

Combined fascial plane blocks as the sole regional anesthesia technique for breast surgery in high-risk patients

Raghu S. Thota, Ramkiran Seshadri¹, Amit R. Panigrahi¹

Department of Anaesthesiology, Critical Care and Pain, Homi Bhabha National Institute, Tata Memorial Centre, E Borges Road, Parel, Mumbai, Maharashtra, ¹Department of Anaesthesiology, Critical Care and Pain, Homi Bhabha Cancer Hospital and Research Centre, Aganampudi, Gajuwaka Mandalam, Vishakapatnam, Andhra Pradesh, India

Abstract

The quest for an effective regional anaesthesia technique in breast surgery has always been eluded by its apparent complexity. Various techniques had been described as anaesthetic techniques for breast cancer surgeries. Fascial plane blocks had been used as analgesic techniques for this procedure. We describe a case series of 12 patients who were given a combination of erector spinae plane block (ESP), Pectoralis I (Pecs I) and serratus anterior plane (SAP) block as sole anaesthetic technique with high risk surgical morbidity. Two patients had discomfort during retraction of axillary apex towards the end of surgery, and one patient had discomfort during medial parasternal incision, which needed a single bolus of low dose ketamine injection. Combined fascial plane blocks could be effectively utilized as a sole regional anesthesia modality for breast cancer surgeries with mild sedation.

Keywords: Combined fascial plane blocks, erector spinae plane block, Pectoralis I (Pecs I), serratus anterior plane block

Introduction

In patients with limited cardio-respiratory reserve, general

Address for correspondence: Dr. Raghu S. Thota,
Department of Anaesthesiology, Critical Care and Pain, Homi Bhabha
National Institute, Tata Memorial Centre, E Borges Road, Parel,
Mumbai, Maharashtra - 400 012, India.
E-mail: ragstho24@gmail.com

anesthesia (GA) with airway intervention may lead to significant hemodynamic vulnerability. Therefore, regional anesthesia techniques have been preferred in this subset. Thoracic epidural fell out of favor in lieu of degree of

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invasiveness and sympatholysis, while paravertebral blocks had their drawbacks with potential central neuraxial spread, systemic toxicity, and inadvertent pneumothorax.^[1]

Fascial plane blocks have emerged as a novel regional anesthesia technique facilitating peri-operative analgesia.^[2] Combined fascial plane blocks have further rejuvenated regional anesthesia in breast surgery. When performed with procedural sedation, they can provide an effective alternative to GA despite the complexity in breast innervation.^[3]

We chose a combination of three distinct fascial plane blocks in this study to attain overlapping dermatome analgesia. The combination of erector spinae plane block (ESP), Pectoralis I (Pecs I), and serratus anterior plane (SAP) blocks were chosen to achieve anterior chest wall as well as axillary analgesia.^[4-6]

Block Technique Description

After informed patient consent, a combination of ultrasound-guided ESP, Pecs I, and SAP blocks were given to achieve complete upper anterolateral chest wall analgesia. The nerves targeted were posterior spinal, thoracic intercostals (D2-D6), medial and lateral pectorals, long thoracic, and thoracodorsal nerve. The total volume of local anesthetic utilized was 50 ml, which was distributed among the individual blocks, namely, 20 ml in ESP, 20 ml in SAP, and 10 ml in Pecs I plane. A combination of 2-mg/kg 0.5% bupivacaine, 7-mg/kg 2% lignocaine with adrenaline (1 in 200000), and 1- μ g/kg dexmedetomidine as adjuvant were utilized with saline dilution to attain a total volume of 50 ml to avoid a toxic dose. Written informed consent was obtained from all patients. Under sterile aseptic precautions, ESP was

