



Original Article

Comparison of Ultrasound Guided Modified Pectoral Nerve Block 2 versus Erector Spinae Plane Block For Post Operative Pain Relief in Patients Undergoing Modified Radical Mastectomy

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Abstract

Background: Breast carcinoma is most common malignancy among female patients. Pain is the most common symptom encountered during post operative period after MRM. Peripheral nerve block is the emerging procedure in anaesthesiology and modified pectoral nerve block 2 and erector spinae plane blocks are given for post operative pain relief in patients undergoing MRM without any side effects.

Aim and Objectives: To compare the effect of modified pectoral nerve block 2 and erector spinae plane block in patients undergoing MRM for post operative pain relief.

Methodology: It is a prospective randomized comparative study conducted in 64 patients undergoing MRM in tirunelveli medical college and hospital. Age group includes 18-65 years of female sex who have given informed written consent. Preanaesthetic evaluation done, checked for iv access, all monitors connected, hemodynamics before the procedure were noted. Group 1 received modified pectoral nerve block 2 with 0.2% ropivacaine 25ml and group 2 received erector spinae plane block with 0.2% ropivacaine 20ml. pain score after the procedure noted by using VAS score[0-10].

Results: PEC 2 Group recorded a better VAS Recovery score than the ESP Group (mean: 2.5 versus 3.65). Opioid requirement is lower in PEC 2 Group compared to ESP group.

Conclusion: Ultrasound guided regional anaesthesia is playing a major role in terms of providing the patients better post operative care. Modified pectoral nerve block 2 is safe and effective procedure during breast cancer surgeries especially modified radical mastectomy. It shows lower intraop and postoperative opioid consumption than erector spinae plane block.

Aim of the Study

- To compare the modified pectoral nerve block 2 with erector spinae plane block for

post operative pain relief in patients undergoing modified radical mastectomy.

Materials and Methodology**Study Design**

- Prospective randomized comparative study
- Sample size: 64 patients
- Conducted at: tirunelveli medical college and hospital.

Inclusion Criteria

- Age group: 18-65 years of female sex
- Who have given written informed consent
- Undergoing modified radical mastoidectomy.

Exclusion Criteria

- Patients not satisfyin inclusion criteria
- Patients with severe caediovascular, respiratory, hepatic, renal, neurological or metabolic diseases.
- Local infection at the site of block
- Patients with known allergy yo local anaesthetics.
- Patient refusal
- Patients with coagulopathies

Ethical Considerations

- After approval from institutional ethical comittiee, the study will be conducted
- The procedure will be explained in a local language to the patient and informed written consent will be obtained.

Methodology

- Group 1- modified pec 2 block with 0.2% ropivacaine 25ml.
- Group 2- erector spinae plane block with 0.2% ropivacaine 20ml.

Preparation for procedure

- Preanaesthetic evaluation
- Informed written consent
- Peripheral iv access
- Equipments and monitors.

Data collation

- Hemodynamics before and after the procedure

- Pain score before and after the procedure by using vas[0-no pain; 10- worst pain]

