

Effectiveness of Paravertebral Block (PVB) for perioperative analgesia in patients undergoing Breast and Gall Bladder Surgery

LEENA AZIZ, ALI REHMAN, MUHAMMAD TAHIR, MUHAMMAD ARSHAD, MUHAMMAD UMAR, MUHAMMAD KHALID BUTT

Associate Professor of Anesthesiology, Fatima Jinnah Medical college/ Sir Ganga Ram Hospital, Lahore.
Email: leenayub@gmail.com

ABSTRACT

Objective: To study the effectiveness of paravertebral block for perioperative analgesia in patients undergoing breast or gallbladder surgery. To study the effect of paravertebral block on hemodynamics and blood glucose level.

Patients and Methods: Seventy female patients undergoing breast or gallbladder surgery under general anesthesia were included in the study. Thirty five patients were put in control group (A) while thirty five patients were in the study group (B). All patients underwent surgeries under general anesthesia. Group A patients received standard perioperative analgesia while group B patients were administered unilateral paravertebral block before induction while awake. Postoperative pain was evaluated in all patients using visual analog scale and compared in both groups. Mean blood pressure and pulse rates were recorded before, during and after the surgical procedure and compared between the groups. Patient's blood glucose were also monitored during the surgical procedure and compared between the groups.

Results: The mean age of group A patients was 46.33 ± 11.08 and Group B was 44.33 ± 15.6 . The mean pain score was significantly higher in group A (2.6 ± 1.72) compared with group B (1.11 ± 1.56) (p value < 0.01). Blood pressure, pulse and blood glucose levels were not significantly different between the groups in pre operative, during surgery or postoperative period.

Conclusions: Paravertebral block provides better analgesia in postoperative period compared with standard postoperative care. Paravertebral block has no significant effect on blood pressure, pulse rate or blood glucose level.

Key Words: Paravertebral bock (PVB), perioperative analgesia, visual analog scale (VAS) breast surgery, cholecystectomy.

INTRODUCTION

Breast surgery and cholecystectomies are commonly performed procedure as a day case in many hospitals. These surgeries may be performed under general or regional anesthesia. Administration of analgesic drugs is a standard method for providing post-operative analgesia in these patients.¹ Paravertebral Block (PVB) is an alternate technique for providing analgesia in these patients.^{1,2} Use of paravertebral block is effective and associated with reduced side effects of analgesic drugs when compared with standard of care.^{1,2} When used in conjunction with general anesthesia, PVB provides better postoperative analgesia in patients undergoing breast surgery.¹ Since PVB is usually performed as a unilateral procedure, it is associated with less respiratory and sympathetic nervous system effects like hypotension.¹ Open as well as laparoscopic

cholecystectomies have also been successfully performed with paravertebral block.^{1,2} Unilateral as well as bilateral paravertebral blocks have been successfully used for thoracic and abdominal surgeries.³ PVB can be used as an alternate to general anesthesia with good results in patients undergoing breast surgeries.³ Although, the effectiveness of PVB has been demonstrated in many studies carried out worldwide, there is little data on the same in our local population.

Paravertebral Block

This technique involves injection a local anesthetic agent just lateral to the site of emergence of nerves from intervertebral foramina. Hugo Sellheim introduced paravertebral block technique for the first time in Germany in 1905. Later on, Lawen and Kappis further refined his technique in 1911 and 1919 respectively.³

If this procedure is carried out while patient is anesthetized, the patient is made to lie on his side with the side being operated on upper side. The procedure is either performed as ultrasound-guided procedure or as a blind procedure using landmark technique. For a simple mastectomy, a T3-T4 spinal level is appropriate, while T6-T7 is usually chosen for cholecystectomy. For more extensive surgeries, wider multi level may be required. After choosing the appropriate level of block, spinous process of respective vertebra is marked. Additional marking is made 25mm lateral to the spinous process. If PVB is performed on an awake patient, local infiltration of local anesthetic agent is required. However, local anesthesia is not required if PVB is performed under anesthesia. A 22 G Quincke spinal needle is usually used for PVB. A 35 mm mark is placed on the needle and it is pierced perpendicularly in the sagittal plane at the 25mm mark lateral to the spinous process aiming at the transverse process. If transverse process is not hit, the needle is slightly withdrawn and reinserted slightly cranial or caudal direction till the transverse process is felt. Once the transverse process is felt, the depth of needle is noted and the forefinger guard is displaced 10 mm distally. The needle is then withdrawn and passed just below the transverse process and is advanced 10mm beyond the depth where transverse process was felt. The needle should not be pushed more than 10mm beyond the transverse process unless there is marked resistance to the needle. A click may be felt or heard on passing the costo-transverse ligament. Paravertebral space penetration can also be confirmed by change of resistance to saline injection. However, a total loss of resistance is not desirable as it indicates penetration of pleural space. Nerve stimulation with a stimulator set at 2 Hz with a pulse width of 0.3 milliseconds and 2 mA current can also be used for confirmation of paravertebral space. Twitching of intercostal or abdominal muscle indicates needle in the proper position. Local anesthetic agent is injected in the paravertebral space after confirmation (figure 1).

