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ORIGINAL ARTICLE

Postoperative Analgesic Efficacy of Ultrasound Guided Modified Pectoral Nerve Block in Breast Surgeries Involving Axillary Lymph Node Dissection: A Prospective Randomised Double Blind Comparative Study

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ABSTRACT

Background and Aims: Women recovering from breast cancer operations frequently report intense early pain, and inadequately controlled acute pain of this kind is known to predispose to a persistent postsurgical pain syndrome. Deposition of local anaesthetic within the pectoral fascial planes, described as the modified pectoral nerve (Pecs I and II) technique, has been advanced as a means of relieving pain after breast procedures that incorporate clearance of the axillary nodes. Our aim was to determine how well this ultrasound directed block controls pain in the first postoperative day, and to document its influence on circulatory variables and on the occurrence of adverse events.

Methods: Sixty women of ASA physical status I or II, between 25 and 65 years of age and listed for breast surgery that included axillary clearance, were enrolled in this double blind, randomised, prospective comparison. One arm (Group A, n = 30) received a standard general anaesthetic without any regional supplementation, while the other (Group B, n = 30) received the same general anaesthetic together with an ultrasound directed modified Pecs block using 30 ml of bupivacaine 0.25 percent. How long and how effectively pain was controlled, graded on a visual analogue scale (VAS), served as the principal endpoint. Circulatory endpoints (mean arterial pressure and heart rate during and after operation), the need for supplementary analgesics, the level of sedation and any complications across 24 hours were recorded as additional outcomes.

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Results: At every recording point through the first 24 hours, pain scores were lower in the block arm than in the control arm (p less than 0.05). Fifteen minutes after operation, a pain score of zero was reported by 43.3 percent of the women who had received the block, whereas no control patient was pain free at that time. Far fewer patients in the block arm asked for supplementary analgesia (6.66 percent against 36.7 percent; p = 0.030). Mean arterial pressure, both during and after surgery, was lower in the block arm at the majority of time points, whereas differences in heart rate seldom reached significance. There were no complications attributable to the block, and sedation levels did not differ between the arms.

Conclusion: When added to general anaesthesia for breast surgery that includes axillary clearance, the ultrasound directed modified Pecs block delivers good pain relief and lowers the demand for additional analgesics. It is therefore a worthwhile element of a multimodal analgesic plan for these patients.

KEYWORDS

• Analgesia • Axillary Lymph Node Dissection • Breast Surgery • Interfascial Plane Block • Pectoral Nerve Block • Ultrasonography

INTRODUCTION

Up to two in five women who undergo surgery for breast cancer report severe pain in the immediate postoperative period, and pain that is poorly managed at this stage is one of the recognised drivers of chronic pain that persists long after the wound has healed.[1,2] When analgesic strategies are applied around the time of surgery, they blunt nociceptor sensitisation, curtail the total amount of analgesic needed and make a chronic pain syndrome less likely to develop.[3-5] For decades, paravertebral block and thoracic epidural analgesia have served as the benchmark regional techniques following breast operations.[3-5]

A regional approach specific to the breast was first put forward by Blanco in 2011.[6] His initial Pecs I block, however, fell short when the operation extended to clearance of the axilla, and a revised version of the technique was published by the same investigators a year later.[7] In the modified form (Pecs I and II), local anaesthetic is placed as an interfascial injection, one aliquot lying between pectoralis major and pectoralis minor and a second reaching the plane overlying serratus anterior.[7]

With this background, we set out to examine how effectively the ultrasound directed modified Pecs block relieves pain after breast operations that include axillary node clearance. Establishing both the extent and the duration of postoperative pain relief formed the primary aim. As secondary aims, we looked at the way the block altered circulatory parameters during operation and in the early recovery phase, and we kept a record of every complication that arose within 24 hours of surgery.

METHODS

Clearance from the institutional Ethics Committee was secured before any patient was recruited to this prospective, double blind, randomised comparison of 60 women booked for breast surgery that included axillary node clearance. Once a patient had been entered into the study, a sequence of random numbers produced by computer determined her group, and each allocation was sealed inside a numbered, non transparent envelope so that concealment was maintained. The person responsible for gathering data in the recovery period had no knowledge of whether a given patient had been given the modified Pecs block alongside her general anaesthetic.

