(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

The Effectiveness of Dual Pectoralis Nerve Block in Managing of Postoperative Pain in Patients after Cardiac Surgery

Kajal Gupta

Assistant Professor, Department of Anaesthesiology, Rama Medical College and Research Centre, Kanpur, Uttar Pradesh, India

ABSTRACT:

Background: Following heart surgery, efficient pain management promotes improved recovery and increased mobility. However, neuraxial blocks are dangerous for heart surgery patients because of their coagulation condition. The Pectoralis Nerve (Pecs) block is a substitute for neuraxial blocks in the management of post-operative discomfort following adult cardiac operations. After adult heart surgery, this novel treatment provides a minimally invasive and safe method for managing post-operative discomfort. The aim of this study was to examine the effects of bilateral pectoralis nerve block on improved recovery and postoperative pain management following heart surgery. **Material & Methods:** This quasi-experimental study took place from June to December of 2015 at the PGIMER, RML Hospital, New Delhi in the departments of anesthesia, analgesia, and intensive care medicine. In this study, 40 adult cardiac surgery patients (aged 25–65) underwent midline sternotomy procedures for valve replacement or repair as well as coronary artery bypass grafting. They were split into two groups: Group B underwent ultrasound guided bilateral Pectoral Nerve (PEC) block with volume of 0.2 ml per kg body weight of 0.25% bupivacaine with 5 mg of dexamethasone for each interfacial plane, and Group A received conventional analgesia with intravenous paracetamol 01 gm TDS with continuous intravenous infusion of 1 microgram per kg body weight of fentanyl. Extubation criteria were applied, and information was gathered using a questionnaire for vital signs such heart rate, blood pressure, respiratory rate, and length of time on invasive ventilation at 0, 2, 4, 8, and 12 hours after surgery, as well as for the visual analogue score. **Results:** Forty patients in total, from the two groups, finished the investigation. There were no discernible variations in vital indicators between Group A and Group B according to the study. Up to 12 hours after being extubated, Group B's pain scores were noticeably lower. At each of the six assessment intervals, Group B's respiratory rate was considerably lower.Hemodynamic variables showed no discernible variations. There was no discernible difference in hospital stays or the amount of time spent on a ventilator between Group B and Group A, but Group B's ICU stay was shorter than Group A's. **Conclusions:** When it comes to adult cardiac procedures like CABG, valve replacement or repair, or medial sternotomy, the Pectoral Nerve (Pecs) block is a safe, effective, and minimally invasive technique that helps patients recover faster.

Keywords: Cardiac Surgery, Pectoralis Nerve Block, Pain Management

Corresponding author: Kajal Gupta, Assistant Professor, Department of Anaesthesiology, Rama Medical College and Research Centre, Kanpur, Uttar Pradesh, India

This article may be cited as: Gupta K. The Effectiveness of Dual Pectoralis Nerve Block in Managing of Postoperative Pain in Patients after Cardiac Surgery. J Adv Med Dent Scie Res 2016;4(3):263-267.

INTRODUCTION

Significant pain and discomfort following cardiac surgery, such as CABG and valve replacements through a medial sternotomy, have been associated with these procedures.[1] Sufficient dynamic pain management has emerged as a critical prerequisite for a quick recovery in the first postoperative phases after surgery.[2] Poor pain management in the initial postoperative period can negatively affect the cardiovascular system (causing increased oxygen consumption and an accelerated heart rate), the musculoskeletal system (causing muscle weakness and underutilization), and the respiratory system (causing atelectasis, pneumonia, and stagnant bronchial secretions). It also results in higher blood sugar levels and stress reactions.[3] Nowadays, with faster recovery, more mobility, and an easier time being discharged from the intensive care unit (ICU), efficient post-cardiac surgery pain management is essential. Postoperative cardiac surgery patients are typically treated with nonsteroidal anti-inflammatory medicines (NSAIDs) and opioids, which have side effects and slow recovery times. Effective acute pain management preserves immune function by controlling the stress response and lowering the need for opioids. Opioids, in particular morphine, impair both humoral and cellular immune responses.Conversely, paravertebral blocks and thoracic epidurals have been extensively studied and used with positive results throughout time. Nevertheless, due to possible hazards such the formation of epidural hematomas and worries about anticoagulation, not all anesthesiologists feel comfortable or have the requisite experience to do these thorough nerve blocks. For patients having thoracic procedures, an alternative would be the pectoral nerve (Pecs) block, which includes the Pecs 1 and Pecs 2 (modified Pecs 1) interfascial blocks. This method offers a fresh and minimally invasive strategy for managing localized discomfort. Blanco et al. first presented the