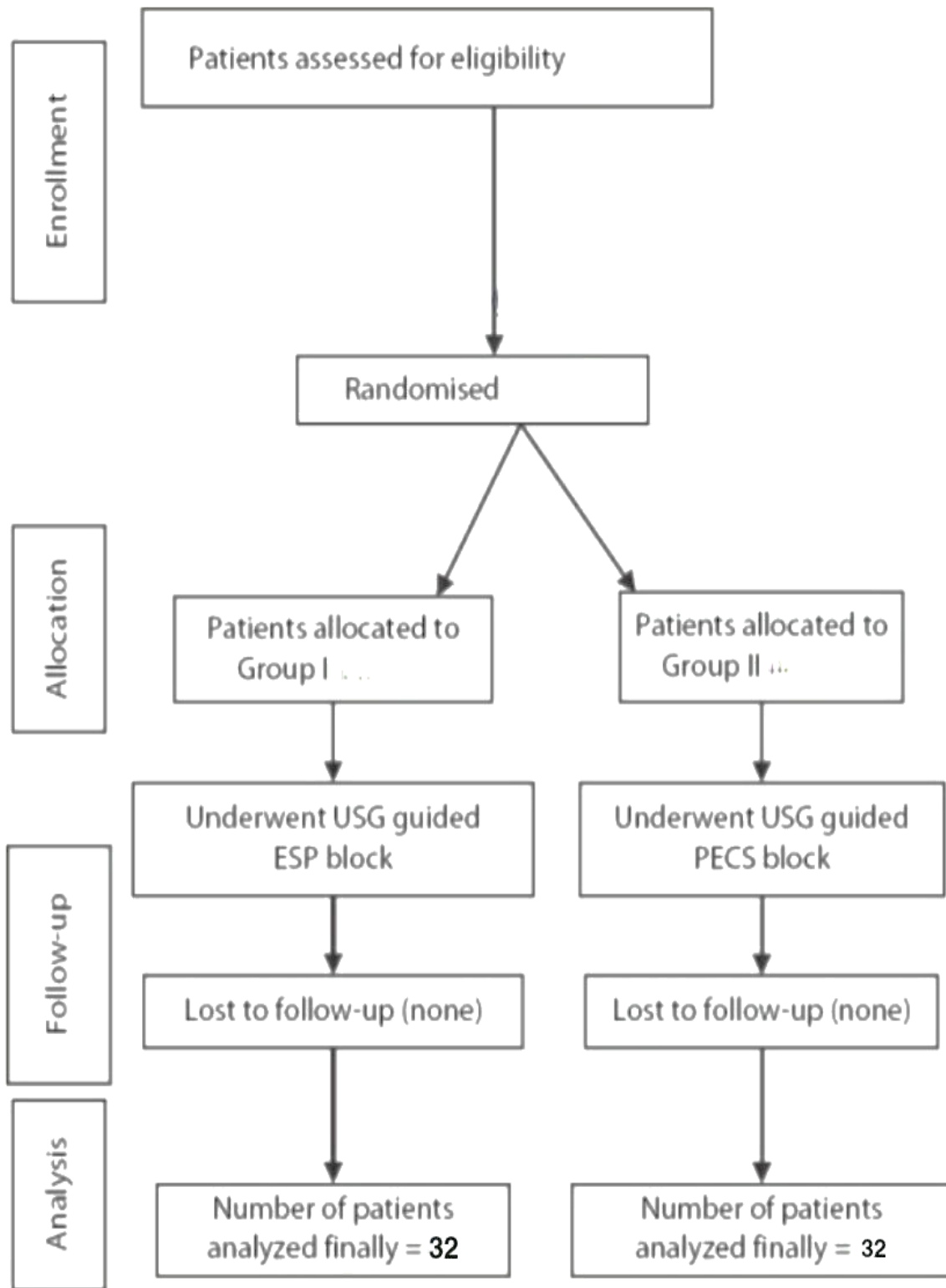
Procedure

- In this randomised prospective comparative study 64 patients sceeduled for mrm are included.
- Patients are distributed in two groups through computer generated random numbers table.
- Group1 patients will receive modified pec2 block given between pectoralis major and pectoralis minor / pectoralis minor and serratus anterior.
- Group 2 patients will receice erector spinae plane block given deep to the erector spinae muscle.

Observation

- Hemodynamics monitoring including heart rate, nibp, respiratory rate and oxygen saturation.
- Visual analog score monitoring before and after the procedure.
- After the procedure vas noted at 0.5,6,12,18,24 hrs post operatively.

Statistical Flow-Chart

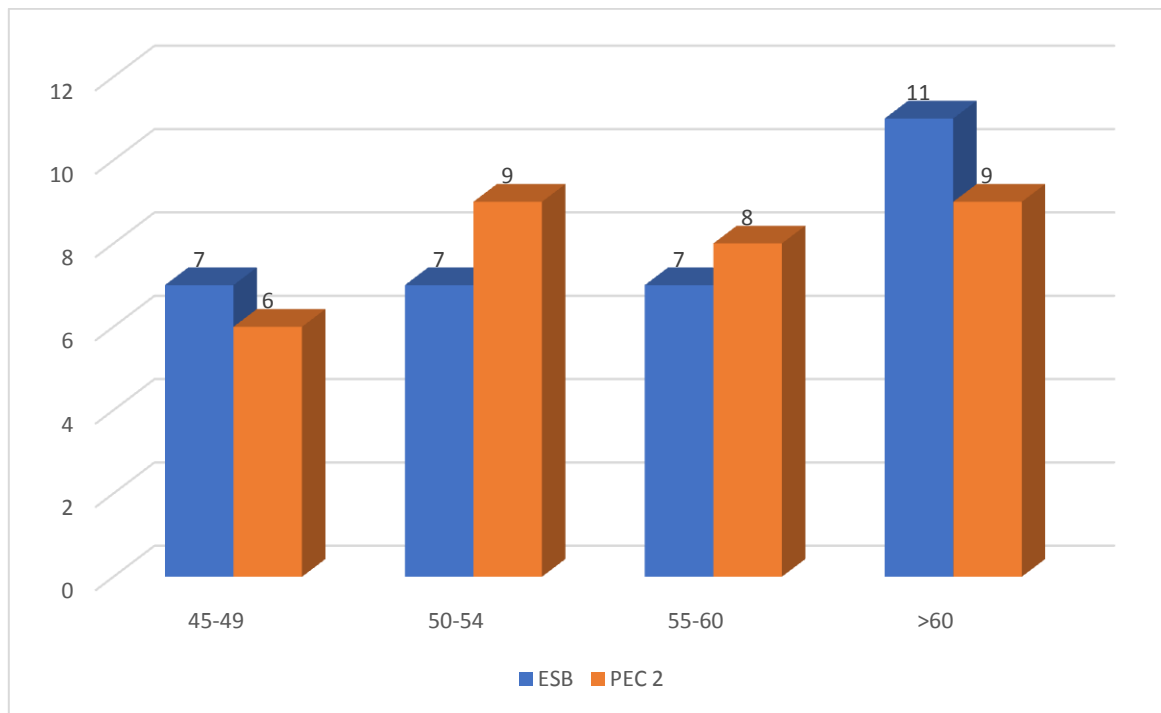


Results

Age Distribution

The study involves most of the patients above the age category of 60 years with frequency 34.38% among Erector spinae block group and 28.13% among PEC II block group.

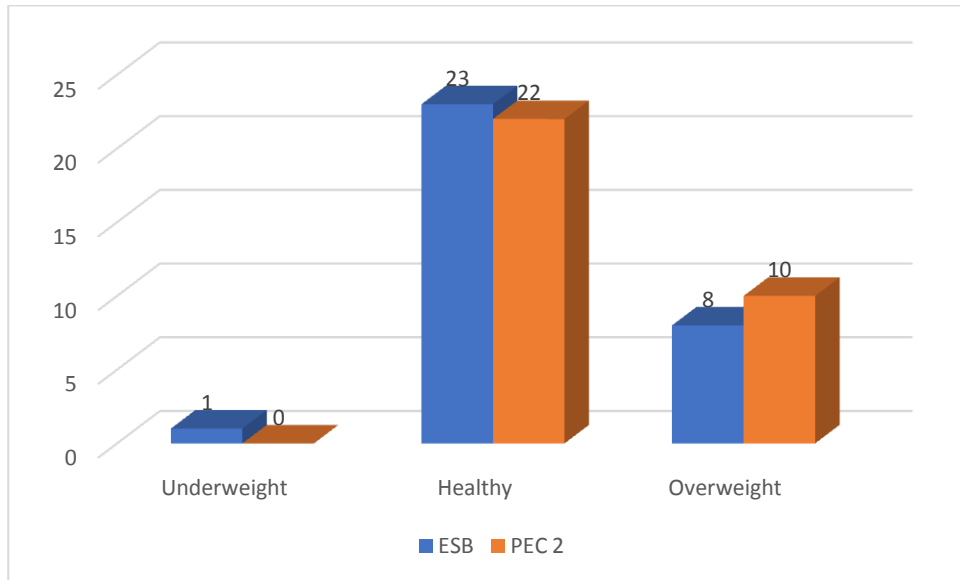
| Age | ESB | | PEC 2 | |
|--------------------|-----------|------------|-----------|------------|
| | Frequency | Percentage | Frequency | Percentage |
| 45-49 | 7 | 21.88 | 6 | 18.75 |
| 50-54 | 7 | 21.88 | 9 | 28.13 |
| 55-60 | 7 | 21.88 | 8 | 25.00 |
| >60 | 11 | 34.38 | 9 | 28.13 |
| Grand Total | 32 | 100 | 32 | 100 |
| Mean | 55.6563 | | 55.1875 | |
| Standard Deviation | 6.7995 | | 5.8112 | |
| Median | 55 | | 55 | |
| Mode | 46 | | 62 | |



BMI of the study population:

Most of the patients fall into healthy category when the BMI is concerned with frequency 71.88% among Erector spinae block group and 68.75% among PEC II block group.

