anesthetic. The needle is inserted perpendicular to the skin, once the transverse process is contacted, the depth is noted by needle marking and the needle walked off caudally beyond the needle depth by 1-1.5 cm, after the negative aspiration for air, cerebrospinal fluid and blood, 4 ml of 0.5% bupivicaine given at each level from T2 to T6.

General anesthesia was induced for all patients using fentanyl (1 μg/kg), propofol (2 mg/kg), and rocuronium 0.5 mg/kg to facilitate endotracheal intubation. Anesthesia was maintained with sevoflurane in a mixture of oxygen, and air and analgesia were supplemented with fentanyl according to the vital signs parameters, and the total amount of narcotics was reported.

At the postoperative care unit, patients in group M were connected to PCA machine containing morphine with a bolus dose of 1 mg boluses, lockout interval 6 min with no basal rate, and maximum 240 mg/24 h.

The pain score was the primary outcome, it was assessed on movement of the shoulder using the numerical pain scale from 0 to 10 (0 = no pain 10 = Worst imaginable pain) at 1 h, 6 h, 12 h, and 24 h postoperatively together with mean arterial pressure (MAP) and heart rate (HR). Patients on both groups received 1 g of intravenous paracetamol every 6 h on regular basis for the first 24 h and the rescue analgesic was lornixacam 8 mg intravenously every 8 h on as needed basis, if this was insufficient additional order of morphine 1 mg every 5 min until pain score is ≤3 was written and calculated. Time to first analgesic demand, and 24-h morphine consumption were recorded. Complications related to the narcotic use such as constipation, urinary retention, purities and postoperative nausea and vomiting (PONV) and complications related to the PVB, such as vascular puncture, dural puncture, pneumothorax, local anesthetics toxicity Horner's syndrome, epidural spreading, hypotension that is not related to another reason were also documented. The length of the hospital stay was recorded and patient's satisfaction was evaluated before hospital discharge with the numerical rating scale (0 = Dissatisfied and 10 = Most satisfied).

Minimal sample size of 17 patients was required in each group to achieve an α error of 5% and a β error of 10%. To compensate for dropout cases and shifting from normality in data distribution, 20 cases were studied in each group. Sample size was calculated using an online statistical calculator (The program G* Power 3 from the Department of Experimental Psychology at Heinrich Heine University, Düsseldorf www.psycho.uniduesseldorf.de/abteilungen/aap/gpower3/). Data were analyzed using SPSS, version 20 (IBM, Somers, NY, USA). They were expressed as mean ± standard deviation unpaired *t*-test was used to compare normally distributed and continuous data. Two-way repeated measure analysis of variance was used for continuous parametric variables. A $P < 0.05$ was considered significant.

Results

Forty patients were included in the study. No patient was excluded for any reason. The demographic characteristics were similar in both groups [Table 1].

Effective analgesia was observed in both groups' 1 h after surgery with comparable pain scores. At 6 and 12 h after surgery, pain scores in group M were significantly higher compared to group P and to 1 h values. After 24 h, pain scores were comparable between both groups and to 1 h postoperative values [Figure 1].

Mean arterial pressure and HR were comparable between preinduction and 1 h postinduction values in both groups. Significantly higher MAP and HR were observed in group M 6 and 12 h after surgery compared to group P and to the preinduction and 1 h postinduction values. After 24 h, MAP values were comparable to the preoperative values [Figures 2 and 3].

Time to request of first analgesia in group P (850 ± 90.8 min) was significantly longer than group M (444 ± 100 min), ($P = 0.000$). Similarly, morphine consumption/24 in group M was significantly higher than group P ($P = 0.000$) with only two patients required morphine supplementation in group P. Patients in group P had significantly shorter hospital stay (1.6 ± 0.325) compared to group M (2.45 ± 0.877), ($P < 0.001$). Patients in group P were significantly more satisfied (5.25 ± 1.41) compared to group M patients (7.85 ± 0.81), ($P = 0.013$).

As complications in group P, we reported two cases with inadvertent vascular puncture with no subsequent hematoma formation, and one case with pain at the site of injection that continued beyond a month and the patient was referred to the pain clinic with good outcome. In group M eight patients reported significant PONV ($P < 0.001$).

Discussion

Our results showed that preoperative unilateral, multiple level, PVB significantly lowers postoperative pain scores compared to PCA morphine. Our results are consistent with previous studies showing that single injection one level thoracic PVB is effective in reducing the severity of postoperative pain after thoracoscopic[8] and breast surgery.[9,10] However, compared to those studies, our patients had more prolonged postoperative analgesia. This may be attributed to multiple levels injections with the optimal spread of the local anesthetic.[11] Furthermore, PVB given before surgery, on the preemptive analgesia concept, could provide better postoperative analgesia than being given after surgery.