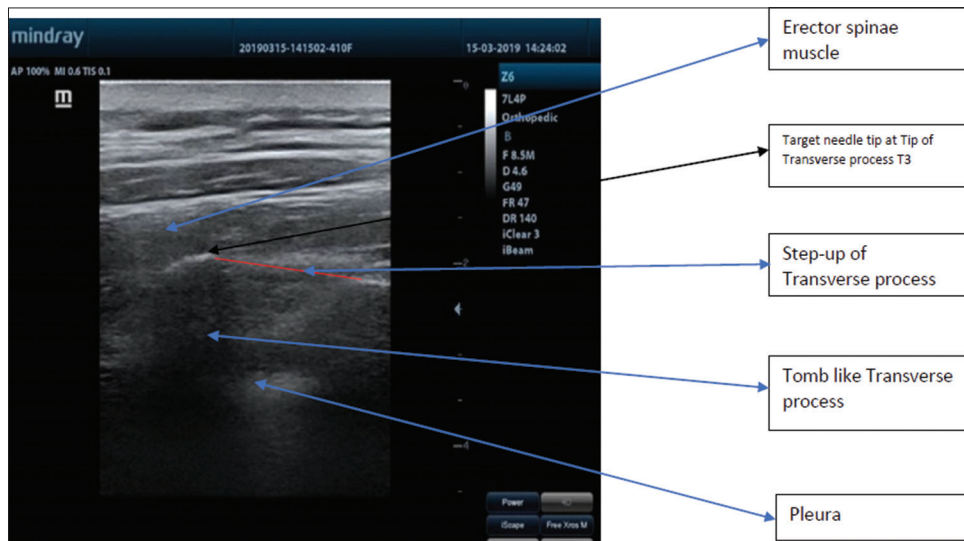


Figure 1: USG image of erector spinae plane block

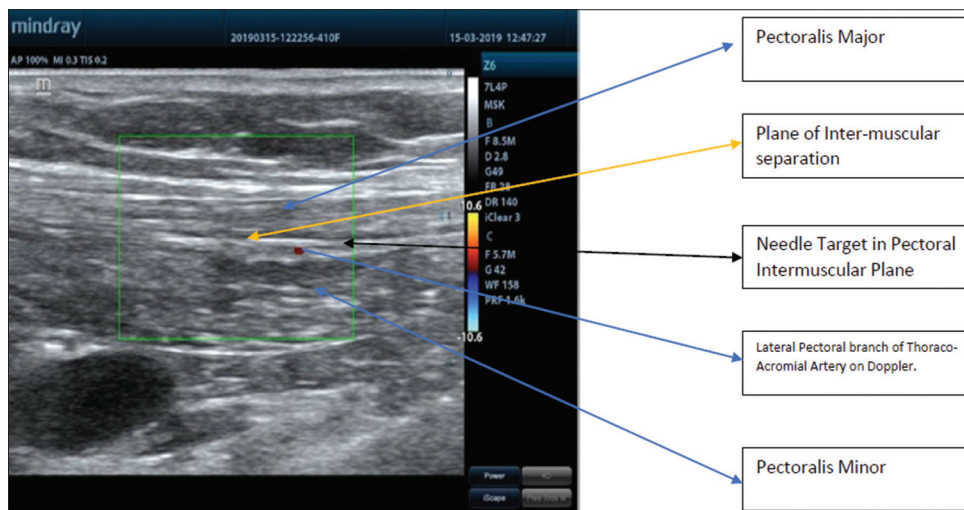


Figure 2: USG image of PECS I & PECS II block

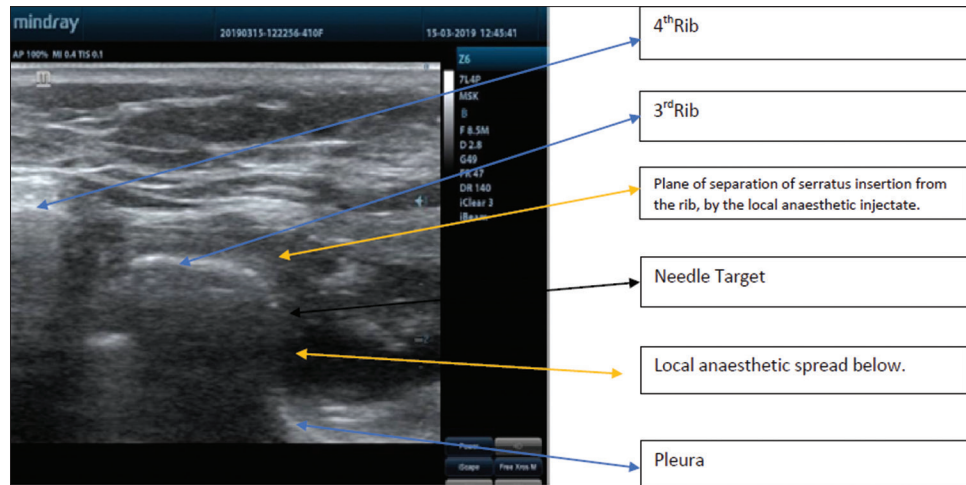


Figure 3: USG image of SAP block

performed in sitting position at T2 level [Figure 1]. The tip of the transverse process was targeted by the block needle and drug deposited deep to the erector spinae muscle plane. Theoretically, it is possible for LA to spread either way. However, injection of LA in sitting posture ensured gravitation of LA caudad. We also performed dynamic scanning after injection in every patient and found that LA always gravitated below but did not spread cephalad. We may not know the exact reason, but not a single injection in sitting position resulted in cephalad spread. The patient was then positioned supine with arms abducted and Pecs I block [Figure 2] was performed with the probe transversely oriented under the clavicle, medial to the coracoid process, targeting the intermuscular plane between pectoralis major and minor muscles at the level of third rib. The SAP block was then performed at the level of third rib along the anterior axillary line [Figure 3]. The block needle was targeted deep to the serratus muscle attachment at the rib insertion to deposit the drug. The need to block ESP at T2 level for axillary dissection was felt extremely necessary as SAP performance was done at T3 in view of more favorable anatomical plane to achieve separation. After recording baseline hemodynamic variables, an intravenous graduated bolus of 0.02-mg/kg midazolam and 1- μ g/kg dexmedetomidine was given, and an infusion of 0.5- μ g/kg/h dexmedetomidine was initiated in all patients. Twenty minutes later, dermatomal anesthesia was confirmed from T2–T6 dermatomes using pin-prick sensation, following which modified radical mastectomy surgery was allowed to proceed.