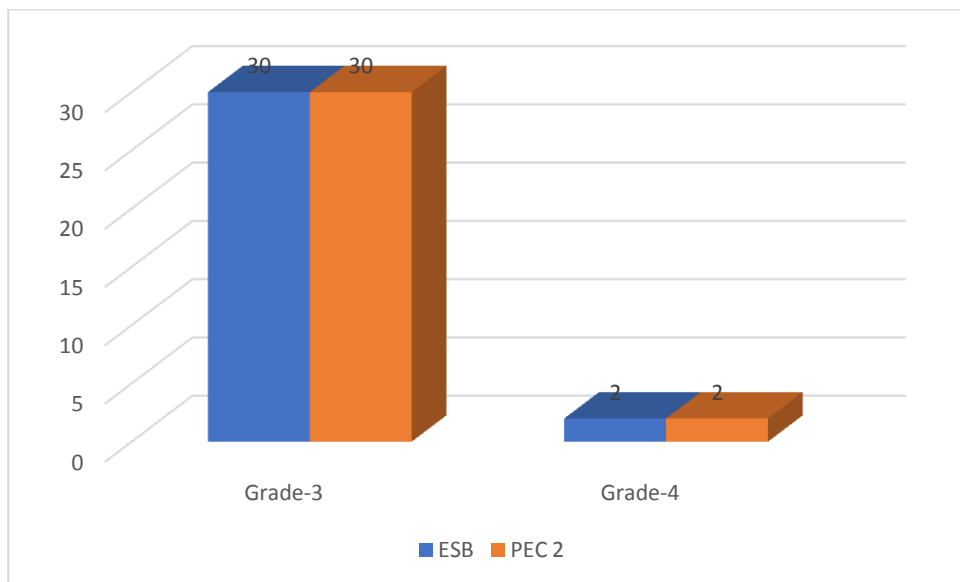
| BMI | ESB | | PEC 2 | |
|--------------------|-----------|---------------|-----------|---------------|
| | Frequency | Percentage | Frequency | Percentage |
| Underweight | 1 | 3.13 | 0 | 0.00 |
| Healthy | 23 | 71.88 | 22 | 68.75 |
| Overweight | 8 | 25.00 | 10 | 31.25 |
| Grand Total | 32 | 100.00 | 32 | 100.00 |
| p=0.53 | | | | |



ASA Grade

Almost all of the patients comes under the ASA Grade II with the frequency of 93.75% among both the groups.

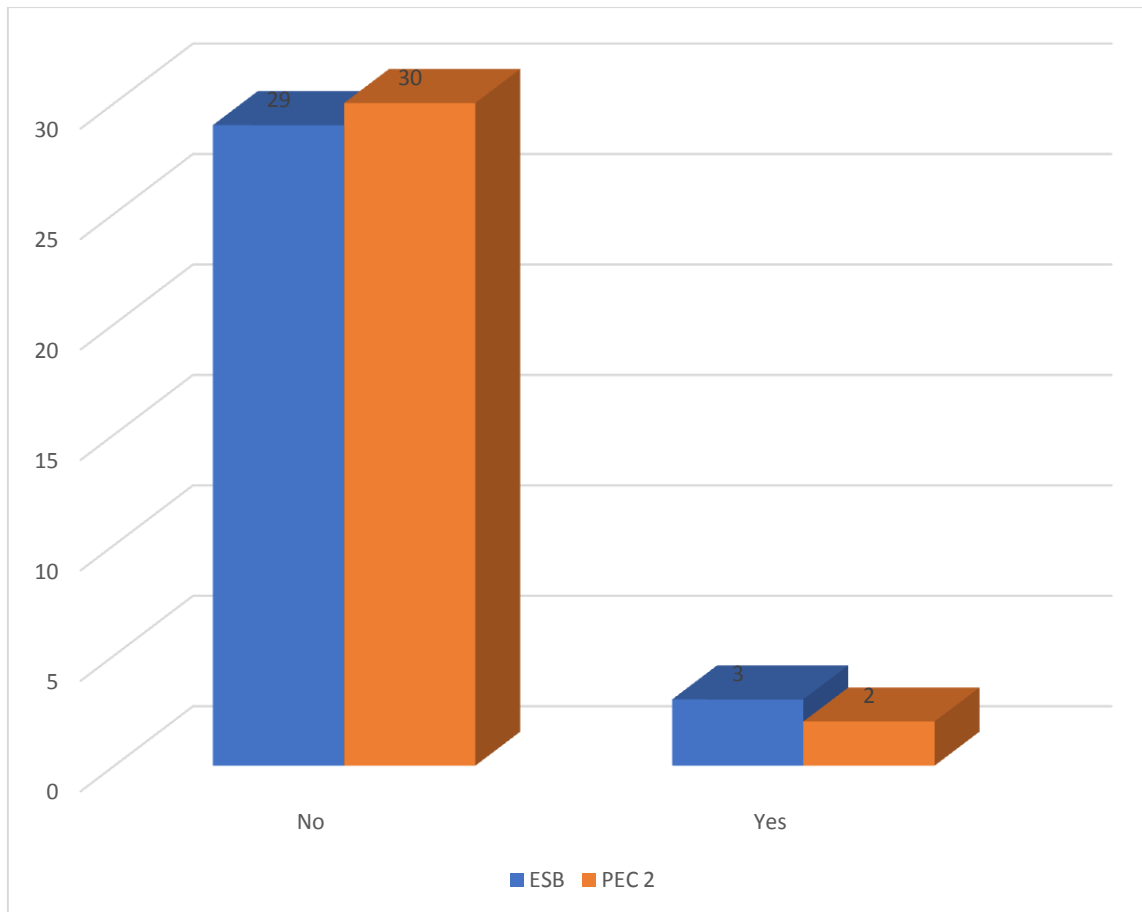
| ASA Grade | ESB | | PEC 2 | |
|--------------------|-----------|---------------|-----------|---------------|
| | Frequency | Percentage | Frequency | Percentage |
| Grade-3 | 30 | 93.75 | 30 | 93.75 |
| Grade-4 | 2 | 6.25 | 2 | 6.25 |
| Grand Total | 32 | 100.00 | 32 | 100.00 |
| p=1 | | | | |