PATIENTS AND METHODS

Including Criteria:

1. All female ASA I or ASA II patients undergoing breast surgery or cholecystectomy under general anesthesia were included in the study.
2. Patients between 15-70 years were included in the study

Excluding Criteria:

1. Patients with hypersensitivity to local anesthetic agents.
2. Patients with high preoperative risk and hemodynamic instability
3. Patients with thoracic abnormalities like kyphoscoliosis making paravertebral block difficult.
4. Patients with unilateral emphysema.
5. Patients with coagulation abnormalities and those on anticoagulants.

Consent and approval:

An informed consent was obtained from all patients.

An approval from ethical committee was obtained prior to the study.

Sample Size:

The study sample size was based on similar studies cited in the recent literature.^{1,2}

Statistical Analysis:

Categorical variable were described as frequencies and continuous variables were described as means. Means of continuous variable were compared students' t test between the groups. Statistical package for social sciences (SPSS V16) was used for data analysis.

METHODS

Alternate patients were placed in group A and Group B. There were 35 patients in group A (control). Patients in group A received standard perioperative analgesia in the form of injection Nalbain (Nalbuphine hydrochloride) 0.1mg per kg along with infusion Provas (paracetamol) 1 gram over 30 minutes.

There were 35 patients in the group B (study). Group B patients received unilateral PVB before surgery in upright position while they were still awake with the technique described above (figure 2). For breast surgery T4 level and for gallbladder surgery, T7 level was used for PVB. For PVB, 15-20 ml of 0.5% ropivacaine was injected at a single level.

Patients' heart rate and mean blood pressure were noted before surgery, during surgery and after the procedure. Moreover, their blood glucose levels were measured before, during and after the surgical procedure. All patients were interviewed for pain perception in postoperative period on a visual analog scale (VAS) of 0-10 ten minutes after

fully gaining consciousness. The mean pain score on VAS was compared between the groups.

RESULTS

All patients were females. The mean age of group A patients was 46.33 ± 11.08 years and Group B was 44.33 ± 15.6 year (table 1). In group A, 11 patients underwent cholecystectomy and 24 patients underwent breast surgery. In group B, 12 patients underwent cholecystectomy and 23 patients underwent breast surgery (figure 3). The mean pain score on visual analog scale was 2.6 ± 1.72 in group A and 1.11 ± 1.56 (table 2). The difference in pain score was highly significant (p value < 0.01). Blood pressure, pulse and blood glucose levels were not significantly different between the groups in pre operative, during surgery or postoperative period (table 3).

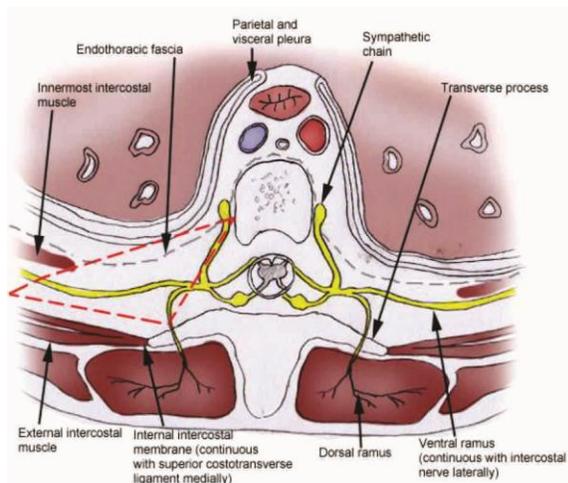


Figure 1: Anatomy of paravertebral space (red dotted triangle).¹



Figure 2: Landmarks for paravertebral block. Spinous processes of Cervical 7 (C7), Thoracic 3 (T3) and Thoracic 7 (T7) vertebrae.

