

Comparison of pectoralis plane blocks with ketamine-dexmedetomidine adjuncts and opioid-based general anaesthesia in patients undergoing modified radical mastectomy

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ABSTRACT

Background and Aims: Regional anaesthesia attenuates surgical stress-response, provides superior analgesia, reduces recovery time with early mobilisation and is opioid-sparing [addresses post-operative nausea vomiting (PONV), constipation, immunosuppression and cancer-progression concerns with opioids]. Hence, we studied pectoralis (PECS) blocks for modified radical mastectomy (MRM). **Methods:** A prospective, interventional, double-blind, randomised, parallel-arm, active-controlled study comparing two anaesthetic techniques for post-operative pain relief in 70 adult American Society of Anesthesiologists grade I/II carcinoma breast patients undergoing MRM was conducted. Patients were randomised to Group-O (opioids, sevoflurane) and Group-P (PECS-block, pre-incisional intravenous (IV) ketamine (0.5 mg/kg), pre-incisional IV dexmedetomidine (1 µg/kg over 10 min, then 0.6 µg/kg/h). Data were subjected to statistical analysis using the Statistical Package for Social Sciences, version-23 and independent sample t-test/Welch test for equality of means and expressed as dotted box-whisker plots. Nominal categorical intergroup data was compared using Chi-squared test/Fisher's exact test. $P < 0.05$ was considered statistically significant. Clinical significance was calculated. **Results:** Higher Visual Analogue Scale (VAS)-scores were recorded in Group-O versus Group-P, immediately post-extubation [mean (SD) 3.6 ± 1.5 and 0.76 ± 0.6] and at 1h (3.1 ± 1.2 and 1.4 ± 0.5), 2h (2.5 ± 0.9 and 1.2 ± 0.6) and 4h (2.2 ± 0.5 and 1.7 ± 0.9) respectively. At 8h and 24h post-surgery VAS was comparable. Cumulative-VAS was lower in Group-P. Intraoperative haemodynamics were comparable. Incidence of PONV and constipation was higher in Group-O where each patient received average 27.46 mg morphine-equivalents of opioids. Time to discharge from surgical intensive care unit was 2h shorter in Group-P. **Conclusion:** Pre-emptive PECS-blocks supplemented with low-dose ketamine and dexmedetomidine comprise a practical and useful alternative technique to the standard opioid-based general anaesthetic technique for MRM.

Key words: Modified radical mastectomy, opioids, pectoralis blocks

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INTRODUCTION

The three basic modes of anaesthesia (general, regional, local), have each been employed for breast surgery with excellent intra-operative results.^[1] Wide variations exist in their side-effect and complications silhouette, nonetheless. Regional anaesthesia attenuates surgical stress-response, provides superior analgesia, promotes early mobilisation, hastens

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recovery, is opioid-sparing (less post-operative nausea vomiting (PONV), constipation, avoids immunosuppression and hampers cancer recurrence).^[2] It does not share the carbon-footprint of volatile anaesthetics and green-house effect of nitrous oxide, satisfying the green-brigade.

The regional anaesthesia armamentarium includes paravertebral block (PVB), thoracic and segmental epidural blocks traditionally blind/landmark-based, but now increasingly being ultrasound-guided.^[2] Anticipating complications like inadvertent vascular/subarachnoid placement or spinal-cord trauma, these blocks are performed in sitting/lateral position in awake-patients (accommodating a test-dose), causing significant patient discomfort. Drawbacks of PVB,^[3] (potential pneumothorax; spinal-cord trauma; incomplete block sparing brachial plexus) prompted us to study simple and fast-acting pectoralis (PECS) blocks performed in supine position, post anaesthetic-induction, with myriad advantages like opioid-sparing effect, sympathetic-sparing effect, better T2-dermatomal spread (unlike PVB), allowance for more liberal anticoagulant use and both motor and sensory nerve-blockade (unlike wound infiltration) while providing complete analgesia for lumpectomy, modified radical mastectomy (MRM) and axillary clearance, with an onset-time of roughly 3 min and analgesia lasting upto 8 h.^[4] Pectus fascial-planes lack opioid-receptors. PECS-blocks conform to the ERAS (enhanced recovery after surgery) protocol advocating reduction/elimination of opioid use^[5] and address the recent concern regarding immunosuppression and cancer-progression with opioids.

We aimed to compare two anaesthetic techniques for modified radical mastectomy (MRM)- the conventional opioid-based technique versus an opioid-free, PECS-block based technique.