Two arms were studied. Women in Group A were operated on under general anaesthesia by itself, whereas women in Group B received the same general anaesthetic supplemented by the modified Pecs block.

Inclusion and exclusion criteria

Consenting women aged 25 to 65 years and graded I or II on the American Society of Anesthesiologists (ASA) physical status scale were eligible. Those whose body mass index reached 30 kg/m2 or above, those listed for breast reconstruction and those with disease affecting both breasts were not enrolled. We

also left out any woman who was sensitive to local anaesthetic agents, who had long standing pain, a psychiatric illness or a history of substance or alcohol misuse, or who suffered from neuropathy of any origin, whether alcoholic, hereditary, nutritional, uraemic or otherwise.

Anaesthetic technique

Every participant was seen for a thorough preoperative assessment covering the clinical history, a physical and airway examination, and the laboratory tests appropriate to her age and coexisting illnesses. The plan of anaesthesia was described to each woman and her written consent obtained in a language she understood. On the morning of surgery, the anaesthetic machine along with all resuscitation equipment was verified against the departmental checklist before the patient entered the theatre.

Premedication in every case comprised intravenous (IV) ranitidine 50 mg, ondansetron 4 mg, glycopyrrolate 0.2 mg, midazolam 1 mg and fentanyl 2 mcg/kg. After routine monitors had been attached, anaesthesia was induced by titrating IV propofol 2 to 3 mg/kg until the verbal response was lost. Tracheal intubation was facilitated with IV atracurium 0.5 mg/kg, which was subsequently topped up as needed to preserve muscle relaxation throughout the procedure.

For women in Group B, positioning for the block followed intubation and verification of correct tube placement. Imaging was carried out on a Philips Envisor CHD ultrasound unit fitted with a 5 to 12 MHz linear transducer. Aseptic preparation used chlorhexidine 2 percent, with the probe enclosed in a sterile cover and sterile gel applied, and the injections were made through a 22 G, 50 mm insulated Stimuplex needle (0.70 by 50 mm). Working in real time with an in plane needle path, the operator first located the interval between pectoralis major and pectoralis minor and deposited 10 ml of bupivacaine 0.25 percent there (the Pecs I component), then advanced to the space separating pectoralis minor from serratus anterior, where a further 20 ml of bupivacaine 0.25 percent was placed (the Pecs II component).

Maintenance of anaesthesia relied on a 50:50 mixture of oxygen and nitrous oxide together with sevoflurane. In both arms, a quarter of the induction dose of fentanyl was given again at hourly intervals. Both groups also received IV paracetamol 1 g roughly 40 minutes before surgery was expected to finish, with the same dose repeated eight hourly through the recovery period.

Monitoring and outcome assessment

Mean arterial pressure (MAP) and heart rate were noted at baseline before induction, again five minutes after induction, and thereafter at five minute intervals for the duration of surgery. In the ward these readings continued every 15 minutes over the first two hours and were then taken at 4, 8, 12 and 24 hours. A fall in MAP below 60 mmHg was corrected with IV ephedrine 5 mg, and a heart rate under 40 per minute with IV atropine 0.6 mg. For the first half hour after operation, oxygen was delivered by Venturi mask at 4 to 5 l/min.

Pain intensity was rated on a visual analogue scale (VAS) anchored at 0 for no pain and 10 for the most severe pain imaginable, at 15 minute intervals for the first two hours and four hourly thereafter until 24 hours. Whenever the VAS exceeded 4, supplementary analgesia was begun with IV diclofenac sodium 75 mg diluted in 100 ml of saline and infused over 20 minutes; should this prove insufficient, IV tramadol 100 mg in 100 ml of saline was infused over 20 minutes with ondansetron 4 mg. The interval until a patient first asked for pain relief was taken as the duration of analgesia. Depth of sedation was graded on the Ramsay Sedation Scale at 15 minute intervals over the first two postoperative hours, a score above four being regarded as oversedation. We also documented any complication (bleeding, haematoma, infection, pneumothorax or persistent sensory loss) arising in the first 24 hours.