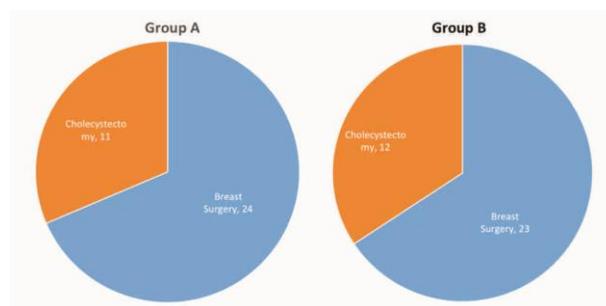


Figure 3: Group A (control) and Group B (study) patients

Table 1: Mean age of study and control patients

	Mean (SD)	P-value
Group A (Control)	46.33(11.08)	0.111
Group B (Study)	44.33(15.6)	

Table 2: Comparison of mean pain score between study and control groups

	Group	Mean	SD	P-value
Pain score	Group A (Control)	2.60	1.72	0.009
	Group B(Study)	1.11	1.56	

Table 3: Comparison of vital hemodynamic parameters and blood glucose level between the groups

	Group	Mean (sd)	P-value
Pre-Op Heart rate	Group A	97.5(16.5)	0.909
	Group B	91.44(15.7)	
Pre-Op blood pressure	Group A	99.6(18.4)	0.079
	Group B	92.05(10.6)	
Pre-Op blood glucose level	Group A	93.5(18.2)	0.691
	Group B	96.4(28.6)	
Intra-Op Heart rate	Group A	82.6(23.7)	0.541

	Group B	81.6(14.3)	
Intra-Op blood pressure	Group A	101.4(90.8)	0.988
	Group B	90.8(15.6)	
Intra-Op blood glucose level	Group A	108.8(22.9)	0.316
	Group B	110.1(32.5)	
Post-Op Heart rate	Group A	83.9(25.0)	0.171
	Group B	87.3(14.8)	
Post-Op blood pressure	Group A	93.6(13.2)	0.155
	Group B	93.6(16.2)	
Post-Op blood glucose level	Group A	126.3(26.2)	0.232
	Group B	120.1(33.2)	

DISCUSSION

Provision of adequate postoperative analgesia in surgical patients is of utmost importance. Inadequate pain control in addition to being inhumane may result in increased mortality and morbidity.¹ Postoperative pain control is usually achieved by administration of narcotic analgesics. The use of narcotic analgesics in the postoperative period may be associated with undesirable side effects. Moreover, some patients may still be complaining of postoperative pain despite administration of narcotic analgesics. Use of paravertebral block has been found to be a useful alternate to the administration analgesics in postoperative period.

This study has demonstrated the effectiveness of thoracic paravertebral block for providing effective postoperative analgesia in patients undergoing breast surgery or cholecystectomy under general anesthesia. The results of our study are in concordance with the previous studies which have also have demonstrated effectiveness of this technique.

Simpson et al. have also demonstrated effectiveness of paravertebral block for breast surgery.¹ Naja et al. has shown better postoperative analgesia and reduced requirements for supplemental analgesic injections in patients receiving with paravertebral block for breast surgery. The same authors demonstrated the effectiveness of PVB for patients undergoing laparoscopic cholecystectomies. Kairaluoma et al. reported better postoperative analgesia in patients undergoing surgery for breast cancer. They followed the same patients and found reduced occurrence of chronic pain in patients receiving PVB. Ono K et al. demonstrated effectiveness of thoracic paravertebral block in conjunction with general anesthesia in 28 patients undergoing major breast surgery comparing postoperative pain

with 17 patients undergoing breast surgery without paravertebral block.

Fallatah S and Mousa WF have demonstrated better postoperative analgesia and reduced use of analgesic drugs in 20 patients receiving PVB compared to 20 patients without PVB. Abdallah et al has also demonstrated better postoperative analgesia in patients undergoing breast surgeries under general anesthesia and PVB.

The results of our study show effectiveness of paravertebral block when used in conjunction with general anesthesia for breast and gallbladder surgeries. The results of our study are in agreement many studies conducted worldwide.

STUDY LIMITATIONS

Due to logistic constraints and limited human resources, this study was limited to immediate postoperative period only. Postoperative pain analysis could not be continued in the wards. This needs to be studied further. This was an open label study. Neither patient nor the operator was blinded of the procedure. The awareness about the procedure might have been a confounding factor in the study.

CONCLUSIONS

Paravertebral block provides better analgesia in postoperative period compared with standard postoperative care. Paravertebral block has no significant effect on blood pressure, pulse rate or blood glucose levels in perioperative period.

