



## Original Research Article

## Erector spinae plane block OR modified pectoralis block for postoperative analgesia after modified radical mastectomy: Which is better ???

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## ABSTRACT

**Introduction:** Finding the best analgesic technique for breast surgeries has always been a matter of great concern. Stable intraoperative hemodynamics and comfortable postoperative patient is what every anesthesiologist aspire of. The benefits of using regional blocks for postoperative analgesia is well known. Hence we intended to study the analgesic efficacy of two of the most latest blocks, used for breast surgeries, the PECS block and the ESP block.

**Materials and Methods:** The prospective open label study was conducted in 59 ASA 1, 2 patients, planned for Modified Radical Mastectomy(MRM) under general anesthesia. After approval from institution scientific and research committee, and obtaining written informed consent, the patients were randomly divided into two groups(P and E). Group P(N=30), received ultrasound guided modified PEC block with 30ml of 0.25% levobupivacaine. Group E(N=29) received ultrasound guided ESP block with 30 ml of 0.25% levobupivacaine. General anesthesia was then administered in both the groups. The intraoperative hemodynamics, duration of analgesia, VAS score, number of rescue analgesia, patients satisfaction, safety and side effects were noted and compared between the two groups.

**Results:** The mean VAS score at 24 hours was  $4.11 \pm 0.629$  in group P and the mean VAS score at 24 hours post operatively was  $3.69 \pm 0.679$  in group E, and the difference was statistically significant ( $P=0.024$ ).

**Conclusion:** Both PECS and ESP block can be used efficaciously for providing analgesia for MRM surgeries, with ESP block providing longer duration of pain free postoperative period, without any noted side effects and technical difficulties.

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### 1. Introduction

The most common cancer in women worldwide and second most common cancer in India is cancer of mammary gland or breast cancer.<sup>1,2</sup> According to National Cancer Registry, it accounts for 25-32% of all female cancers in India.<sup>3</sup>

31% of the breast surgeries performed is Modified Radical Mastectomy (MRM).<sup>4</sup> MRM is commonly performed under general anesthesia, and is very often associated with postoperative pain, nausea and vomiting, causing increased patient suffering.

The incidence of moderate to severe postoperative pain after mastectomy under general anesthesia was

seen to be 70-80.9% on first postoperative day, and 53%, 33% on the second and third postoperative day respectively.<sup>5,6</sup> The presence of acute postoperative pain leads to the development of chronic post mastectomy pain syndrome. Almost 50% of the patients having severe acute postoperative pain will eventually develop chronic pain syndrome with impaired quality of life.<sup>4,7</sup>

Finding the best analgesic technique for breast surgeries has always been a matter of great concern. Stable intraoperative hemodynamics and comfortable postoperative patient is what every anesthesiologist aspire of. The beneficial analgesic effect of regional blocks is well known, the other potentially beneficial effects include decreased need for opioids, decreased postoperative nausea vomiting, fewer pulmonary complications, and decreased

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duration of post anesthesia care unit stay.<sup>8,9</sup> Regional anesthesia may reduce cancer progression by attenuation of the surgical stress response, and by direct protective action of local anesthetics on cancer cell migration.<sup>10</sup>

The most commonly and time trusted blocks for providing analgesia for breast surgeries, are the paravertebral blocks and the thoracic epidural.

The recently introduced PEC block and modified PEC block, have showed promising results with excellent intraoperative analgesia and comfortable postoperative patients. In a study comparing PEC block to paravertebral block and local wound infiltration, PEC block was found to be superior to the previous two conventional methods.<sup>11</sup>

Newest to the list is the Erector Spinae Plane block (ESP block) with numerous case reports showing outstanding results and easier ultrasonographic landmarks and approach. The ultrasound guided Erector Spinae Plane Block may be used as a valuable adjunct to ensure postoperative analgesia in breast surgeries, if it is found to be potent and safer in the upcoming time.