Nausea

Both the group has minimal incidence of nausea and vomiting following the procedure which makes them a better alternative for opioid analgesics.

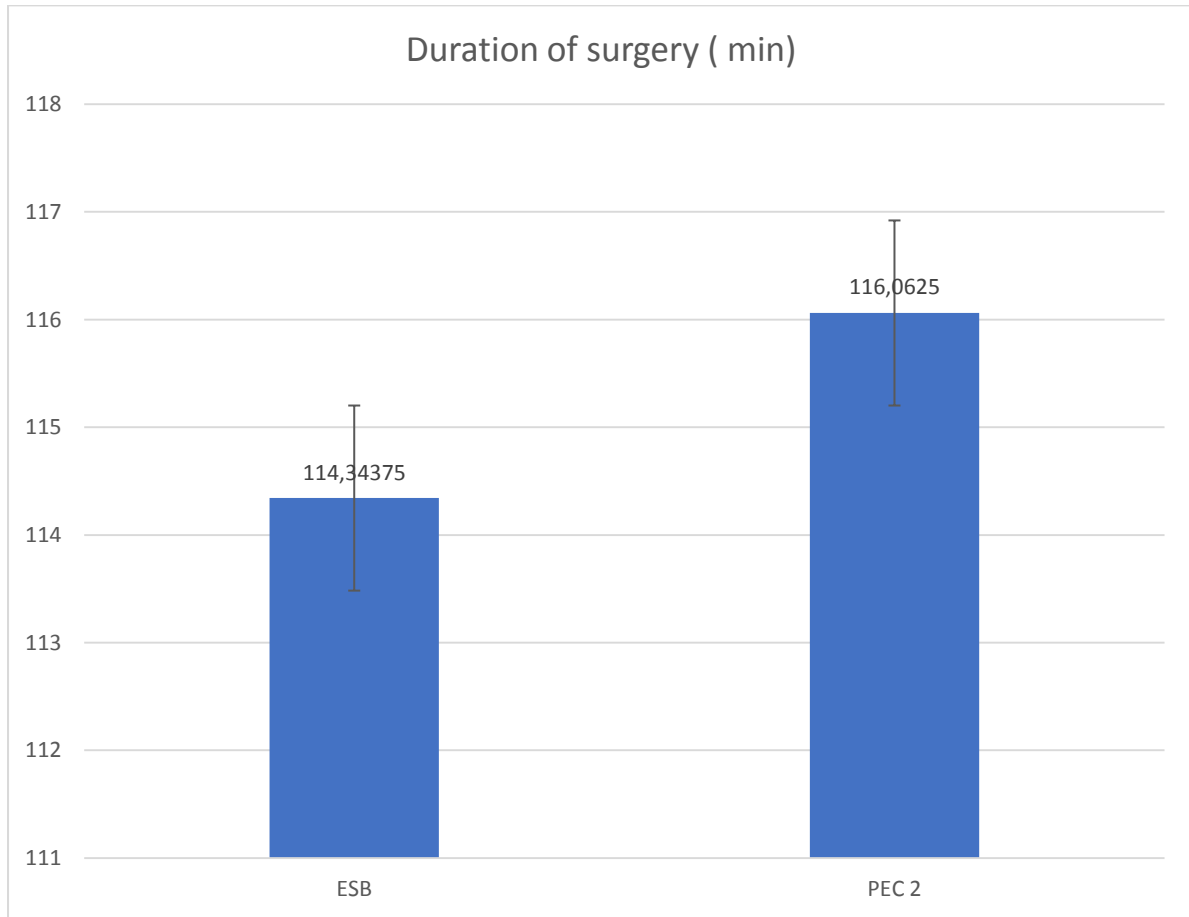
| Nausea | ESB | | PEC 2 | |
|--------------------|-----------|---------------|-----------|---------------|
| | Frequency | Percentage | Frequency | Percentage |
| No | 29 | 90.63 | 30 | 93.75 |
| Yes | 3 | 9.38 | 2 | 6.25 |
| Grand Total | 32 | 100.00 | 32 | 100.00 |
| p=0.6414 | | | | |



Duration of surgery

The mean time duration of surgery for both the group are almost similar with mean value around of 115min.