Sample size and statistical analysis

For this randomised, prospective comparison, simple random sampling was applied and the required number of participants estimated in advance. Taking a standardised effect size of 0.83 from earlier work, together with 80 percent power and an alpha of 0.05, gave a target of about 60 women.

Data were analysed with the Statistical Package for the Social Sciences (SPSS), version 17.0. Continuous data are reported as the mean with its standard deviation, or, when the distribution was skewed, as the median with the interquartile range, while categorical data

appear as counts and percentages. Between group comparisons used the Student t test for normally distributed continuous variables, the chi square or Fisher exact test as appropriate for categorical variables, and the Mann Whitney U test for continuous variables that were not normally distributed. Significance was set at a p value of 0.05 or below.

RESULTS

The two arms were well matched at baseline: mean age (48.53 plus or minus 6.64 years in Group A versus 51.4 plus or minus 7.82 years in Group B; p = 0.131), weight (65.2 plus or minus 6.78 kg versus 63.77 plus or minus 9.24 kg; p = 0.496) and body mass index (25.84 plus or minus 2.83 kg/m2 versus 24.98 plus or minus 3.69 kg/m2; p = 0.320) showed no meaningful difference between them (p greater than 0.05).

Postoperative pain scores

Complete pain relief was far more frequent in the block arm. A VAS of 0 was recorded in 13 of 30 women (43.3 percent) at both 15 and 30 minutes and in 14 of 30 (46.7 percent) at 45 minutes, yet not a single control patient was pain free at these times. By 60 minutes the number free of pain in the block arm had risen to 16 of 30 (53.3 percent), and at 75 minutes to 17 of 30 (56.7 percent), while once more no woman in the control arm reached a VAS of 0. Across every recorded interval up to 24 hours, pain scores were significantly lower in the block arm than in the control arm (p less than 0.05). Figure 1 sets out the mean pain scores of the two arms at each recording point.

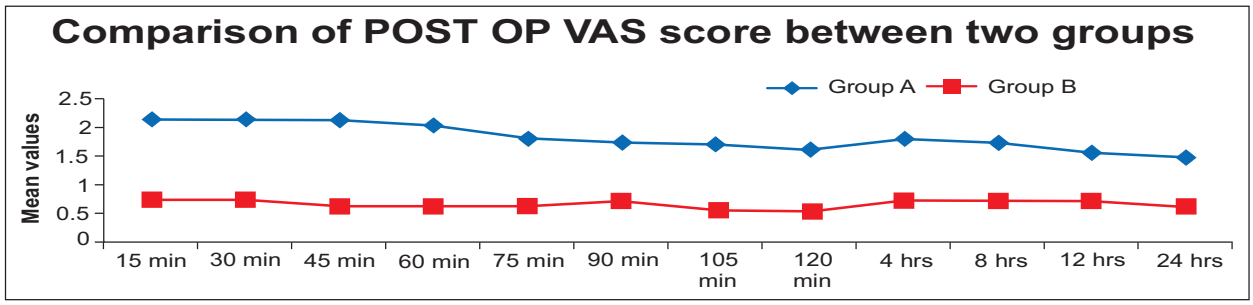

Figure 1: Comparison of postoperative VAS scores between the two groups

Rescue analgesia

Demand for additional pain relief was significantly higher among the control patients. Rescue analgesics were needed by 11 of 30 women (36.7 percent) in Group A but by only 2 of 30 (6.66 percent) in Group B (p = 0.030). The first request for rescue analgesia came at 5.80 plus or minus 4.34 hours in Group A and later, at 10.0 plus or minus 2.0 hours, in Group B, although this particular difference did not reach statistical significance.