MATERIAL AND METHODS

This prospective, interventional, single-centric, double-blind, randomised, parallel-group, active-controlled, Helsinki protocol-compliant clinical study was registered with Clinical Trial Registry of India. It was conducted after obtaining written informed consent from all patients and approval from the institutional review board. Seventy American Society of Anesthesiologists (ASA) physical status I/II female patients, aged 18-75 years, weighing 40-85 kg,

undergoing elective MRM for carcinoma breast were included. Exclusion criteria comprised patient-refusal, local-anaesthetic allergy, opioid-addiction, neuropsychiatric disorders, infection/tumour at PECS-block site and bilateral MRM.

Enrolment of patients commenced in October-2018 and concluded in March-2019. Patients were block-randomised (computer-generated) to Group-O (opioids; sevoflurane) and Group-P (PECS-block; dexmedetomidine; ketamine). The method of concealment comprised of sequentially numbered, sealed, opaque envelopes. The study was participant and outcome-assessor blinded.

After applying standard monitors including bispectral index (BIS), all patients were pre-medicated with intravenous (IV) glycopyrrolate 4 µg/kg and midazolam 0.03 mg/kg.

Group-P patients received dexmedetomidine loading infusion (1 µg/kg over 10 min) followed by anaesthetic induction with propofol, IVesmolol (0.5 mg/kg) to block the haemodynamic response to endotracheal intubation, facilitated with atracurium 0.6 mg/kg and pre-emptive IVparacetamol 1000 mg. Pre-incisional ultrasound-guided PECS-blocks preceded pre-incisional analgesic-dose IVketamine (0.5 mg/kg). BIS-guided dexmedetomidine infusion (no inhalational anaesthetics) maintained BIS in 40-60 range. If BIS approached 58-60, 2 ml dexmedetomidine (4 µg/ml) bolus, besides the baseline infusion of 0.6 µg/kg/h, was instituted. If after 2 min BIS did not fall, another 2 ml dexmedetomidine bolus, followed 2 min later by 20 mg propofol, if required, was administered.

After pre-incisional IVketamine 0.5 mg/kg, two more ketamine doses (0.25 mg/kg) were administered at 20-minutes intervals.

Blocks were instituted using a 7.5 MHz linear ultrasound probe (Sonosite; Micromaxx, Bothell, USA) and 8 cm/22-gauge echogenic needle (Pajunk; Sonoplex stim cannula; Geisingen, Germany) in supine position, ipsilateral arm abducted [Figure 1]. An anaesthesiologist proficient in ultrasonography (USG) guided nerve blocks administered the modified PECS-block comprising PECS-I (0.2 ml/kg 0.25%bupivacaine between pectoralis major and minor muscles, targeting median and lateral pectoral nerves) and PECS-II (0.4 ml/kg 0.25%bupivacaine between pectoralis minor and serratus anterior muscles, targeting long thoracic,

thoracodorsal and T2-T6 intercostal nerves) inferior to the lateral-third of clavicle through the same entry point at the 4th rib level, and serratus anterior plane block (SAP). SAP targets T2-T9 intercostal nerves, injecting 0.2 ml/kg 0.25% bupivacaine divided equally both superficial and deep to serratus muscle (above 5th-rib; mid-axillary line).

Intraoperative propofol, dexmedetomidine and ketamine consumption were recorded.

Post-operative opioids were avoided. IV paracetamol 1g was administered, 8-hourly and whenever patients exhibited visual analogue scale (VAS) score ≥ 3 , total dose ≤ 4 g in 24 h. IV ketorolac 50 mg was added for elevated VAS-scores despite paracetamol. If despite PECS-block, dexmedetomidine and ketamine, intra-operative analgesia was inadequate; or if paracetamol-ketorolac combine failed to maintain postoperative VAS < 3 , fentanyl (20 μ g bolus) as rescue analgesia was planned.

Group-O patients received fentanyl 2 μ g/kg, followed by propofol till loss of response to verbal command and atracurium 0.6 mg/kg to facilitate endotracheal intubation. Maintenance of anaesthesia comprised pre-emptive IV paracetamol 1000 mg, IV morphine 0.1 mg/kg and sevoflurane (in medical-air; oxygen) to maintain BIS in 40-60 range. Intraoperative propofol,

opioid requirement plus sevoflurane consumption and uptake (autogenerated values from Draeger-Primus workstation post-surgery) were recorded. IV morphine 1.5 mg 8-hourly and whenever VAS-score ≥ 3 (total dose ≤ 0.1 mg/kg in 6h) provided postoperative analgesia. Rescue analgesia comprised additional fentanyl boluses (20 μ g each; maximum total dose 3 μ g/kg) followed by 3 mg morphine boluses (maximum total dose 0.2 mg/kg) if VAS was still ≥ 3 .