REFERENCES

1. Lynch EP, Welch KJ, Carabuena JM, Eberlein TJ. Thoracic epidural anesthesia improves outcome after breast surgery. *Ann Surg* 1995;222:663–9.
2. Naja MZ, Ziade MF, Lonnqvist PA. Nerve-stimulator guided paravertebral blockade vs.

- general anaesthesia for breast surgery: a prospective randomized trial. *Eur J Anaesth* 2003;20:897–903.
3. Terheggen MA, Wille F, Rinkes IHB, Ionescu TI, Knape JT. Paravertebral blockade for minor breast surgery. *Anesth Analg* 2002;94:335–9.
 4. 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 Jan-Mar;10(1):13-7.
 5. 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.
 6. Schnabel A, Reichl SU, Kranke P, Pogatzki-Zahn EM, Zahn PK. Efficacy and safety of paravertebral blocks in breast surgery: a meta-analysis of randomized controlled trials. *Br J Anaesth*. 2010 Dec;105(6):842-52.
 7. Davies RG, Myles PS, Graham JM. A comparison of the analgesic efficacy and side-effects of paravertebral vs epidural blockade for thoracotomy--a systematic review and meta-analysis of randomized trials. *Br J Anaesth*. 2006 Apr;96(4):418-26.
 8. Paleczny J, Zipser P, Pysz M. Paravertebral block for open cholecystectomy. *Anestezjoi Intens Ter*. 2009;41:89–93.
 9. Beyaz SG, Özocak H, Ergönenç T, Erdem AF. The thoracic paravertebral block performed for open cholecystectomy operation in order to anesthesia: Two cases. *Anesthesia, Essays and Researches*. 2014;8(2):239-242.
 10. Richardson J, Lönqvist PA, Naja Z. Editor's Choice: Bilateral thoracic paravertebral block: potential and practice. *Br J Anaesth*. (2011) 106 (2): 164-71
 11. Das S, Bhattacharya P, Mandal MC, Mukhopadhyay S, Basu SR, Mandal BK. Multiple-injection thoracic paravertebral block as an alternative to general anaesthesia for elective breast surgeries: A randomised controlled trial. *Indian J Anaesth*. 2012 Jan;56(1):27-33.
 12. Richardson J. Fin-de-siecle renaissance of Paravertebral analgesia. *Pain Rev*. 1997;4:159–71.
 13. Baidya DK, Khanna P, Maitra S. Analgesic efficacy and safety of thoracic paravertebral and epidural analgesia for thoracic surgery: a systematic review and meta-analysis. *Interact Cardiovasc Thorac Surg*. 2014 May;18(5):626-35.
 14. Asida SM, Youssef IA, Mohamad AK, Abdelrazik AN. Post-thoracotomy pain relief: Thoracic paravertebral block compared with systemic opioids. *Egypt J Anaesth*. 2012; 28: 55–60
 15. Kuleszaa G, Tuyakovb B, Brackzkowskab M, Onichimowskib D, Mayzner-Zawadzka E. Paravertebral blockade - Underrated method of regional anesthesia. *Pol Ann Med* 2014;21:63-8.
 16. Katz J, Jackson M, Kavanagh BP, Sandler AN. Acute pain after thoracic surgery predicts long-term post-thoracotomy pain. *Clin J Pain*. 1996;12:50–55.
 17. Simpson J, Ariyathenam A, Dunn J, Ford P. Breast surgery using thoracic paravertebral blockade and sedation alone. *Anesthesiol Res Pract*. 2014;2014:127467.
 18. Naja MZ, Ziade MF, Lonnqvist PA. General anaesthesia combined with bilateral paravertebral blockade (T5-6) vs. general anaesthesia for laparoscopic cholecystectomy: a prospective, randomized clinical trial. *Eur J Anaesthesiol*. 2004;21:489–95.
 19. Kairaluoma PM, Bachmann MS, Rosenberg PH, Pere PJ. Preincisional PVB reduces the prevalence of chronic pain after breast surgery. *Anesth Analg*. 2006;103:703–8.
 20. Ono K, Danura T, Koyama Y, Hidaka H. Combined use of paravertebral block and general anesthesia for breast cancer surgery. *Masui*. 2005 Nov;54(11):1273-6.
 21. Abdallah FW, Morgan PJ, Cil T, McNaught A, Escallon JM, Semple JL, Wu W, Chan VW. Ultrasound guided multilevel paravertebral blocks and total intravenous anesthesia improve the quality of recovery after ambulatory breast tumor resection. *Anesthesiology*. 2014 Mar;120(3):703-13.