Intraoperative haemodynamics

At the readings taken five minutes before and five minutes after induction, MAP did not differ meaningfully between the arms (p = 0.739 and p = 0.113 respectively). From 10 minutes after induction onward, however, the mean MAP recorded in Group A exceeded that in Group B at each subsequent 10 minute point, and the gap was statistically significant at 10, 20, 30, 40 and 60 minutes after induction (p less than 0.05) [Figure 2].

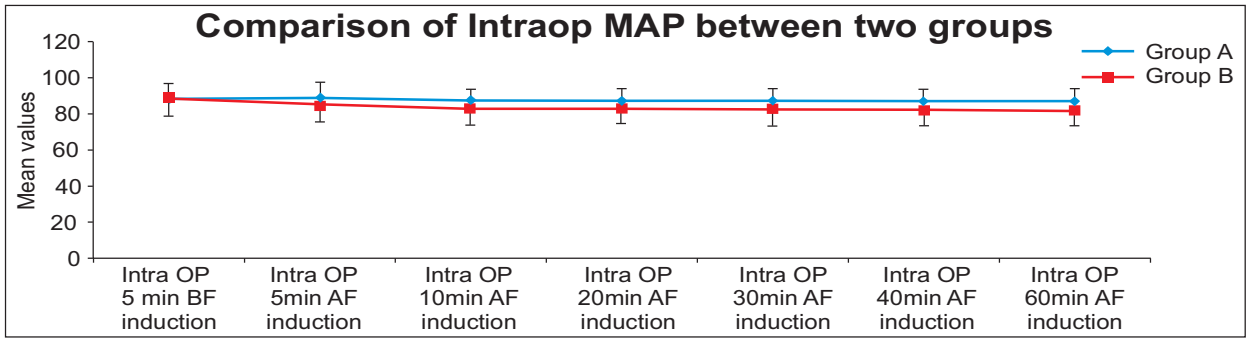

Figure 2: Comparison of intraoperative mean arterial pressure between the two groups

Baseline heart rate five minutes before surgery was similar in the two arms (p = 0.537). At 5, 10, 20, 30, 40 and 60 minutes after induction the values in Group B ran below those in Group A, but at none of these points did the difference attain statistical significance (Figure 3).

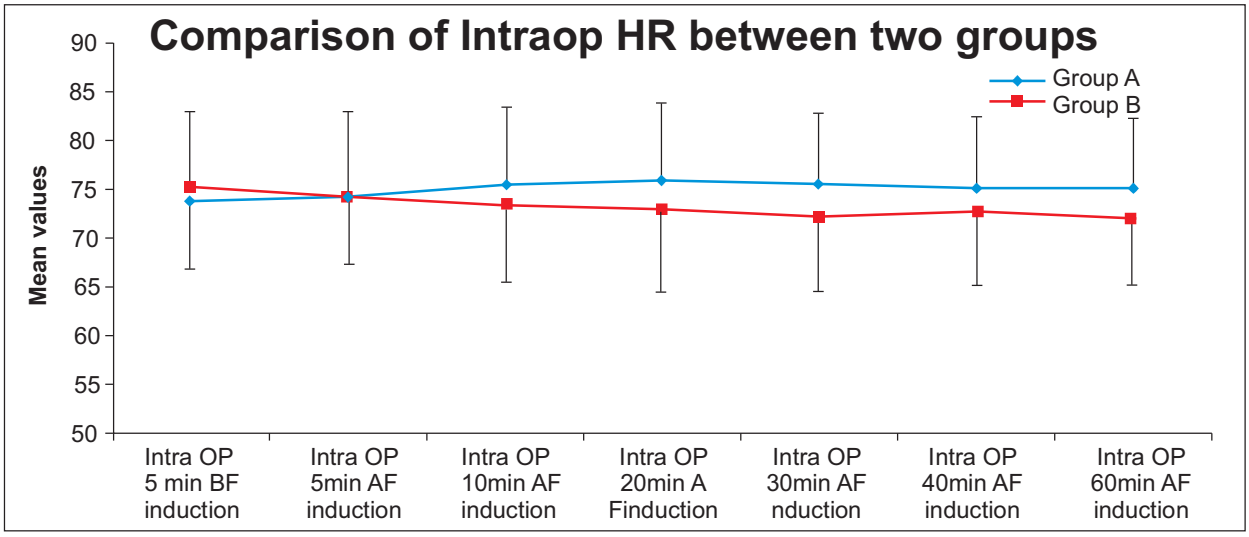

Figure 3: Comparison of intraoperative heart rate between the two groups

Postoperative haemodynamics

In the recovery period MAP again sat higher in Group A than in Group B, and this separation was statistically significant at every postoperative time point apart from 60 and 120 minutes. Postoperative heart rate, by contrast, showed no significant difference between the arms at most of the intervals studied.