Case descriptions are in Table 1

All patients had given consent to publish the case report.

Discussion

Our study describes the novel combination of Pecs I, SAP block along with ESP; this combination was selected to establish a sole regional anesthesia technique in high-risk patients presenting for modified radical mastectomy.

There was no conversion to GA in any of the patients, although two patients (Cases 3 and 5) felt discomfort during retraction of axillary apex toward the end of surgery and one patient (Case 9) had discomfort during medial parasternal incision. A bolus of low dose ketamine (0.25 mg/kg) was used in Cases 3, 5, and 9 as rescue. Case 3 needed an additional 50 μ g of fentanyl. No anesthesia-related complication was reported in any patient. There was no delay in discharge from the post-anesthesia care unit. Patients received intravenous paracetamol 1 gm 6th hourly for 24 h postoperatively. All patients had negligible pain (NRS < 2) on shoulder movement exercise done at 6th hour postoperatively. None of these patients needed any postoperative rescue analgesic.

ESP is a recent addition to fascial plane block and is fast emerging as a simple and safe technique.^[6] Although originally described at T5 level, we incorporated block performance at T2 level instead, as Intercostobrachial nerve at T2 segmental distribution was vital for the block success. The post block local anesthetic spread assessed by ultrasound showed distribution from T2 to T6, with the plane of separation underneath erector spinae demonstrable in all cases.