Till date there have been very few studies regarding the efficacy of ESP block in MRM surgeries and no studies regarding the comparative efficacies of PEC and ESP blocks.

## 2. Materials and Methods

After obtaining approval from our institutional scientific and research committee, 59 ASA physical status I-II patients, aged 25-65 years, scheduled for elective MRM procedures were enrolled in the study. The procedure was explained, and written informed consent was taken from all the patients.

Patients with history of allergy to local anesthetic, bleeding disorder or receiving anticoagulants, BMI>35kg.m<sup>-2</sup>, spine or chest wall deformity and pregnancy, were excluded from the study.

During preoperative visit demographic data from the patients was recorded, and Visual Analogue Scale (VAS: 0-10, 0- No pain, 10- Worst pain) was explained to patients.

Before surgery patients were randomly allocated according to the random number chart into two groups. On the day of surgery patients were premedicated with tablet alprazolam 0.5mg 2 hours before the expected time of surgery. In the operating room, iv access was secured by 18G iv cannula on the non operative side. Monitorings were applied (NIBP, 5 lead ecg, SPO<sub>2</sub>) and baseline parameters were noted. Midazolam was given in the dose of 0.02mg/kg it ravenously (iv), along with Fentanyl 1µg/kg iv.

Both the blocks were performed with 23G spinal needle, using linear probe ultrasound (USG), of high frequency (6-13 MHz, sonosite) with an imaging depth of 4-6cm after sheathing.

1. Group P (PEC 30 patients) received ultrasound guided PEC block preoperatively.
2. Group E (ESP 29 patients) received ultrasound guided ESP block preoperatively.

After performing the respective blocks, general anesthesia was induced with Fentanyl 1ug/kg, Propofol 1.5- 2mg/kg and endotracheal intubation was facilitated with atracurium 0.5mg/kg. Anesthesia was maintained with isoflurane and O<sub>2</sub> /air mixture with a fraction of 40% inspired oxygen.

Fentanyl 1ug/kg in bolus doses was given intravenously if mean blood pressure or heart rate exceeded 20% of the preoperative value, and these cases were excluded from the study, as block failure. The patients with immediate postoperative VAS≥5 (within 30 minutes of extubation) were also considered as block failure, and were excluded from the study.

After recovery from anesthesia, the patients were shifted to post anesthesia care unit for the first 2 hours. And the HR, NIBP, SPO<sub>2</sub> and pain scores (VAS) were recorded.

After this, the patients were shifted to post operative ward where they were monitored. Rescue analgesia was given when the VAS ≥4, in the form of Tramadol 1mg/kg slow iv. The time of demand of first rescue analgesia was taken as the total duration of analgesia provided by the block, and the number of rescue analgesics required in the first 24 hours were noted.

The patients were also enquired about the overall satisfaction in the procedure and postoperative comfort in the form of patient satisfaction score (1-highly satisfied, 2-satisfied, 3-dissatisfied). The reasons for score 2-3 were sought and recorded.

### 2.1. Data and statistical analysis

The data was entered in Microsoft excel 2007 and checked for co-investigator for any missing entry. The variables were coded and analyzed using Epi Info version 7. The data thus obtained was analysed using paired student t Test and other suitable statistical tests as applicable were applied. P value >0.05 was considered to be insignificant, p-value <0.05 was considered to be significant and p-value <0.001 were considered to be highly significant.

## 3. Results

This prospective open label study was conducted in the Department of Anesthesia, Indira Gandhi Medical College, Shimla from October 2018 to April 2019. We intended to compare the Erector Spinae Plane (ESP) block and modified PEC block in view of better analgesic efficacy for breast surgeries.

30 patients fulfilling the inclusion criteria were enrolled in Group P, received ultrasound guided modified PEC block with 30ml of 0.25% levobupivacaine. 1 patient required additional intraoperative fentanyl boluses and was

considered as block failure, and 1 patient was lost in follow up. So these 2 patients were excluded from the study.