ultrasound-guided representation of the Pecs block for breast surgery.[5] The Pecs block has shown promising results in a variety of chest wall operations since it was first introduced. Radiation mastectomies, breast-conserving operations, implantation of breast implants, implantation of pacemakers and Automated Implantable Cardioverter-Defibrillator (AICD), intercostal drainage tube insertions, and rib fracture therapies are among these procedures. Two planes are used in the Pecs block. The first injection of the operation is given between the pectoralis major and minor muscles (known as Pecs 1) at a weight of 0.2 ml/kg body weight with 0.25% bupivacaine plus 5 mg of dexamethasone, all under real-time USG guidance. The second puncture then involves inserting, under real-time USG guidance, 0.2 ml/kg body weight of 0.25% bupivacaine with 5 mg of dexamethasone between the pectoralis minor and the serratus anterior muscle (also known as Pecs 2)5, precisely at the level of the fourth rib. The anesthesia of the medial and lateral pectoral nerves is the principal aim of the Pecs 1 block. The Pecs 2 block, on the other hand, targets the thoracodorsal nerve, the long thoracic nerve, and the anterior divisions of the thoracic intercostal nerves from T2 to T6. Usually, the medial pectoral nerve comes from C8 and T1, whereas the lateral pectoral nerve comes from C5, C6, and C7. From T2 to T6, the anterior divisions of the thoracic intercostal nerves run in a plane between the intercostal muscles all the way to the sternum. They are located posteriorly, between the pleura and the posterior intercostal membrane. The nerve that runs from C5 to C7 is called the serratus anterior nerve. It enters the axilla behind the remaining portion of the brachial plexus and rests atop the serratus anterior muscle.[5]

Objectives

The aim of this study was to examine the effects of bilateral pectoralis nerve block on ultrafast tracking and postoperative pain control in heart surgery.

MATERIALANDMETHODS

The study includes forty adult patients, aged 25–65, who are receiving CABG or valve replacement surgery via midline sternotomy. Patients were divided into two groups of thirty each at random. Group A was given a continuous intravenous infusion of 1 microgram of fentanyl per kilogram of body weight along with traditional analgesia with 1 gram of paracetamol TDS. Group B obtained a pair of PEC blocks. Following surgery, Group B underwent an ultrasound-guided bilateral Pectoral Nerve (PEC) block, using 0.2 ml of 0.25% bupivacaine and 5 mg of dexamethasone per kg of body weight for each interfacial plane. Once the extubation is completed, the patient is removed. A semi-structured questionnaire was created in English. The variables selected in accordance with the stated objectives were used to design the questionnaire. The questionnaire asked about pre- and post-operative outcomes in addition to sociodemographic factors. A questionnaire was used to gather information for the visual analogue score as well as critical metrics such heart rate, blood pressure, respiratory rate, and the amount of time patients spent on invasive ventilation at zero, two, four, eight, and twelve hours after surgery. In order to capture important details from the history sheet, admission record, and pertinent medical records, a checklist was also created. After the interview, data were examined as soon as possible, together with the relevant investigation reports. With the use of an established interview schedule, measured parameters, and investigations, all pertinent data were obtained from each respondent. The study comprised participants who were scheduled for cardiac surgery for mitral/aortic valve replacement via sternotomy or coronary artery bypass grafting via sternotomy. Exclusion from the trial should be considered for patients who have had prior surgery, allergic reactions to local anaesthetic, known coagulopathy, preoperative severe illness, or urgent surgeries.

Statistical Analysis

Quantitative data was expressed as mean and standard deviation, while qualitative data was described as frequency distribution and percentage. All data were methodically documented in pre-made data collection forms. The statistical analysis was performed using SPSS (Statistical Package for Social Science) Version 26 for Windows 10 was used to do the statistical analysis. A P value of less than 0.05 was deemed statistically significant.