Complications and sedation

Other than episodes of bradycardia and hypotension, seen in two and six women respectively in Group A and in one and two women respectively in Group B, no further adverse events were recorded in either arm over the first 24 hours. Ramsay sedation scores were comparable between the two arms, with no significant difference [Figure 4].

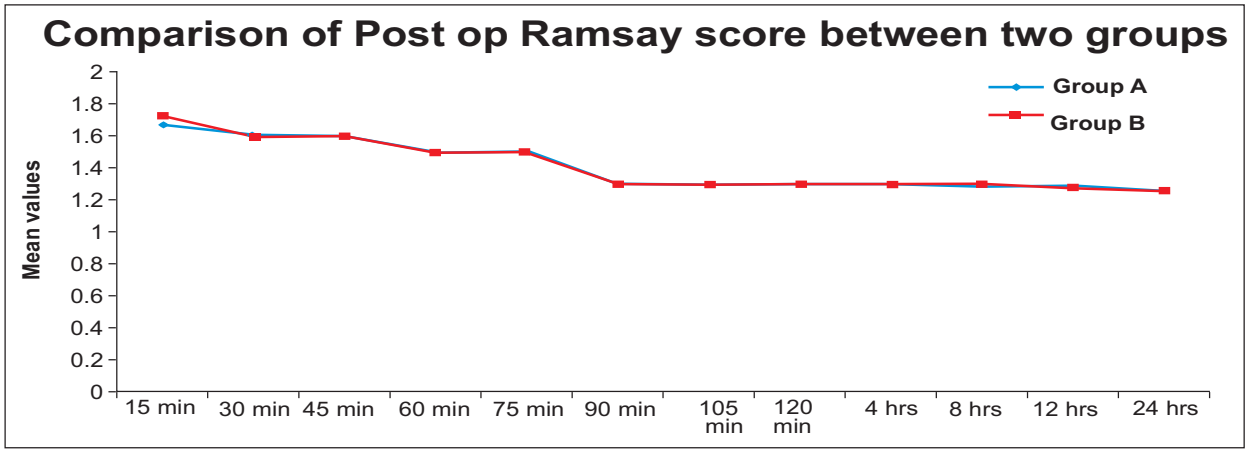

Figure 4: Comparison of postoperative Ramsay sedation scores between the two groups

DISCUSSION

Because breast cancer is so common in women, operations to treat it are carried out in large numbers. Pain control for these procedures began with a multimodal regimen combining non steroidal anti inflammatory agents with infiltration of local anaesthetic. Paravertebral and thoracic epidural techniques were adopted subsequently, and the arrival of ultrasound guidance has since brought regional interfascial plane blocks into wider use.

An influence of the Pecs I or Pecs II block on the circulation has been noted before; Kaur et al found that intraoperative systolic and diastolic pressures fell significantly when dexmedetomidine was added to the block.[8] We did not quantify intraoperative analgesic use as such, but the finding that MAP in the control arm ran higher at every 10 minute point from 10 minutes after induction, significantly so at 10, 20, 30, 40 and 60 minutes (p less than 0.05), points to better intraoperative analgesia among the women who had received the block. Their mean intraoperative heart rate was likewise lower at all points, though this trend did not achieve significance.