In our study, we found that PVB significantly affect the course of the postoperative period. The PVB group demonstrated significantly lower pain scores, stable MAP and HR 6 h and

Table 1: Demographic data

Variables	Group P (n = 20)	Group M (n = 20)	P
Age	51.80±10.52	50.75±13.91	0.789
ASA I	7	7	
ASA II	10	11	
ASA III	3	2	
Height	159.90±7.14	157.45±6.00	0.247
Weight	75.60±14.78	72.00±11.84	0.401

ASA: American society of anesthesiologists

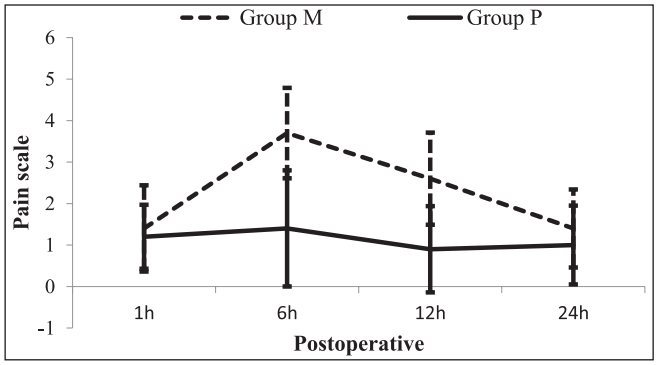

Figure 1: Pain scores in the two groups versus time

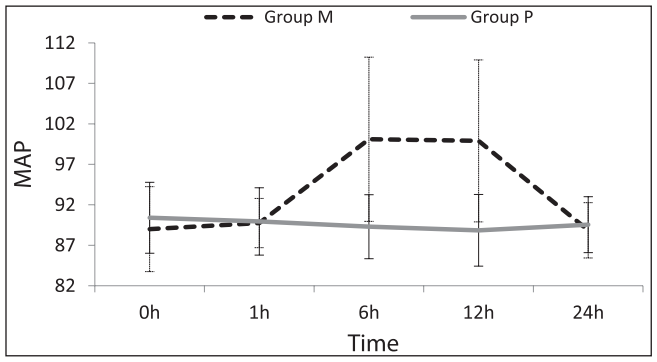

Figure 2: Mean arterial pressure in the two groups versus time

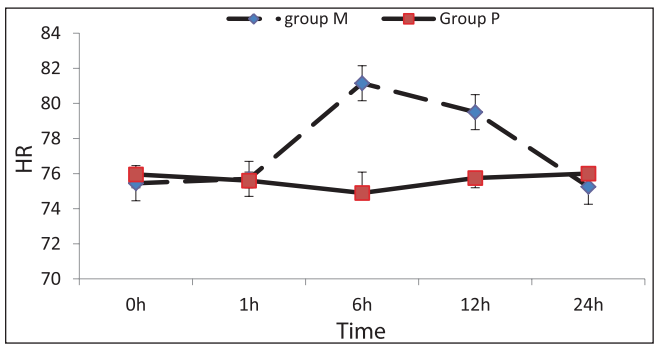

Figure 3: Heart rate in the two groups versus time

12 h postoperatively; on the other hand, patients who received PCA experienced higher pain scores, higher MAP and HR, which led to longer hospital stay. We can thus hypothesize that this could cause an increase in the total hospital cost, however, this was not calculated.

Low incidences of PVB induced complications are well documented. This included hypotension (4.0%), vascular puncture (6.8%), hematoma formation (2.4%), intrathecal or epidural spread (1.0%), pneumothorax (0.5%), and pain at the site of injection (1.3%).[10] In this study, we had a low incidence of complications related to the PVB that may be attributed to the small sample size in our study. The PCA group had significantly higher incidence of PONV throughout the first 24 h, which could be explained by the known emetogenic effect of morphine.

Different techniques have been tried in breast cancer surgery aiming to improve the postoperative experience, expressed in lower pain scores, less nausea and vomiting, shorter hospital stay. Those include local infiltration,[12] intercostal nerve block[13,14] and thoracic epidural block,[15,16] however each technique showed some limitations. Local infiltration caused local tissue distortion, pain on injection and carries a risk of local anesthetic toxicity, intercostal block is technically difficult as the approach is obscured by the scapula that interferes with the injection and limit the spread of the local anesthetic, and while the thoracic epidural provide satisfactory analgesia, it has the risk of neurological damage, hemodynamic instability, necessitates monitoring and it requires higher level of technical experience. On the other hand, PVB is a simple technique with high success rate, adequate postoperative analgesia, and low complication rate.[17]

Our finding confirms the outcome of previous studies showing that PVB given before surgery in combination with GA could provide better postoperative analgesia than did GA alone for unilateral breast surgery.