RESULTS

Visual analogue score were significantly low in patients who received bilateral pectoral is nerve block(Group B) at 0,2,4,8, and 12h from postoperatively($P<0.05$). The pain scores progressively decreased in both groups overtime. Demographic Characteristics of the respondents. We found that there were no significant differences between Group A and Group B for age, height, weight, and BMI. Table1

Table 1: Demographic Characteristics of the respondents

Variable	Group A	Group B	P value
Age	51.49±13.86	51.52±8.79	0.56
Height	155.52±3.4	152.53±5.91	0.73
Weight	66.21±14.15	63.81±7.62	0.25

BMI(kg/m2)	29±7	29±7	0.79

There was no significant difference between the groups in the mean values of hemodynamic variables (blood pressure: BP, heart rate: HR) at six different assessment times. We also found that respiratory rate(RR) was significantly lower in group B than in group A at six assessment times(P<0.005).

Table 2: Time course of visual analog scale(VAS) pain scores at rest

Time(h)	VAS rest		P value
	Group A	Group B	
VAS(0)	5.71±0.36	3.04±.0.73	<0.001
VAS(2)	4.72±2.04	2.4±0.78	<0.001
VAS(4)	5.81±2.25	3±0.73	<0.001
VAS (8)	5.21±2.36 3.4±2.21	3.4±2.21	<0.001
VAS(12)	4.77±2.74	3.10±2.51	0.002

The of post operative parameters like duration of ventilator used(min), ICU stay(hours) and hospital stays(days) between group A and group B patients. The Mean duration of ventilator used in group A and B were 113±11.81 minutes and 89±21minutes respectively which was statistically not significant. Mean duration of ICU stay of group A and B was 81.23 ± 9.42 hours and 61.53 ± 10.21hours respectively. The differences between duration of ICU stay were statistically significant. Mean hospital stays of group A was 11.67±3.3days and group B was 10.41±3.23days which was statistically not significant. Table 4

Table 4: Post-Operative outcomes of the respondents

Post-operative outcomes	Group A	Group B	P value
Mean duration of ventilator used(min)	113±11.81	89±21	0.020
Mean duration of ICU stays(hours)	81.23 ± 9.42	61.53 ± 10.21	0.001
Mean hospital stays(days)	11.67 ± 3.3	10.41 ± 3.23	0.09

DISCUSSION

Several medical centers have experienced a sharp rise in the use of ultrasound-guided Pecs block during chest wall procedures for multimodal analgesia. However, the risk of postoperative hemodynamic instability and systemic heparinization during cardiopulmonary bypass limit the effective regional anesthetic options available for heart surgery. In addition to contributing to pulmonary problems, hypoxemia, cardiac ischemia, thrombosis, delayed wound healing, and extended hospital stays, severe postoperative pain can also result in comorbidities like decreased respiratory mechanics, restricted movement, and elevated hormonal and metabolic activity. Although neuraxial procedures have been shown effective for superior analgesia in noncardiac thoracic surgery, they are typically not used in cardiac surgery because of the extremely rare but serious danger of epidural hematoma. For chest wall analgesia, paravertebral blocking works well, but it could need training and resources. On the other hand, Pecs blocking, a rather straightforward and secure fascial plane infiltration technique, was formerly employed in chest wall analgesia during breast surgery. In the present study, patients with midline sternotomy having heart surgery received bilateral Pecs block as a component of multimodal analgesia. For analgesia following breast surgery, Wahba and Kamal [7] compared thoracic paravertebral block to Pecs block. They found that, in comparison to paravertebral block, Pecs block performed prior to MRM resulted in less postoperative morphine consumption in the first 24 hours and lower pain intensity in the first 12 hours. A study comparing Pecs block with thoracic paravertebral block for postoperative analgesia after radical mastectomy was carried out by Kulhari et al. [8]. When compared to thoracic paravertebral block, their results showed that the Pecs block was a safer and more effective method of relieving pain. The Pecs block also decreased the amount of opioids taken after surgery. The Pecs block stands out as a technically straightforward, easily learned method with few contraindications, according to ELdeen's comparison of ultrasound-guided Pecs blockade with thoracic spinal blockade for conservative breast surgery in breast cancer patients. It was discovered to have a low rate of complications and to provide hemodynamic stability. All things considered, ELdeen found the Pecs block to be a secure and reliable method for unilateral conservative breast surgery.[9] The Pecs block group (Group B) had lower VAS scores during deep breathing or coughing than the patients receiving conventional analgesia with intravenous paracetamol 1 gm TDS and continuous intravenous infusion of 1 microgram per kg body weight of fentanyl (Group A). These findings suggest that Group B experienced less pain following surgery than Group A. Additionally, Group B's VAS values were significantly reduced for almost 12 hours