Heart rate (HR) and mean arterial pressure (MAP) were noted at baseline, induction, tracheal-intubation, incision, at 15-minute intervals thereafter and at end of surgery in both groups. Hypotension (20%MAP-fall below baseline) commanded crystalloid boluses and, when required, IV ephedrine 3-6 mg. Bradycardia (HR < 40 beats/min) necessitated IV glycopyrrolate 0.2 mg. For $> 20\%$ rise in HR or MAP above baseline intraoperatively, rescue analgesic was given before IV esmolol (0.5 mg/kg) and IV diltiazem 5 mg bolus respectively. All patients underwent tracheal-extubation in the operation theatre with immediate transfer to surgical intensive care unit (SICU). Post-operative pulse oximetry and 'Richmond Agitation Sedation Score'^[6] (RASS) monitoring was done and VAS-score, HR and MAP recorded at specific time-points (immediately after tracheal-extubation; 1,2,4,8 and 24h post-operatively). Modified Aldrete score $\geq 10/12$ was the criteria for SICU-discharge.

Our primary outcome measure was post-operative VAS-scores at various time-points (immediately after tracheal-extubation, and at one, two, four, eight and 24h, post-operatively).

Secondary outcome measures were incidence of post-operative constipation, pruritus and PONV, HR and MAP (at induction, intubation, surgical incision, every 15 min thereafter, end-surgery and one, two, four, eight and 24h, post-operatively) and time-to-discharge from SICU. This is an interim-analysis and another secondary outcome measure, cancer recurrence 5 years post-surgery, is not yet available for analysis.

Referencing a study by Ueshima *et al*,^[7] the sample-size was calculated using nMaster-2.0 software. Type-I (α) and Type-II (β) errors were entered as 5% and 20%, respectively, for this two-sided test. Mean intergroup difference of VAS-scores at 1st postoperative hour was 1 unit, standard deviation (SD) in first and second groups was 2 and 0.5 units, respectively, and the effect-size emerged as 0.8. The sample-size calculated based on

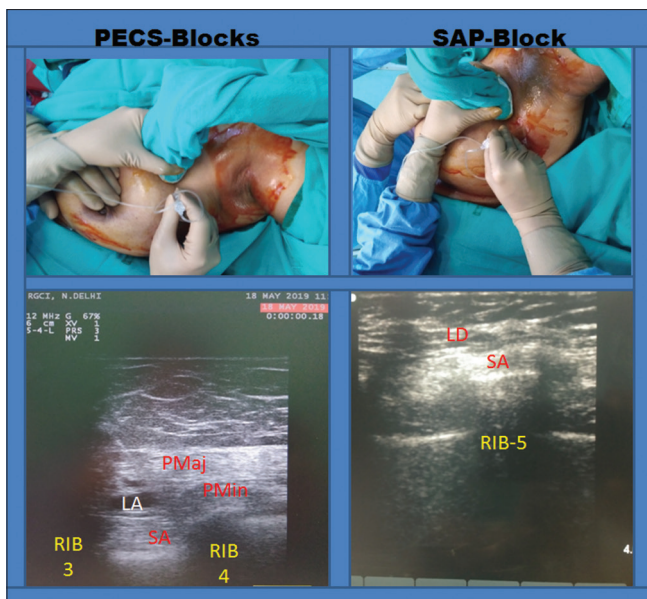


Figure 1: Probe positioning and sonoanatomy of PECS blocks (right side) and SAP block (left side); (LA = local anaesthetic; PECS blocks = pectoralis muscle plane blocks; PMaj = pectoralis major muscle; PMin = pectoralis minor muscle; SA = serratus anterior muscle; SAP block = Serratus anterior plane block; LD = latissimus dorsi muscle)