29 patients enrolled in Group E, received ultrasound guided ESP block with 30 ml of 0.25% levobupivacaine. 3 of the 29 (2 of 3 had immediate postoperative VAS $\geq$ 5 and 1 required additional intraoperative fentanyl boluses) patients had block failure and hence were excluded from the study (Figure 1).

The patients enrolled in the two groups had similar demographic profile (age, weight, height, BMI) ( $P>0.05$ ).

The baseline HR, NIBP and SPO2 of the patients of both the groups were similar, with no statistically significant difference between the two groups ( $P>0.05$ ).

On comparing the intraoperative hemodynamics after the block performance and induction, there was no statistically significant difference in the two groups seen ( $P>0.05$ ).

The VAS score was noted after extubation in the recovery room and post operative ward for the first 24 hours and compared. The mean VAS score was less than 4 in both the groups till 18 hours postoperatively, and the comparison was not statistically significant ( $P\geq 0.05$ ).

The mean VAS score at 24 hours postoperatively was  $4.11 \pm 0.629$  in group P, and was  $3.69 \pm 0.679$  in group E, this difference was found to be statistically significant with  $P=0.024$  (Figure 2).

The time of demand of first rescue analgesia was  $19.57 \pm 5.87$  hours in group P and  $21.08 \pm 4.53$  hours in group E ( $P = 0.299$ ).

The average number of rescue analgesic required in group P was  $1.46 \pm 0.693$  in group P, and  $1.35 \pm 0.562$  in group E ( $P = 0.496$ ) (Figure 3).

On enquiring about the satisfaction in block performance and pain relief 21 patients in group P and 22 patients in group E were highly satisfied. 2 patients in group P were dissatisfied with the block performance and reason given was the pain of needle insertion during block performance (Figure 4).

Although no patient complained about this in group E, but the block failure rate was higher in group E, i.e. 3 of 29 patients compared to 1 of 30 patients in group P had block failure.

#### 4. Discussion

The thoracic epidural analgesia (TEA) and thoracic para vertebral block (PVB) have long been considered the gold standard for providing analgesia in breast surgeries. Wheatly et al<sup>12</sup> and Lau et al<sup>13</sup> had shown that TEA is associated with decreased thoracic component of ventilation, increased incidence of hypotension and additional supplemental analgesia requirement for axillary clearance. The PVB provides ipsilateral dermatomal blockade without block of contralateral sympathetic chain. However, PVB does not block medial and lateral pectoral nerves as well as long thoracic and thoracodorsal nerves.

Coveney et al<sup>14</sup> reported that inadequacy of block after multiple injections was 15% while Pusch et al<sup>15</sup> reported that the inadequacy of block was 19% after single injection during axillary dissection. Therefore, during breast surgeries involving axillary dissection, there is lack of adequate analgesia by both these time trusted methods.

The utilization of ultrasound in regional anesthesia has marked the onset of new era in regional anesthesia. In our study we compared the two neoteric ultrasound guided blocks, the modified PEC block and the ESP block, using 30 ml of 0.25% levobupivacaine.

In 2013, Blanco R<sup>16</sup> reported a variation of his original technique by performing his original PECs 1 block and then adding an additional local anesthetic injection between the serratus anterior and pectoralis minor muscle (PECs2). The analgesia remained till 8 hrs. This modification aimed to extend analgesia to the axilla.

In a study done by Bashandy GM and colleagues,<sup>17</sup> the patients receiving pectoral blocks, the opiate consumption was reduced both intra operatively and for 12 hours postoperatively and pain scores were reduced for 24 hours postoperatively. Similarly in our study the average number of rescue analgesic required in 24 hours in group P was  $1.46 \pm 0.693$ , with the average pain free period of  $19.57 \pm 5.87$  hours (till the VAS score was  $\leq 4$ ).