following surgery, indicating that postoperative pain in cardiac surgery including a midline sternotomy was effectively managed by USG guided bilateral PECS block.[10,11] Patients in Group A required ventilator assistance for 112±10.85 minutes, while patients in Group B had superior analgesia and required ventilator support for 88±28 minutes, with a $P < 0.0001$. This suggests that patients in the group receiving PECS block had a better comfort profile than those in the group receiving traditional analgesia with fentanyl and paracetamol.[12] With varying degrees of success, paracetamol has been investigated in a variety of surgical contexts, including functional endoscopic sinus surgery, cholecystectomy, hysterectomy, and orthopedic procedures.[13, 14] In order to achieve an antipyretic plasma concentration (10 mg/ml), acetaminophen administered rectally or via a nasogastric tube is insufficient; this was most likely mostly due to delayed gastric emptying during anesthesia and surgery.[15,16] According to a study by Cattabriga et al., intravenous paracetamol effectively reduces discomfort in patients undergoing heart surgery.[17, 18] Critically sick people have experienced hypotension after taking paracetamol; however, this effect may be due to an allergic reaction.[19] The results of the systematic review study by Apfel et al. [20] demonstrated that single-dose Paracetamol can lower PONV in patients by at least as much as antiemetic medication. The mechanism underlying this effect is not linked to a decrease in the need for opioids; rather, it stems from patients experiencing less pain, which in and of itself is a risk factor for PONV, as well as the brain's metabolization to AM404, which prevents anandamide from being reabsorbed.[21]

CONCLUSIONS

In summary, postoperative pain and discomfort following adult cardiac surgeries—particularly those requiring a medial sternotomy, such as coronary artery bypass grafting, valve repair, or replacement—can result in hemodynamic instability and increased oxygen consumption if not properly managed. A prompt recovery and protection of critical systems depend on the efficient management of pain. In adult cardiac procedures, the Pectoral Nerve (Pecs) block offers a less intrusive and secure method of managing post-operative discomfort. The Pecs block, which was first created for breast treatments, has shown to be successful in a variety of chest surgeries. It not only offers substantial pain relief but also reduces the hazards connected to conventional techniques like epidurals. This novel strategy takes into account the drawbacks of traditional methods and provides a focused remedy for the control of pain following adult cardiac procedures, including CABG and valve replacement procedures.