After surgery, the superior analgesia of the block arm went hand in hand with lower average MAP and heart rate, the latter falling short of significance, and both observations sit comfortably with the higher pain scores seen in the control arm. Those higher control scores persisted throughout, and were most striking through the first eight hours: at that point half of the block arm (15 of 30) still reported a VAS of 0, against just 1 of 30 (roughly 3 percent) of controls. Even at 12 and 24 hours, half of the block patients remained pain free, whereas only 3 of 30 (10 percent) and 5 of 30 (16.7 percent) of controls did so. This advantage over general anaesthesia alone mirrors the randomised experience of Sharma et al, who likewise found better analgesia in mastectomy patients given the Pecs block,[19] and the benefit extends to lesser resections, since Kim et al reported reduced pain and opioid use when a PECS II block was added for breast conserving surgery with sentinel node biopsy.[20]

Analgesia from the modified Pecs block arises because it covers the lateral cutaneous branches of the T2 to T6 spinal nerves, and probably their anterior cutaneous branches as well, which explains the lower pain scores relative to controls. Spread of local anaesthetic into the axilla additionally blocks the long thoracic nerve, reinforcing the effect. If the anterior cutaneous branches are missed because the injectate does not diffuse adequately across the external intercostal muscles, the inner chest wall can be left incompletely covered.[6,9,10,11] That mechanism may account for the two of 30 block patients (6.7 percent) who still scored a VAS of 4 at 90, 105 and 120 minutes. Satish *et al* described a similar picture, reporting lower pain scores at 1, 6, 12 and 24 hours in patients given the Pecs block.

In much the same way, Bashandy and Abbas recorded lower pain scores when the Pecs block accompanied general anaesthesia than with general anaesthesia alone, together with markedly reduced intraoperative fentanyl use, fewer episodes of postoperative nausea and vomiting, lower sedation scores, less morphine over the first 12 hours, and shorter times in both the recovery unit and hospital.[9] Blanco et al attributed the analgesic effect to bupivacaine enveloping the pectoral, intercostobrachial, intercostal and long thoracic nerves. Good control of acute pain also helps preserve immune competence, since it dampens the surgical stress response and lessens the need for anaesthetic drugs and opioids. As opioids, morphine in particular, depress both cellular and humoral immunity, the reduced morphine use that follows from blunting intraoperative nociception may promote quicker recovery and earlier discharge and may underlie the lower rates of postoperative nausea, vomiting and sedation seen with the Pecs block.[6,7]

In our patients, the between arm difference in the need for postoperative analgesia was significant ($p = 0.030$). Within the control arm, 30 percent were given the first line agent (IV diclofenac sodium) and 6.66 percent the second line agent (IV tramadol), while in the block arm just 2 women (6.66 percent) received diclofenac and none needed tramadol. This accords with the reports of Blanco et al and Bashandy et al. Beyond needing less analgesia, the block patients also waited longer before their first rescue dose, an observation echoed by Wahba and Kamal in their comparison of the Pecs block with total paravertebral block (TPVB), each combined with general anaesthesia. Since the paravertebral block does not dependably reach the medial and lateral pectoral nerves or the long thoracic and thoracodorsal nerves, its analgesia can be incomplete during breast surgery with axillary clearance; here too the lower rate of postoperative nausea and vomiting in the Pecs arm was ascribed to reduced morphine use.[12] Siddeshwara et al reached a comparable conclusion when they added levobupivacaine and dexamethasone to either block, finding the Pecs technique to be at least as effective as the paravertebral approach after modified radical mastectomy.[18]

A number of investigators report that adjuvants make the Pecs block work better still. Dexmedetomidine, for instance, has been shown to lower pain scores, extend the

analgesic window and cut postoperative morphine use.[8] Pairing the block with a postoperative infusion of local anaesthetic likewise sharpened analgesia and lowered the 24 hour analgesic requirement compared with either method used alone; the evidence suggested that the block supplies strong early relief that begins to fade around four hours, after which the infusion takes over to give better late analgesia.[13] We chose not to run a continuous infusion because acute pain was already well controlled in our cohort. Future work might combine an infusion with the modified Pecs block and, importantly, gather data on chronic pain.