The Pecs I block, originally described by Blanco^[7] from being a modification of infraclavicular block approach, has been further modified with probe orientation

Table 1: Details of the cases that underwent breast surgeries

Case	Case Description
Congenital bronchiectasis	A 55-year-old female presented with invasive ductal carcinoma in the right breast for modified radical mastectomy. She was a known case of congenital bronchiectasis, necessitating frequent hospital admissions since childhood. Had compromised lung function with episodic exacerbations, recent episode 6 weeks prior, needing supportive intravenous antibiotics and mucolytics.
Rheumatoid arthritis Atrial fibrillation Dilated cardiomyopathy Hypothyroidism	A 65-year-old patient was a known case of rheumatoid arthritis, was on disease-modifying drugs methotrexate and oral steroid prednisolone, had advanced disease progression leading to severe flexion deformity at the neck secondary to upper cervical spine dislocation. Was hospitalized thrice in the recent 6 months with breathlessness on exertion. Further evaluation revealed atrial fibrillation needing rate control with beta blocker and amiodarone initially. Subsequently developed poor effort tolerance secondary to dilated cardiomyopathy, necessitating treatment changeover to ACE inhibitor Ramipril and clopidogrel. Associated comorbidities were hypothyroidism, anemia, and elevated serum creatinine.
Diabetes mellitus, Hypertension Azotemia Valvular heart disease Poor functional status	A 70-year-old patient, was a non-ambulant, wheelchair-bound patient with left hip injury secondary to impacted prosthesis due for removal. Comorbidities included insulin-dependent diabetes mellitus, hypertension on combined calcium and beta blocker, medical renal disease with azotemia not needing replacement therapy, Right middle lobe fibrotic opacities secondary to old pulmonary tuberculosis post anti-tuberculosis treatment 12 years back, calcified aortic and mitral valve leaflets with combined aortic stenosis and regurgitation, mitral regurgitation, moderate pulmonary hypertension and left ventricular diastolic dysfunction.
Bronchial asthma Pulmonary hypertension Atrial fibrillation	An 82-year-old known case of bronchial asthma on inhaled steroids, poor effort tolerance, and dyspnea on minimal exertion. 2D Echocardiography revealed septal hypokinesia, moderate mitral regurgitation, and pulmonary hypertension. Had documented intermittent atrial fibrillation, on ambulatory electrocardiography (Holter) for episodic dizziness. The patient was on Nikorandil and beta blockers for rate control and anti-platelet agents
Cervical spondylitis Fixed flexion deformity	A 50-year-old patient with a history of cervical spondylitis with limited neck movement and fixed flexion deformity. Sensorimotor involvement was documented on radiologic imaging and nerve conduction studies. The patient was asked to self-position during block performance and intra-operatively.
Diabetes mellitus Hypertension Coronary artery disease Pulmonary artery hypertension	A case of breast malignancy occurring in a 70-year-old male. Was a known case of insulin-dependent diabetes mellitus, hypertension, and coronary artery disease with double vessel disease for which drug-eluting stent was inserted into the right coronary artery. Post-intervention 2D echocardiography had revealed mitral regurgitation and mild pulmonary artery hypertension 3 months back. The patient was on nimodipine, clonidine, and aspirin. Benefit versus risk for major adverse cardiac event explained and patient voluntarily opted for regional anesthesia technique.
Limited effort tolerance Inconclusive for coronary artery disease	C and S, 42 and 78 years, respectively, presented with limited effort tolerance, abnormal electrocardiography revealing left bundle branch block pattern, subjected to further testing with a cardiologist. Stress test and 2D echocardiography were inconclusive for coronary artery disease. Patient S was subjected to coronary angiography by the cardiologist, developed supraventricular tachycardia during the study treated with adenosine. The study was inconclusive for coronary ischemia. Patients were explained about the risk and informed consent sought for regional anesthesia.
Hypothyroidism Conjugated hyperbilirubinemia	Patient aged 40 years, post neoadjuvant chemotherapy with doxorubicin, cyclophosphamide 4 cycles. Known case of hypothyroidism, on thyroxine supplement. Incidentally detected raised serum transaminase, altered liver enzymes, and a modest rise in bilirubin (3 g/dL) with conjugated hyperbilirubinemia. Hepatologist consult sought and planned under regional anesthesia avoiding volatile and hepatotoxic anesthetics. The peri-operative course and recovery were uneventful.
Diabetes mellitus Hypertension Thrombo-embolic stroke Post thrombolysis	S aged 39 years was a known diabetic on insulin, hypertensive on telmisartan. Had suffered a recent thrombo-embolic stroke 1 month ago, intra-arterial thrombolysis performed on an emergency basis, developed acute infarct of middle cerebral artery secondary to bleed, leading to residual neurological deficits and slurring of speech. Was on anti-platelet aggregators after neurology consult.
Diabetes mellitus Hypertension Subarachnoid hemorrhage Transverse sinus thrombosis	R aged 46 years was a known diabetic and hypertensive on clinidipine. Post chemotherapy with doxorubicin and cyclophosphamide. Developed headache, accelerated hypertension following which had subarachnoid hemorrhage with right sagittal sinus, sylvian fissure, and transverse sinus thrombosis. Developed left side monoplegia, facial palsy and recovered over time without any neurological deficits.
Hypertension Graves disease	D aged 50 years presented with hypertension on telmisartan. Known case of graves disease on methimazole. Had recent history of exposure to anesthetic for breast conservation surgery, during which developed tachyarrhythmia, accelerated hypertension leading to procedure getting limited to wide excision. Subsequent margin positivity led her getting posted for modified radical mastectomy. She was further investigated with urine Vanillyl mandelic acid, ultrasound abdomen to rule out underlying pheochromocytoma. Renal artery Doppler was done to rule out secondary hypertension. Electrocardiography and 2D echocardiography were normal ruling out cardiac cause. Thyroid profile was normal ruling out hyperthyroidism. Endocrinology and cardiology consult sought preoperatively to rule out multiple endocrine neoplasia. Patient was explained about the subsequent exposure risk to volatile anesthetics and the patient opted for regional anesthesia technique instead.