REFERENCES

1. BlancoR,ParrasT,McDonnellJG,Prats-GalinoA.Serratusplaneblock:anovelultrasound-guidedthoracicwallnerveblock.Anaesthesia.2013;68(11):1107-13.doi:10.1111/anae.12344.
2. Kehlet H, Holte K. Effect of postoperative analgesia onsurgical outcome. Br J Anaesth. 2001;87(1):62-72. doi:10.1093/bja/87.1.62.
3. CoganJ.Painmanagementaftercardiacsurgery.SeminCardiothoracVascAnesth.2010;14(3):201-4.doi:10.1177/1089253210378401.
4. SacerdoteP,BianchiM,GaspaniL,ManfrediB,Maucione A, Terno G, et al. The effects of tramadoland morphine on immune responses and pain aftersurgeryincancerpatients.AnesthAnalg.2000;90(6):1411-4.doi:10.1097/00000539-200006000-00028.
5. Blanco R, Fajardo M, Parras Maldonado T. UltrasounddescriptionofPecsII(modifiedPecsI):anovelapproachtobreastsurgery.RevEspAnestesiolReanim. 2012;59(9):470-5. doi:10.1016/j.redar.2012.07.003.
6. KheraT,MurugappanKR,LeibowitzA,BareliN,ShankarP,GillelandS,etal.Ultrasound-GuidedPecto-Intercostal Fascial Block for Postoperative PainManagementinCardiacSurgery:AProspective,Randomized,Placebo-ControlledTrial.JCardiothoracVascAnesth. 2021;35(3):896-903. doi:10.1053/j.jvca.2020.07.058.
7. WahbaSS,KamalSM.Thoracicparavertebralblockversus pectoral nerve block for analgesia after breastsurgery.EgyptJAnaesth.2014;30:12935.
8. KulhariS,BhartiN,BalaI,AroraS,SinghG.Efficacyof pectoral nerve block versus thoracic paravertebralblockforpostoperativeanalgesiaafterradicalmastectomy:Arandomizedcontrolledtrial.BrJAnaesth. 2016;117:3826.
9. ELdeenHM.Ultrasoundguidedpectoralnerveblockadeversusthoracicspinalblockadeforconservativebreastsurgeryincancerbreast:Arandomized controlled trial. Egypt J Anaesth. 2016;32:29-35.
10. EngorenM,HadawayJ,SchwannTA,HabibRH.Ketorolac improves graft patency after coronary arterybypass grafting: a propensity-matched analysis. AnnThoracSurg.2011;92(2):603–9
11. WarnerTD, GiulianoF, Vojnovic I, BukasaA, MitchellJA,VaneJR.Nonsteroiddrugselectivitiesforcyclo-oxygenase-1ratherthancyclo-oxygenase-2areassociatedwith humangastrointestinal toxicity:afullin vitro analysis. ProcNatlAcad Sci. 1999;96(13):7563–8
12. FunkCD,FitzGeraldGAJJ.COX-2inhibitorsandcardiovascularrisk.JCardiovascPharmacol.2007;50(5):470–9.
13. Berger MM, Berger-Gryllaki M, Wiesel PH, Revelly JP,HurniM,CayeuxC,etal.Intestinalabsorptioninpatientsaftercardiacsurgery.CritCareMed.2000;28(7):2217-23.doi:10.1097/00003246-200007000-00006.
14. Arslan M, Celep B, Çiçek R, Kalender HÜ, Yılmaz H.Comparingtheefficacyofpreemptiveintravenousparacetamol on the reducing effect of opioid usage incholecystectomy.JResMedSci.2013;18(3):172.
15. BannwarthB,NetterP,LapicqueF,GilletP,PéréP,BoccardE,etal.Plasmaandcerebrospinalfluidconcentrationsofparacetamolafterasingleintravenousdoseofpropacetamol.BrJClinPharmacol.1992;34(1):79-81.doi:10.1111/j.1365-2125.1992.tb04112.x.
16. JebarajB,MaitraS,BaidyaDK,KhannaP.Intravenousparacetamolreducespostoperativeopioidconsumption

after orthopedic surgery: a systematicreviewofclinicaltrials.PainResTreat.2013; 2013:402510.doi:10.1155/2013/402510.
17. DouzjianDJ,KulikA.Olddrug,newroute:asystematic review of intravenous acetaminophen afteradultcardiacsurgery.JCardiothoracVascAnesth.2 017;31(2):694–701.31.
18. CattabrigaI,PaciniD,LamazzaG,TalaricoF,DiBartolo meoR,GrilloneG,etal.Intravenousparacetamol as adjunctive treatment for postoperativepainaftercardiacsurgery:adoubleblindra ndomizedcontrolledtrial.EurJCardiothoracSurg.2007 ;32(3):527–31.32.
19. Jóźwiak-BebenistaM,NowakJZ.Paracetamol:mechanismofact ion,applicationsandsafetyconcern.ActaPolPharm.201 4;71(1):11–23
20. Apfel CC, Turan A, Souza K, Pergolizzi J, Hornuss C.Intravenousacetaminophenreducespostoperativena usea and vomiting: a systematic review and meta-analysis.Pain2013;154(5):677-89.
21. Choukèr A, Kaufmann I, Kreth S, Hauer D, FeuereckerM, Thieme D, et al. Motion sickness, stress and theendocannabinoid system. PLoS One. 2010;5(5):e10752.doi:10.1371/journal.pone.0010752.