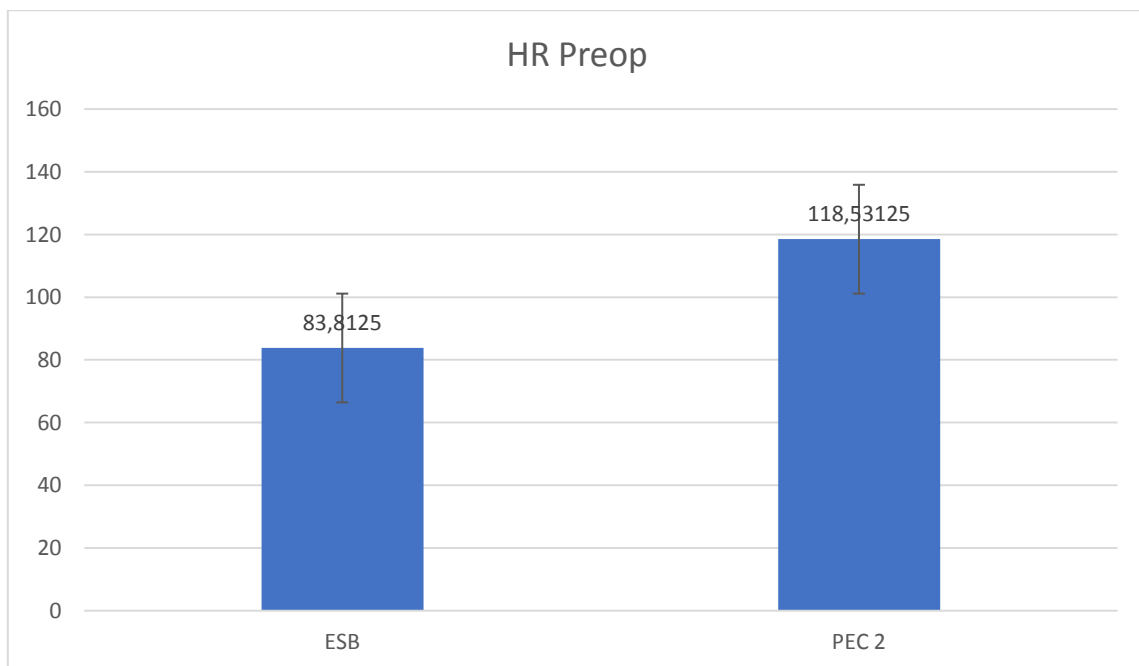
| Duration of surgery (min) | Mean | Standard Deviation | p value |
|----------------------------|----------|--------------------|----------|
| ESB | 114.3438 | 10.76916 | 0.568754 |
| PEC 2 | 116.0625 | 13.11472 | |



Preoperative Heart Rate

Mean pre-operative heart rate is lesser for erector spinae block than the PEC-II block group

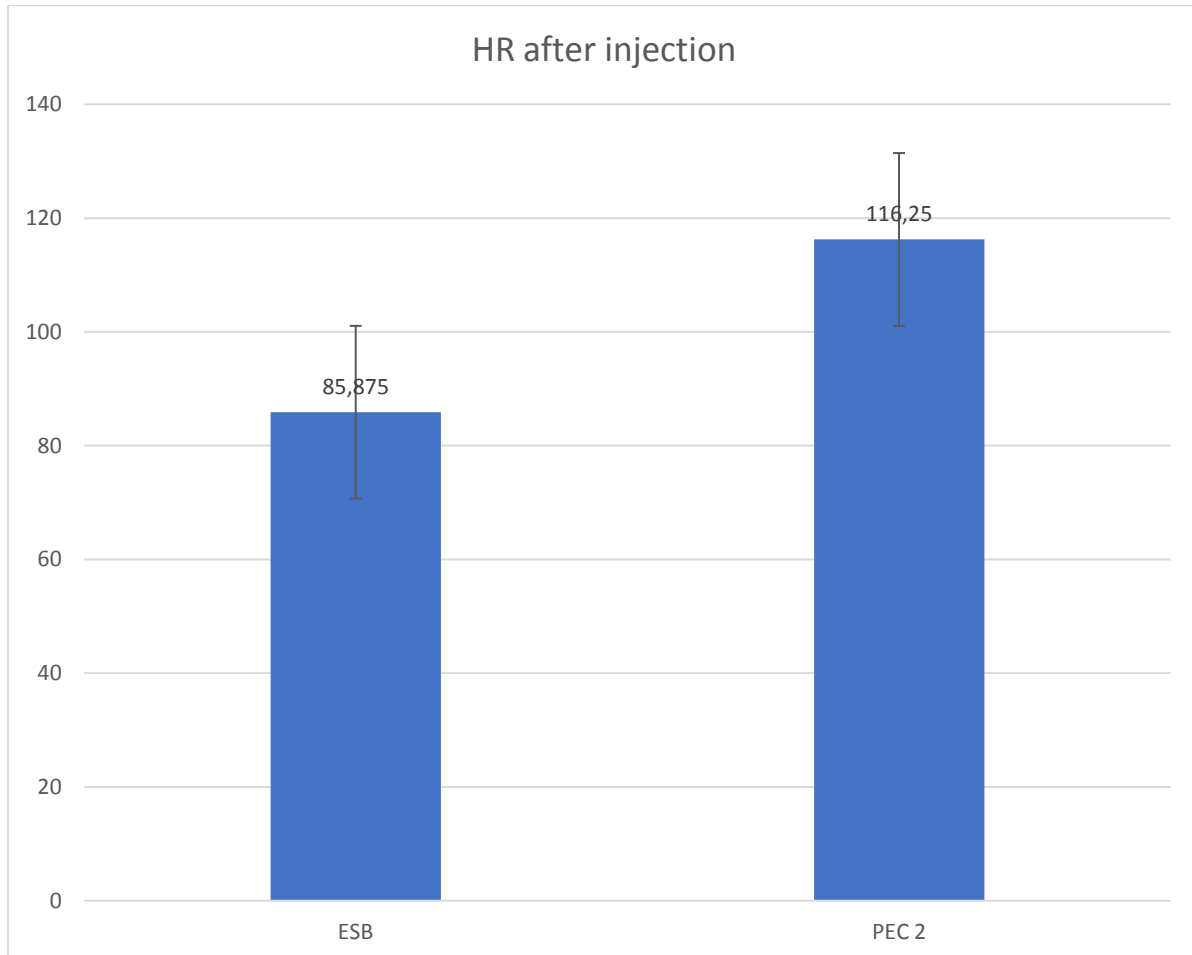
| HR Preop | Mean | Standard Deviation | p value |
|----------|----------|--------------------|----------|
| ESB | 83.8125 | 5.710418 | 0.634629 |
| PEC 2 | 118.5313 | 6.445726 | |