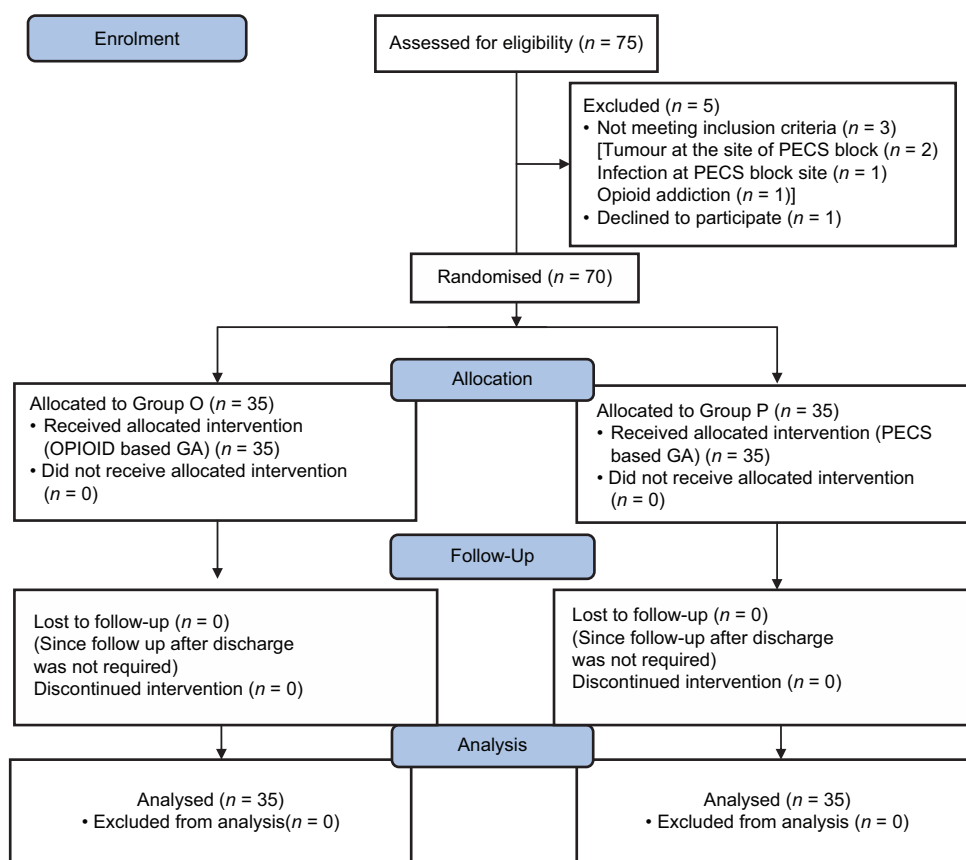


Figure 2: CONSORT diagram depicting flow of participants

these parameters was 33/group. Allowing for dropouts, we arrived at a sample-size of 35 patients/group. Statistical testing utilised the Statistical Package for Social Science (SPSS) version 23.0 (Chicago; SPSS Inc.). Kolmogorov–Smirnov test was utilised to test normal data distribution. Continuous variables were expressed as mean \pm SD with 95% confidence intervals for mean, and as dotted box-and-whisker plots. Categorical variables were expressed as absolute numbers/percentage. Intergroup nominal categorical data was compared using Chi-squared test/Fisher’s exact test. The unpaired t-test/Welch test for unequal variance was used for continuous variables. P value <0.05 was considered statistically significant.

RESULTS

The CONSORT flow-chart [Figure 2] depicts the participant-flow in both groups. The groups displayed comparable demographic parameters, ASA-grading, baseline HR and MAP [Table 1].

The mean post-operative resting VAS-scores in Group-O and Group-P were 3.6 ± 1.5 and 0.76 ± 0.6 (post tracheal-extubation), 3.1 ± 1.2 and 1.4 ± 0.5 (first hour),

2.5 ± 0.9 and 1.2 ± 0.6 (second hour), 2.2 ± 0.5 and 1.7 ± 0.9 (fourth hour), 2.9 ± 1.2 and 2.1 ± 1 (eighth hour) and 1.7 ± 0.6 and 1.7 ± 0.8 (24th post-operative hour), respectively [Figure 3]. Immediately after tracheal-extubation, 22/35 Group-O patients had VAS ≥ 3 while all Group-P patients had VAS <3 . Cumulative VAS-scores in Group-O and Group-P were 482 and 270, respectively. VAS-scores on movement were a notch higher in both groups. Motor deficit was absent on assessment with crossed-arm adduction.