ESP block, first described by Ferrero et al,<sup>18</sup> in 2016 targeting the dorsal and ventral rami of spinal nerve roots in the plane between erector spinae and intercostal muscles to anesthetize the anterior and posterior chest wall, axilla and medial aspect of upper arm. But due to limitation of data on its efficacy in breast surgeries, is a major drawback.

In a case reported by Veiga M,<sup>19</sup> ESP block was given in a patient undergoing radical mastectomy. Block was given before induction of anesthesia in a 40 year old woman. Opioid sparing effect was seen intraoperatively. During hospitalization, the patient reported no pain, without resorting to rescue analgesia.

Also in case reports reported by Ohgoshi Y and colleague<sup>20</sup> the area of analgesia was broad on POD1-2, and the patients experienced little or no pain at rest.

Similarly in our study the VAS  $\leq 4$  in group E for  $21.08 \pm 4.53$  post operatively.

In a recent study done by Gad M and colleagues<sup>21</sup> comparing ultrasound guided ESP block to modified PECS block, demonstrated that PECS block provides better quality analgesia than ESP block in patients undergoing MRM surgeries. This is in contrary to our study. In our study, the mean VAS score at 24 hours was  $4.11 \pm 0.629$  in group P and the mean VAS score at 24 hours post operatively was  $3.69 \pm 0.679$  in group E, and the difference was statistically significant ( $P=0.024$ ). This difference may be due to the volume of local anesthetic used by Gad M and colleagues was 20 ml for ESP block and 30 ml for PECS block, whereas we have used the same volume of 30 ml for both the PECS