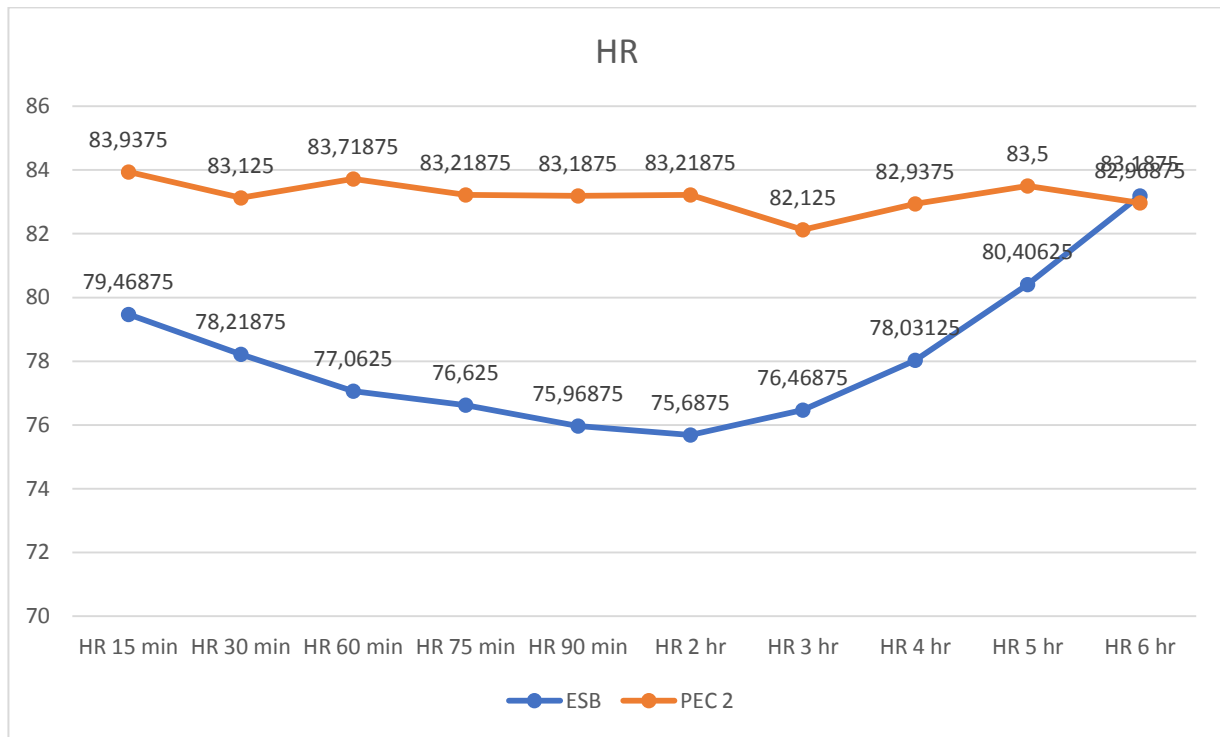
Heart rate after Injection

Like the pre-operative heart rate, the heart rate measured after injection of the anaesthetic agent is again found to be higher in PEC-II block group(116.25) than the Erector spinae block group.

| HR after injection | Mean | Standard Deviation | p value |
|--------------------|--------|--------------------|---------|
| ESB | 85.875 | 5.22247 | 1 |
| PEC 2 | 116.25 | 7.62847 | |



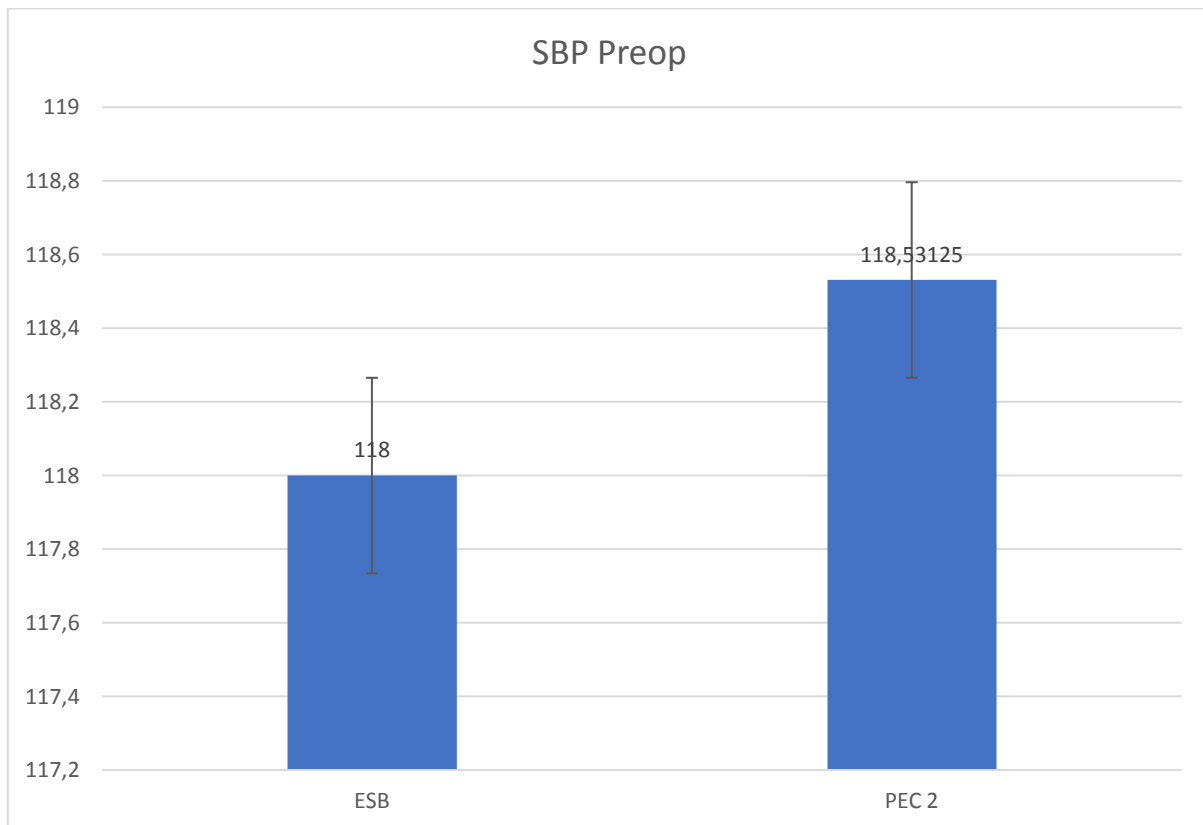
| Parameter | ESB | | PEC 2 | | p value |
|-----------|----------|--------------------|----------|--------------------|----------|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| HR | | | | | |
| HR 15 min | 79.46875 | 5.775278 | 83.9375 | 5.523776 | 0.002417 |
| HR 30 min | 78.21875 | 4.695464 | 83.125 | 5.773968 | 0.000418 |
| HR 60 min | 77.0625 | 5.254414 | 83.71875 | 5.826715 | 1.04E-05 |
| HR 75 min | 76.625 | 5.551809 | 83.21875 | 5.840539 | 1.93E-05 |
| HR 90 min | 75.96875 | 5.158672 | 83.1875 | 5.526695 | 1.11E-06 |
| HR 2 hr | 75.6875 | 5.239044 | 83.21875 | 6.110458 | 1.67E-06 |
| HR 3 hr | 76.46875 | 5.616705 | 82.125 | 5.463958 | 0.000129 |
| HR 4 hr | 78.03125 | 6.098569 | 82.9375 | 5.84718 | 0.00168 |
| HR 5 hr | 80.40625 | 5.695835 | 83.5 | 6.064173 | 0.039481 |
| HR 6 hr | 83.1875 | 4.099075 | 82.96875 | 5.625314 | 0.859473 |