Haemodynamics in both groups [Figure 4] show no statistically significant difference in HR recorded at baseline and other intra-operative time-points. The first HR reading in SICU was significantly higher in Group-O (76.3 ± 16.2) versus Group-P (73 ± 12.3). At 8 h and 24 h post-surgery, Group-P recorded a significantly higher HR (74.1 and 77.3 , respectively) versus Group-O (68.9 and 74.5 , respectively). HR at all other time-points was comparable. The MAP at intubation, incision, end-surgery, SICU-shifting and for subsequent 2 h was significantly higher in Group-O vis-a-vis Group-P (104.5 vs 99.3 ; 86.5 vs 81.1 ; 94.4 vs 88 ; 105.1 vs 90.7 ; 100.1 vs 87.1 and 96.8 vs 87.5 , respectively). MAP at induction was

Table 1: Demographic parameters and drug utilisation					
Demographic parameter	Group	Mean±SD	Median	95%C.I. for mean	P
Age (yrs)	Group-O	50.77±10.6	52.5	46.8-54.7	0.51
	Group-P	52.7±12.1	51.5	48.2-57.2	
Weight (kg)	Group-O	64.01±8.3	63.00	59-67.1	0.22
	Group-P	66.7±9.48	66.00	62.2-71.2	
Height (cm)	Group-O	154.9±4.2	155.00	153.3-156.4	0.10
	Group-P	156.6±4	157.00	155.1-158.1	
BMI (kg/m ²)	Group-O	26.21±3.99	26.45	24.7-36.44	0.39
	Group-P	27.15±4.59	26.95	25.4-28.8	
Heart Rate (beats/min)	Group-O	82.2±16.0	86.5	76.2-88.2	0.69
	Group-P	80.8±10.8	78.5	76.8-84.8	
Mean Arterial Pressure (mmHg)	Group-O	109.5±12.5	110.5	104.8-114.2	0.25
	Group-P	106.03±10.7	105	102.0-110.0	
ASA (I/II/III)	Group-O	11/20/4	-	-	-
	Group-P	10/21/4	-	-	
Induction Propofol (mg)	Group-O	73.7±11.9	1	69.2-78.1	0.000
	Group-P	37.3±6.1	40	35.0-39.6	

BMI-Body mass index, ASA-American Society of Anesthesiologists, SD-Standard deviation