transverse-oblique under the clavicle, medial to the coracoid process beside lateral pectoral branch of thoraco-acromial artery, at the level of third rib and drug deposited between the pectoralis intermuscular plane.^[4,5,7] The SAP block was originally described by Blanco at the fifth rib in the midaxillary line, either superficial or deep to the serratus muscle, resulting in blockade of lateral branch of thoracic upper intercostal nerves, long thoracic nerve, and thoracodorsal nerve.^[8] We deposited the drug deep into the serratus muscle at the third rib with an intention to achieve spread onto axilla.

The combination of Pecs I and SAP block has been utilized successfully with GA and as a regional anesthesia technique along with propofol sedation.^[4] The study could not establish the block combination as a standalone regional anesthesia technique. The addition of ESP in our study to the above provided the versatility to enhance the block quality and hence achieve self-efficiency. Thota *et al.*^[9] had described a successful case of modified radical mastectomy using ESP block with continuous catheter as an anesthetic technique. In a double-blind randomized controlled trial, Thiagarajan *et al.*^[10] concluded that ultrasound-guided ESP block with GA offers superior postoperative analgesia compared to GA alone in patients undergoing unilateral nonreconstructive breast cancer surgeries and is associated with better patient satisfaction scores at discharge. Fascial plane blocks have the potential to become the future sole regional anesthetic modality in high-risk patients presenting for breast surgery, though further randomized control studies shall be needed to delineate the ideal combination.

Conclusion

Combined fascial plane blocks could be effectively utilized as a sole regional anesthesia modality along with continuous sedation in high-risk patients presenting for breast cancer surgery and mitigating the need for GA.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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