Systolic Blood pressure pre-operative period

Systolic Blood pressure in the pre-operative period is almost identical among the two group (approx. 118)

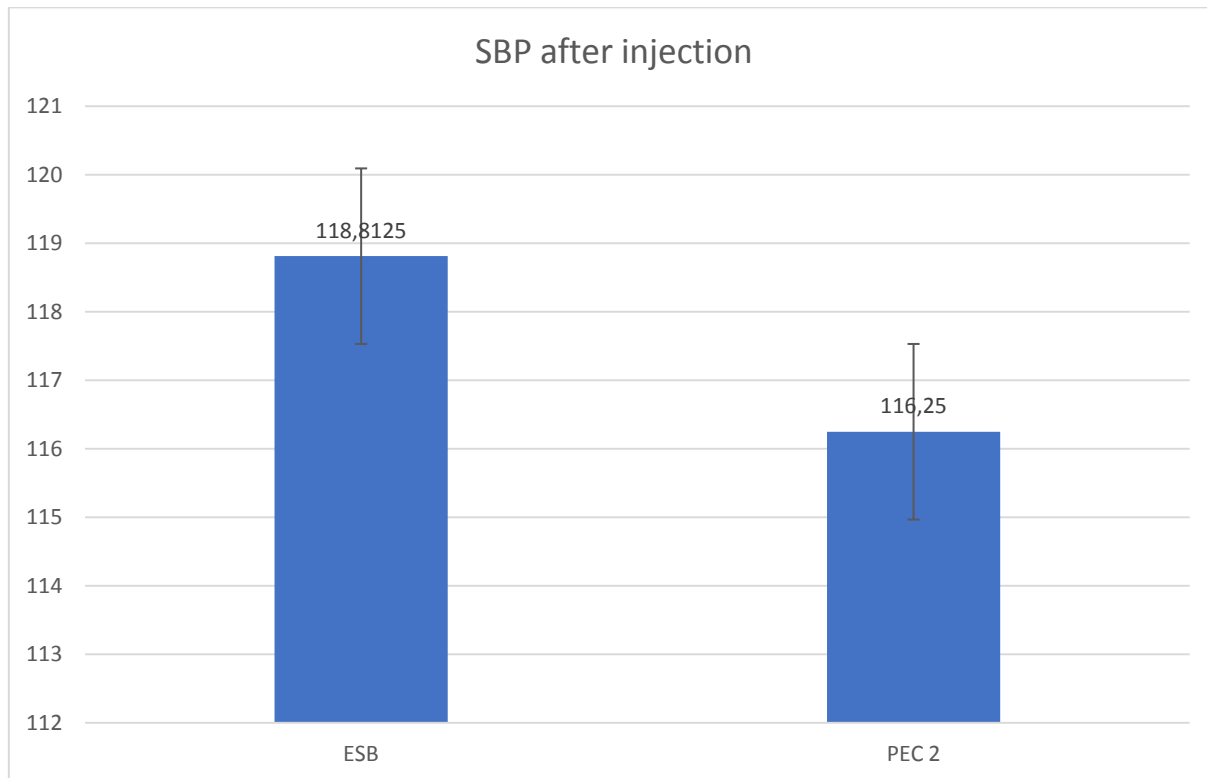
| SBP Preop | Mean | Standard Deviation | p value |
|-----------|----------|--------------------|----------|
| ESB | 118 | 5.435843 | 0.722742 |
| PEC 2 | 118.5313 | 6.445726 | |