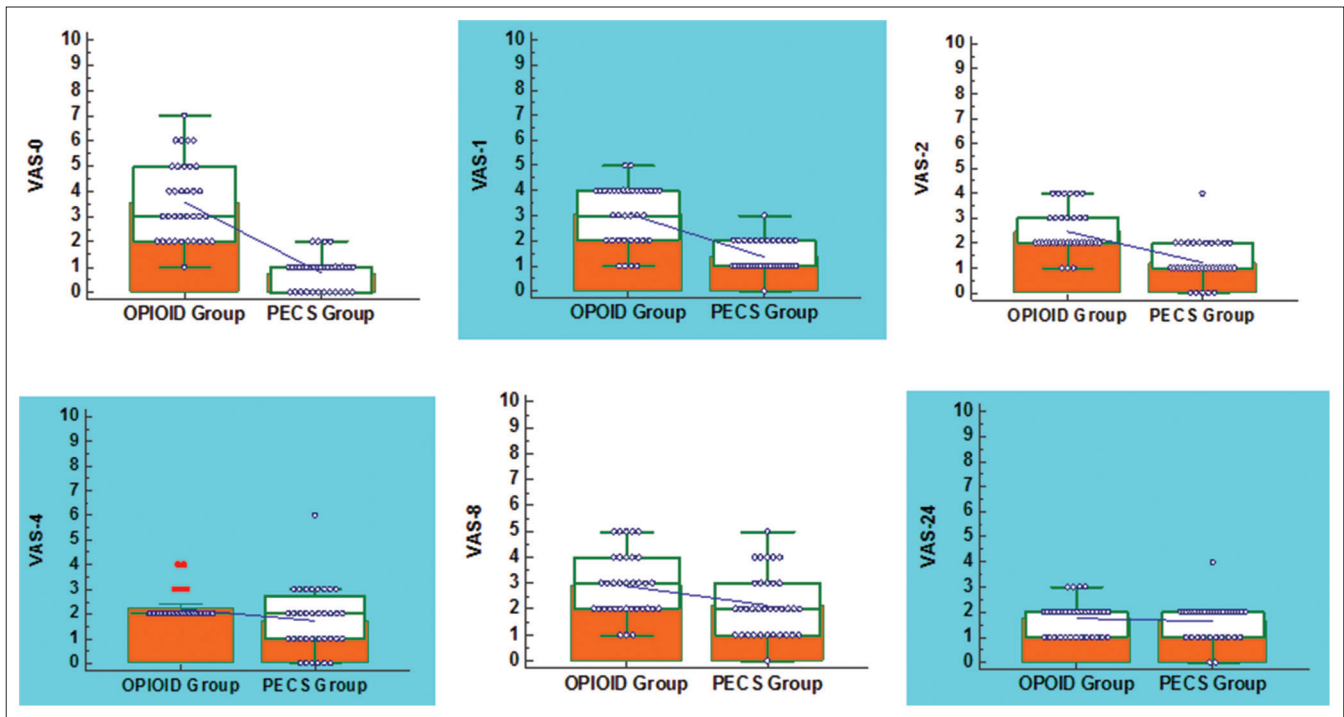


Figure 3: Dotted box and whisker plots depicting mean postoperative VAS scores with error bars showing 95% confidence intervals for mean; Y-axis shows 0-10 anchoring of the VAS (VAS = Visual Analog Scale; VAS-0 = VAS at 1 minute post tracheal extubation; VAS-1 = VAS at 1 h, postoperatively; VAS-2 = VAS at 2 h, postoperatively; VAS-4 = VAS at 4 h postoperatively; VAS-8 = VAS at 8 h, postoperatively; VAS-24 = VAS at 24 h, postoperatively)

significantly lower in Group-O vis-a-vis Group-P (79.7 vs 84.7). MAP recorded at all other time-points was comparable.

Induction dose of propofol was 73.7 ± 9.3 mg in Group-O versus 37.3 ± 6.1 mg in Group-P [Table 1]. Midazolam, dexmedetomidine and propofol sufficed in all Group-P patients although fentanyl was reserved as rescue-drug. Mean intra-operative

fentanyl and morphine consumption in Group-O was 133.7 ± 16.8 µg and 5.6 ± 0.6 mg respectively whereas no rescue-opioid was required in Group-P.

VAS-score was ≥ 3 , at total 93 time-points, spanning 35 Group-O patients, in the 24 h post-operative period. IVmorphine 1.5 mg was administered at these time-points. Mean post-operative morphine consumption in Group-O was 8.49 ± 1.6 mg/patient

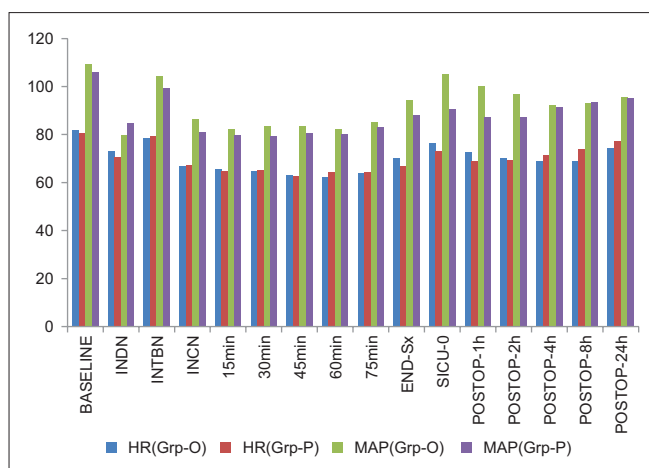


Figure 4: Changes in heart rate (HR) and mean arterial pressure (MAP) at various time points during the intraoperative and postoperative periods

(4.5 mg–13.5 mg). Sevoflurane consumption and uptake (Group-O) was 12.5 ± 0.7 ml and 3.3 ± 0.9 ml respectively. Mean dexmedetomidine and ketamine consumption was 161.9 ± 9.7 μ g and 63 ± 29.5 mg respectively in Group-P. At 23 time-points in the first 24 post-operative hours in 35 PECS-group patients VAS-score was ≥ 3 . IV paracetamol 1g alone sufficed at 11 such points (11 patients) while at six other points, IV ketorolac 50 mg was required for pain relief in addition to paracetamol. At the remaining six time-points, ketorolac 50 mg alone was administered since paracetamol dose-cap was reached. The average IV paracetamol and ketorolac administered in Group-P was 3.49 ± 0.5 g/patient (range 3–4 g) and 17.14 ± 38.5 mg/patient (range 0–150 mg) respectively, in 24 h.

The postoperative complication-profile included PONV, constipation, pruritus, RASS and SpO₂-fall [Figure 5]. Time to discharge from SICU was 8.5 h in Group-O versus 6.5 h in Group-P.