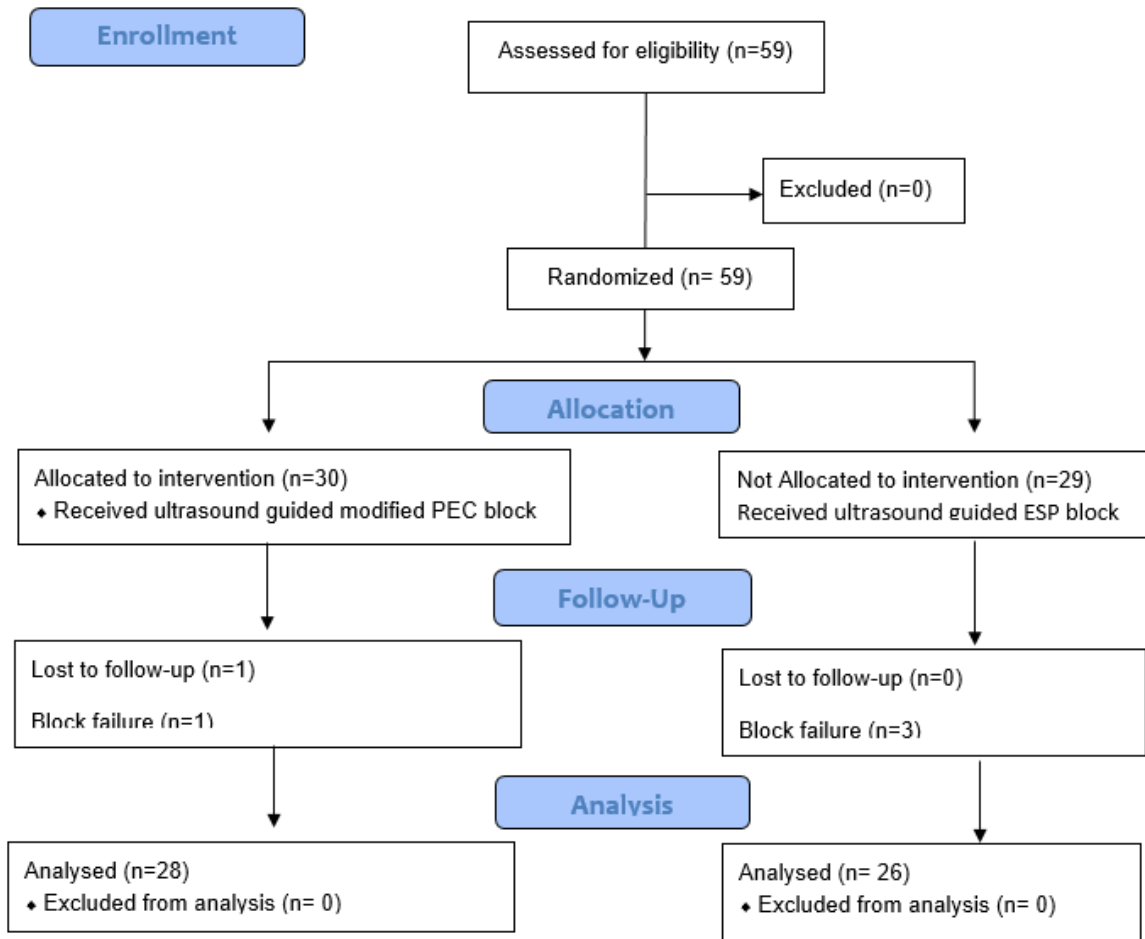


Fig. 1: Consort flow diagram

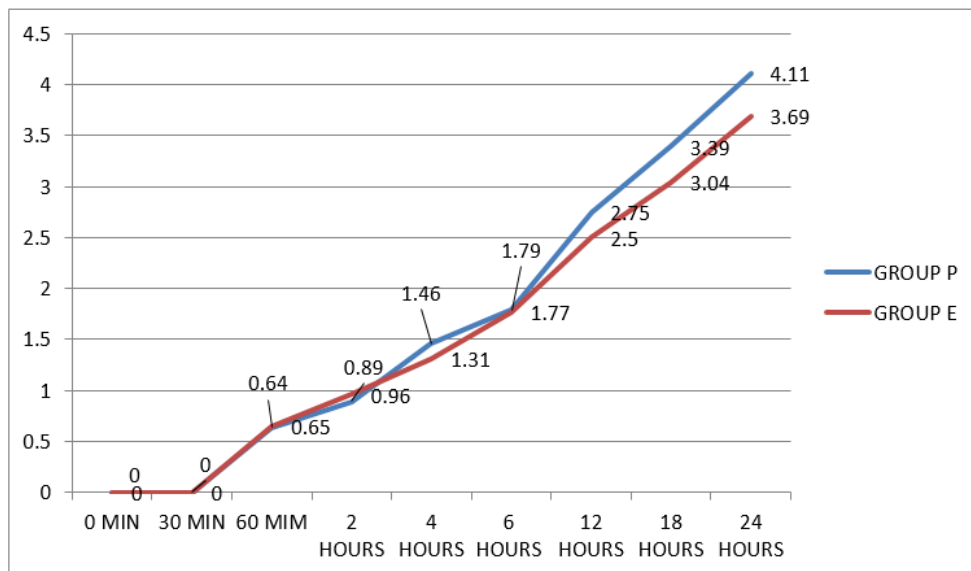


Fig. 2: Comparison of post operative VAS

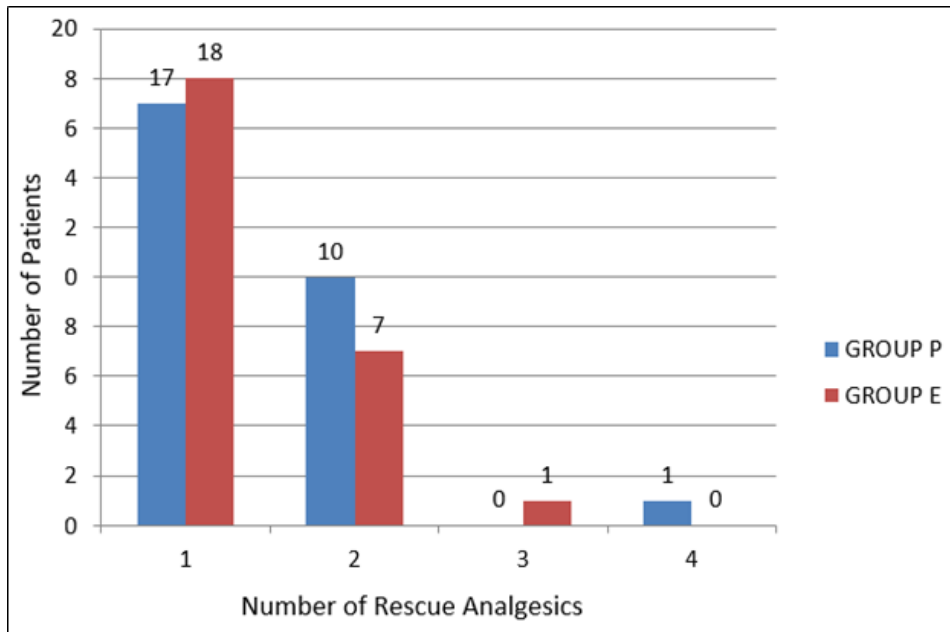


Fig. 3: Number of rescue analgesics required

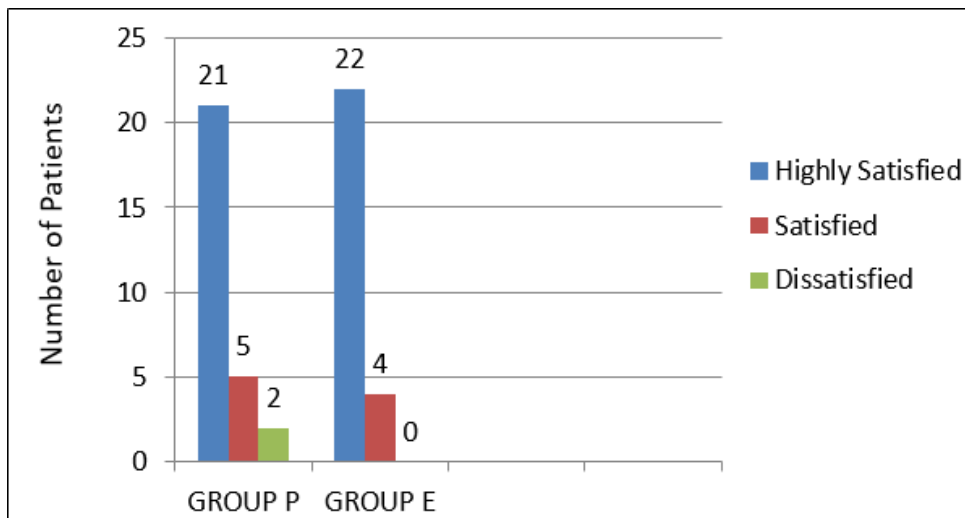


Fig. 4: Patient satisfied score

and ESP block.

The limitation of our study was that the ESP block was new to us and hence more number of block failures were noted, i.e. 10.3% in ESP block, compared to 3% PECS block.

Secondly the dissatisfaction due to needle prick during block performance can be overcome by performing block after induction of general anesthesia. It is convenient to perform modified PEC block under general anesthesia. On the other hand, positioning for ESP block can be a challenge after induction of anesthesia and requires dedicated team of operating room personnel for positioning only.

Hence, further studies are required to broaden our knowledge regarding these two outstanding blocks and to overcome the limitations of our study.

### 5. Conclusion

Both PECS and ESP block can be used efficaciously for providing analgesia for MRM surgeries, with ESP block providing longer duration of pain free postoperative period, without any noted side effects and technical difficulties. Article Page count = 11.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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