This study, however, is not without limitations. Firstly, we should consider it a proof of concept; being a preliminary report on a small sample size. Secondly, was the lack of double blindness in the methodology. This is because primarily, we do not think it is ethical to give a placebo PVB using saline in the PCA group and expose the patients to the complications of the procedure. Secondly, it was impractical to blind the clinician or the patient to the assigned treatment group; however, we do not expect the results to provide biased information, as there was good conformity with the protocol.

Conclusion

Multiple levels PVB is superior to PCA morphine for postoperative pain management in patients with breast cancer who undergo unilateral lumpectomy and axillary dissection and moreover, it is associated with less narcotics consumption, fewer side effects, and earlier hospital discharge.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Tahiri Y, Tran DQ, Bouteaud J, Xu L, Lalonde D, Luc M, *et al.* General anesthesia versus thoracic paravertebral block for breast surgery: A meta-analysis. J Plast Reconstr Aesthet Surg 2011;64:1261-9.
2. Beyaz SG, Ergonenc T, Altıntoprak F, Erdem AF. Thoracal paravertebral block for breast surgery. Dicle Med J 2012;3:594-603.
3. Kaye AM, Kaye AD, Lofton EC. Basic concepts in opioid prescribing and current concepts of opioid-mediated effects on driving. Ochsner J 2013;13:525-32.
4. Klein SM, Bergh A, Steele SM, Georgiade GS, Greengrass RA. Thoracic paravertebral block for breast surgery. Anesth Analg 2000;90:1402-5.
5. Klein SM, Pietrobon R, Nielsen KC, Steele SM, Warner DS, Moylan JA, *et al.* Paravertebral somatic nerve block compared with peripheral nerve blocks for outpatient inguinal herniorrhaphy. Reg Anesth Pain Med 2002;27:476-80.
6. Jamieson BD, Mariano ER. Thoracic and lumbar paravertebral blocks for outpatient lithotripsy. J Clin Anesth 2007;19:149-51.
7. Kuleszaa G, Tuyakovb B, Braczkowskab M, Onichimowskib D, Mayzner-Zawadzkab E. Paravertebral blockade — Underrated method of regional anesthesia. Pol Ann Med 2014;21:63-8.
8. Bondár A, Szucs S, Iohom G. Thoracic paravertebral blockade. Med Ultrason 2010;12:223-7.
9. Kairaluoma PM, Bachmann MS, Korpinen AK, Rosenberg PH, Pere PJ. Single-injection paravertebral block before general anesthesia enhances analgesia after breast cancer surgery with and without associated lymph node biopsy. Anesth Analg 2004;99:1837-43.
10. Naja MZ, Ziade MF, Lönnqvist PA. Nerve-stimulator guided paravertebral blockade vs. general anesthesia for breast surgery: A prospective randomized trial. Eur J Anaesthesiol 2003;20:897-903.
11. Naja ZM, El-Rajab M, Al-Tannir MA, Ziade FM, Tayara K, Younes F, *et al.* Thoracic paravertebral block: Influence of the number of injections. Reg Anesth Pain Med 2006;31:196-201.
12. Byager N, Hansen MS, Mathiesen O, Dahl JB. The analgesic effect of wound infiltration with local anaesthetics after breast surgery: A qualitative systematic review. Acta Anaesthesiol Scand 2014;58:402-10.
13. Atanassoff PG, Alon E, Weiss BM. Intercostal nerve block for lumpectomy: Superior postoperative pain relief with bupivacaine. J Clin Anesth 1994;6:47-51.
14. Fajardo M, Garcia FJ, López S, Dieguez P, Alfaro P. Analgesic combined lateral and anterior cutaneous branches of the intercostal nerves ultrasound block in ambulatory breast surgery. Cir May Amb 2012;17:95-104.

15. Lynch EP, Welch KJ, Carabuena JM, Eberlein TJ. Thoracic epidural anesthesia improves outcome after breast surgery. Ann Surg 1995;222:663-9.
16. Belzarena SD. Comparative study between thoracic epidural block and general anesthesia for oncologic mastectomy. Rev Bras Anestesiol 2008;58:561-8.
17. Abdallah FW, Morgan PJ, Cil T, McNaught A, Escallon JM, Semple JL, *et al*. Ultrasound-guided multilevel paravertebral blocks and total intravenous anesthesia improve the quality of recovery after ambulatory breast tumor resection. Anesthesiology 2014;120:703-13.