DISCUSSION

Annual breast cancer cases are projected at 1797900 for India in 2020.^[6] Acute post-operative pain if ignored transcends into distressing chronic post-mastectomy pain.^[9] Higher VAS-scores occurred immediately after tracheal-extubation and at 1, 2 and 4 h post-operatively in Group-O in our patients. Subsequently, the trendline exhibited downslope in Group-O and an upslope in Group-P making VAS at 8 h post-surgery comparable. Intergroup VAS-score difference was statistically insignificant at 24 h post-surgery, but cumulative VAS was higher in Group-O. In Group-O, as per the three-cluster pain model, 10 patients fell in

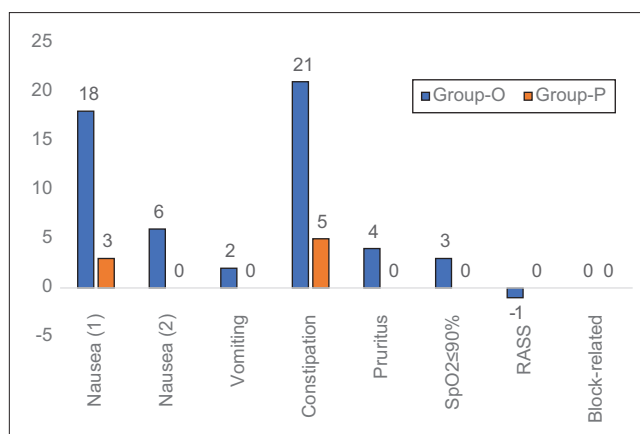


Figure 5: Post-operative complications (Group-O: Opioid group; Group-P: PECS group; Nausea (1): Nausea occurring immediately post tracheal-extubation; Nausea (2): Nausea after receiving post-operative morphine for VAS ≥ 3 ; RASS: Richmond agitation-sedation score; SpO₂: Pulse oximeter reading of arterial oxygen saturation)

the mild/no pain cluster (VAS <3), 20 patients fell in the moderate pain cluster (3-5) and 5 patients fell in the severe-pain cluster (VAS 6-10). The 'severe-pain' cluster patients were the ones who exhibited higher VAS-scores at 8 and 24 h post-surgery. The 24 h acute-pain trajectory exhibited downslope throughout excluding a small peak at 8 h when next morphine bolus was routinely instituted. All Group-P patients had VAS <3 immediate post-operatively and hence could not be clustered into three groups. The 24 h acute-pain trajectory for Group-P showed an idyllic rise from initial subclinical levels (VAS 0.77) pinnacled at 8 h (VAS 2.13) implying waning of PECS-block, followed by dip to subclinical levels (VAS 1.77) at 24 h post-surgery after paracetamol and ketorolac institution. Comparing GA with and without PECS-blocks, Thomas *et al.*^[10] found that ratio of patients experiencing mild versus moderate pain was significantly higher in the PECS-group (27/28 and 26/28 patients experienced mild pain at 1 h and 24 h post-surgery, respectively). Comparing PVB with PECS-block for MRM, Wahba *et al.*^[11] observed that post-operative VAS-score at 1, 6 and 12 h was lower in PECS-group. At 18 h and 24 h VAS was lower in PVB-group. A meta-analysis (13 RCTs), revealed significantly reduced post-operative pain (first 24 h) at all time-points in PECS-group versus GA alone.^[12]

The minimal clinically important difference (MCID)^[13] for pain-VAS is reported as 9.9 for a 1-100 scale implying that roughly a minimum 10-unit change in VAS-score indicates a meaningful clinical change in pain status. Quoting the same study, the patient acceptable symptom state (PASS)