How the modified Pecs block compares with other interfascial techniques is now an active question, and the evidence is not uniform. Sekiguchi et al, in a retrospective series, found the Pecs II and serratus plane blocks broadly similar for short term analgesia after breast cancer surgery,[21] whereas two more recent randomised trials favoured the alternatives, with a bi level erector spinae plane block giving lower morphine consumption than the Pecs block after radical mastectomy in the study of Cesur et al,[22] and Alshawadfy and Al-Touny reporting a longer time to first rescue analgesia and lower total analgesic use with the serratus anterior plane block II.[23] These divergent results suggest that block selection may depend on the extent of surgery and on operator familiarity, and a direct head to head comparison in patients undergoing axillary clearance would be a valuable next step.

Performing the modified Pecs block under ultrasound makes it a safe procedure. The complications that are theoretically possible include nerve damage, inadvertent injection into the acromiothoracic artery or cephalic vein, pneumothorax and, as has been suggested, an upper limb fistula.[14] None of these arose in our series, in line with most of the literature.[9] TPVB, on the other hand, carries a higher burden of vascular puncture, hypotension, wide epidural or intrathecal spread, accidental pleural puncture or pneumothorax, nerve injury and Horner or Harlequin syndrome, the risk of epidural and intrathecal spread being especially worrying on account of the circulatory instability it can cause.[15] Two of our block patients had transient hypotension and one had bradycardia; the hypotension (MAP below 60 mmHg) was managed with incremental IV ephedrine 5 mg and the bradycardia (heart rate below 40 per minute) with IV atropine 0.6 mg.

Every block in our study was successful, which matches the published experience,[9,16,17] whereas TPVB has been associated with an overall failure rate of around 6.1 percent. We relied on ultrasound together with an echogenic needle introduced in plane so that the relevant anatomy was seen clearly. Neither a catheter within the fascial planes nor an adjuvant in the local anaesthetic was used, though either might have lengthened the duration of analgesia. It has also been noted that fluid left in the tissues can interfere with electrocautery; lengthening the gap between block and incision, for example by carrying out the block in the holding area, has been proposed as a remedy, albeit one that may change how the local anaesthetic is absorbed.

CONCLUSION

For women having breast surgery that includes axillary node clearance, the ultrasound directed modified Pecs block gives sound pain relief while trimming both opioid use and the wider need for analgesics after operation. It is, on this basis, a valuable part of a multimodal analgesic regimen for such patients. What remains to be established, through further trials, is whether the modified Pecs block can also blunt the development of chronic pain following breast surgery with axillary clearance.

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REFERENCES

1. Gartner R, Jensen MB, Nielsen J, Ewertz M, Kroman N. Prevalence of and factors associated with persistent pain following breast cancer surgery. JAMA 2009;302:1985-92.
2. Poleshuck EL, Katz J, Andrus CH, Hogan LA, Jung BF, Kulick D. Risk factors for chronic pain following breast cancer surgery: A prospective study. J Pain 2006;7:626-34.
3. Vadivelu N, Mitra S, Schermer E, Kodumudi V, Kaye AD, Urman RD. Preventive analgesia for postoperative pain control: A broader concept. Local Reg Anesth 2014;7:17-22.
4. Karanikolas M, Aretha D, Tsolakis I, Monantera G, Kiekkas P, Papadoulas S, et al. Optimized perioperative analgesia reduces chronic

phantom limb pain intensity, prevalence, and frequency: A prospective, randomized, clinical trial. Anesthesiology 2011;114:1144-54.