or 25th centile of VAS equivalent to 'good surgical recovery as per the patient's account' represents a VAS of 33. This implies that a 'one-unit difference' between two VAS-values plotted on a 1-10 scale is clinically significant making the difference in VAS-values between Group-O and Group-P at 0, 1, 2 and 4 h post-extubation clinically significant while at 8 and 24 h postoperatively clinically insignificant. Clinically, since no analgesic was required for patients with VAS <3, no Group-P patient required an analgesic-rescue immediately post-operatively while 25/35 Group-O patients received rescue analgesic immediately post-extubation. Somewhere between 4 and 8 h post-operatively, the effect of PECS-block subsided and VAS-scores peaked at 8h, implying that PECS-block induced analgesia lasts upto 8 h. Most studies, including ours, have employed the original 'Blanco-version' of PECS and SAP-blocks^[14,15] but PECS-block with 45 ml 0.2%ropivacaine for lumpectomy in a 94-year-old lady is also reported.^[16] Adjunctive dexmedetomidine in 0.25% ropivacaine prolongs the duration of PECS-block from 298.2 min to 469.6 min (combination-group).^[17] Kulhari *et al*,^[4] reported a mean 5h duration of analgesia with PECS-block with a median-VAS of 2 at 2h post-extubation. Another study reported adequate early analgesia, which diminished 4h after PECS-blocks.^[18] Comparing USG-guided modified PECS-II block with SAP-block (using 40 ml 0.25%L-bupivacaine with adrenaline 1:200000) Razek *et al*,^[19] reported paraesthesia lasting 3 h for PECS and 8 h for SAP. Another study utilised 0.125%L-bupivacaine with similar results.^[20] We simultaneously utilised both PECS and SAP blocks, but since only 10 ml bupivacaine was used for SAP, analgesia lasted between 4 and 8 h. Some researchers have instituted PECS-block in awake-patients before anaesthetic induction at the cost of avoidable patient discomfort. For blocks administered after inducing GA, the drawback is inability to assess the sensory effect.

Comparing GA with and without PECS-blocks Bashandy *et al*,^[21] found significantly lower VAS-scores and post-operative morphine requirement (2.9 mg) in PECS-group. Two similar studies^[4,11] reported 24 h post-operative morphine consumption as 3.9 mg and 21 mg respectively.

Case-reports describe breast surgery performed sans-GA, under PECS-blocks with dexmedetomidine-sedation.^[22] Here, although

analgesia-onset time was 3 min, surgical-analgesia developed after 15 min of block-administration. Analgesia lasted 8 h, corroborating our findings.

In our study, both groups displayed haemodynamic stability spanning majority of intra-operative and post-operative periods except that MAP at intubation, incision, end-surgery, SICU-shift and subsequent 2 h was significantly higher in Group-O, attributable to better suppression of sympathetic response to pain-stimulus in Group-P.

Mean intra-operative morphine-equivalent of opioid (IVfentanyl 100 µg and IVmorphine 10 mg are equianalgesic)^[23] was 18.97 in Group-O. PECS-block with adjunctive ketamine and dexmedetomidine intra-operatively and PECS-block, paracetamol and ketorolac combination post-operatively, protected Group-P patients from 27.46 mg morphine-equivalents of opioids, presumably responsible for the higher incidence of PONV, constipation, xerostomia and pruritus in Group-O, producing comparatively prolonged SICU-stays.

Opioids and volatile-anaesthetics, have been implicated in promoting cancer progression (hampering immune surveillance; promoting inflammation/angiogenesis).^[1,2,24-26] Dexmedetomidine reduces surgical stress, favourably alters helper T-cell ratio, reduces inflammatory response and is immunoprotective.^[27] Hence, dexmedetomidine was employed instead of sevoflurane for endotracheal tube-tolerance. Ketamine, unlike morphine, does not imbalance the Th1/Th2 ratio in CD4-positive human lymphocytes.^[28] In our study, a single ketamine bolus was administered immediately post-block, before surgical-incision, to cover-up for the 15-20 min latency in surgical-analgesia onset after PECS-blocks owing to time-pressure to start surgery. Dexmedetomidine-associated xerostomia, hypotension and bradycardia were nullified by ketamine while ketamine-associated post-operative hallucinations and hypersalivation were neutralised by dexmedetomidine. Hence, Group-P patients benefitted from the complementary, symbiotic relationship between ketamine and dexmedetomidine.^[29] Significantly reduced induction-doses of propofol sufficed in Group-P owing to additive-effect of dexmedetomidine.

Ours is the first reported study comparing the conventional 'opioid-sevoflurane based' technique

with a completely 'opioid and sevoflurane-free, PECS-block based' technique.

Seeking a uniform mode of drug-delivery for both groups, we refrained from using a patient-controlled analgesia pump for post-operative morphine (a similar pump is unavailable for paracetamol).

CONCLUSION

Pre-emptive PECS-blocks supplemented with low-dose ketamine and dexmedetomidine provide adequate intra-operative analgesia and haemodynamic stability. Practicality, simplicity and patient-comfort in administering PECS-blocks, comparable postoperative VAS-scores with reduced PONV, constipation and ERAS-protocol conformity, make it a useful alternative to the traditional, opioid-based, general anaesthetic technique for MRM.

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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