5. Penprase B, Brunetto E, Dahmani E, Forthoffer JJ, Kapoor S. The efficacy of preemptive analgesia for postoperative pain control: A systematic review of the literature. AORN J 2015;101:94-105.
6. Blanco R. The pecs block: a novel technique for providing analgesia after breast surgery. Anaesthesia 2011;66:847-8.
7. Blanco R, Fajardo M, Parras Maldonado T. Ultrasound description of Pecs II (modified Pecs I): a novel approach to breast surgery. Rev Esp Anestesiol Reanim 2012;59:470-5.
8. Kaur H, Singh G, Rani S, Gupta KK, Kumar M, Rajpal AS, et al. Effect of dexmedetomidine as an adjuvant to levobupivacaine in supraclavicular brachial plexus block: A randomized double-blind prospective study. J Anaesthesiol Clin Pharmacol 2015;31:333-8.
9. Bashandy GMN, Abbas DN. Pectoral nerves I and II blocks in multimodal analgesia for breast cancer surgery. Reg Anesth Pain Med 2015;40:68-74.
10. Kamiya Y, Hasegawa M, Yoshida T, Takamatsu M. Impact of pectoral nerve block on postoperative pain and quality of recovery of patients undergoing breast cancer surgery. Eur J Anaesthesiol 2018;35:215-23.
11. Kurhade VS, Page ND. Pectoral nerve block: A novel modality for managing chronic chest wall pain. Indian J Pain 2017;31:73-4.
12. Wahba SS, Kamal SM. Thoracic paravertebral block versus pectoral nerve block for analgesia after breast surgery. Egypt J Anaesth 2014;30:129-35.
13. O Scanaill P, Keane S, Buggy DJ. Single-shot pectoral plane (PECs I and PECs II) blocks versus continuous local anaesthetic infusion analgesia or both after non-ambulatory breast-cancer surgery: a prospective, randomised, double-blind trial. Br J Anaesth 2018;120:846-53.
14. Moon EJ, Kim SB, Chung JY, Song JY, Yi JW. Pectoral nerve block (Pecs block) with sedation for breast conserving surgery without general anesthesia. Ann Surg Treat Res 2017;93:166-9.
15. Naja Z, Lonnqvist PA. Somatic paravertebral nerve blockade. Incidence of failed block and complications. Anaesthesia 2001;56:1184-8.
16. Satish K, Deepali G, Santosh KS, Ahmad S, Dwivedi P, Deo N, et al. A randomised controlled study of postoperative analgesic efficacy of ultrasound guided pectoral nerve block in the first 24 hours after modified radical mastectomy. Indian J Anaesth 2018;62:436-42.
17. Kulhari S, Bharti N, Bala I, Arun S, Singh G. Efficacy of pectoral nerve block versus thoracic paravertebral block for postoperative analgesia after radical mastectomy: a randomized controlled trial. Br J Anaesth 2016;117:382-6.
18. Siddeshwara A, Singariya G, Kumari K, Kamal M, Kumar R, Seervi S. Comparison of efficacy of ultrasound-guided pectoral nerve block versus thoracic paravertebral block using levobupivacaine and dexamethasone for postoperative analgesia after modified radical mastectomy: a randomized controlled trial. Saudi J Anaesth 2019;13:325-31.
19. Sharma K, Nair N, Tiwari S, Sharma S. Randomized controlled trial comparing the efficacy of pectoral nerve block with general anesthesia alone in patients undergoing unilateral mastectomy. Indian J Surg Oncol 2021;12:143-9.
20. Kim CS, Kim DH, Kim HJ, Lee IG, Lee JH, Choi KT, et al. Efficacy of pectoral nerve block type II for breast-conserving surgery and sentinel lymph node biopsy: a prospective randomized controlled study. Pain Res Manag 2018;2018:4315931.
21. Sekiguchi A, Shibata Y, Fujii T, Nishiwaki K, Ando R, Aoki W, et al. Efficacy of pectoral nerve block type-2 (Pecs II block) versus serratus plane block for postoperative analgesia in breast cancer surgery: a retrospective study. Nagoya J Med Sci 2020;82:93-101.
22. Cesur S, Aksu C, Guler SS, Kus A. Modified pectoral nerve block versus bi-level erector spinae plane block for postoperative analgesia after radical mastectomy surgery: a prospective, randomized, controlled trial. Korean J Anesthesiol 2023;76:57-65.
23. Alshawadfy A, Al-Touny SA. Comparing the quality of analgesia with ultrasound-guided pectoral nerve block and serratus anterior plane block II in patients undergoing modified radical mastectomy: a randomised clinical trial. Anaesthesiol Intensive Ther 2023; 55:34-40.