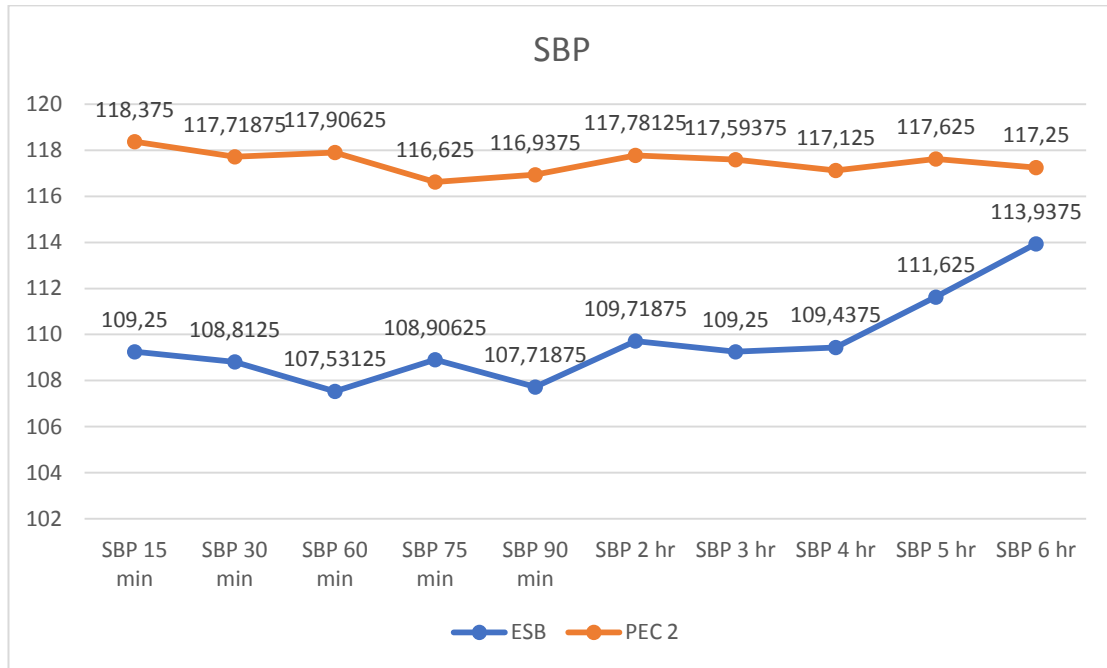
Systolic Blood pressure after injection

The systolic pressure is found to decrease a bit after injection of the dose in PEC-II block (116.25) but not on the ESP group

| SBP after injection | Mean | Standard Deviation | p value |
|---------------------|----------|--------------------|----------|
| ESB | 118.8125 | 6.213604 | 0.145725 |
| PEC 2 | 116.25 | 7.62847 | |



| Parameter | ESB | | PEC 2 | | p value |
|------------|----------|--------------------|----------|--------------------|----------|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| SBP 15 min | 109.25 | 7.322083 | 118.375 | 6.068161 | 1.01E-06 |
| SBP 30 min | 108.8125 | 7.136627 | 117.7188 | 6.279688 | 1.63E-06 |
| SBP 60 min | 107.5313 | 6.237164 | 117.9063 | 5.771786 | 3.12E-09 |
| SBP 75 min | 108.9063 | 5.479342 | 116.625 | 4.770541 | 1.07E-07 |
| SBP 90 min | 107.7188 | 7.663211 | 116.9375 | 5.752629 | 9.52E-07 |
| SBP 2 hr | 109.7188 | 7.05844 | 117.7813 | 6.583138 | 1.36E-05 |
| SBP 3 hr | 109.25 | 7.530583 | 117.5938 | 6.015353 | 7.29E-06 |
| SBP 4 hr | 109.4375 | 5.999664 | 117.125 | 5.762784 | 2.14E-06 |
| SBP 5 hr | 111.625 | 5.868176 | 117.625 | 5.884644 | 0.000129 |
| SBP 6 hr | 113.9375 | 7.335013 | 117.25 | 6.355084 | 0.058088 |

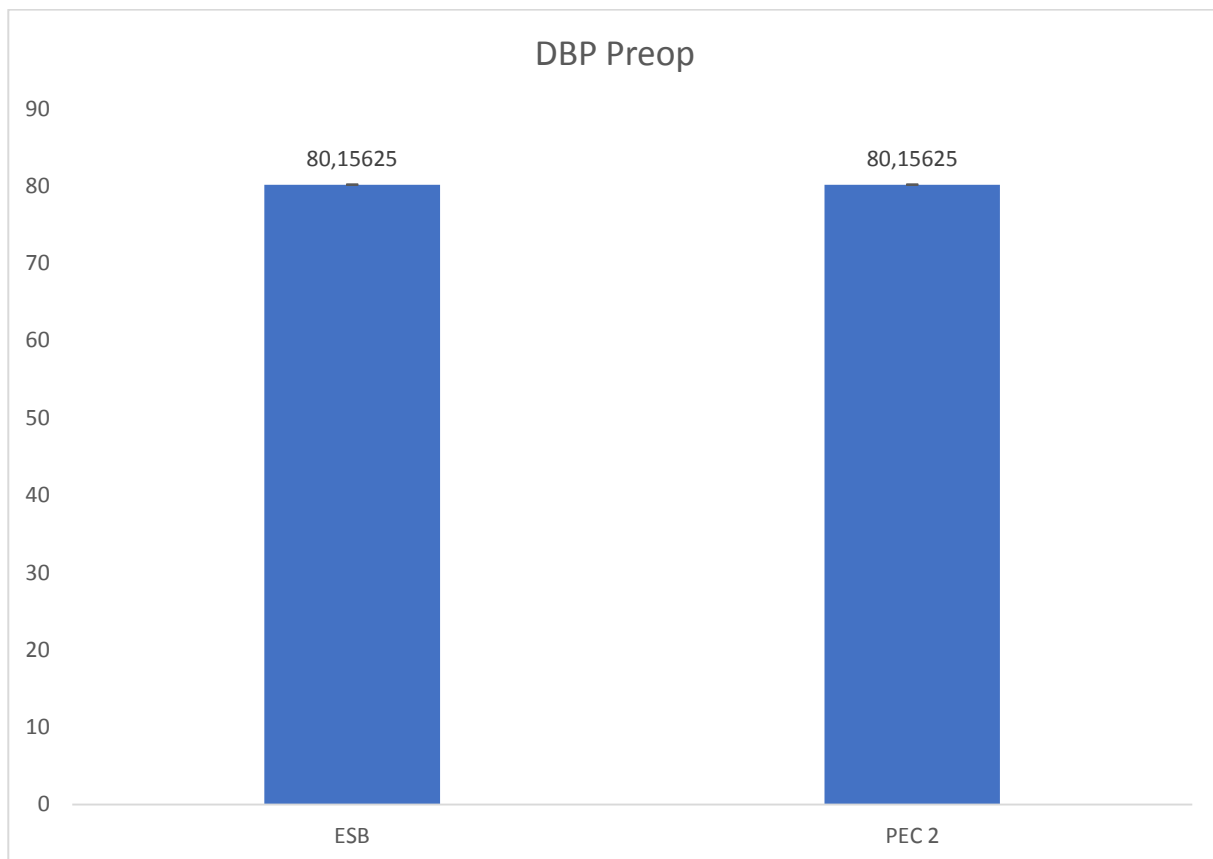


Diastolic Blood pressure pre-operative period

Diastolic Blood pressure in the pre-operative period is identical in the groups

(Mean value of 80)

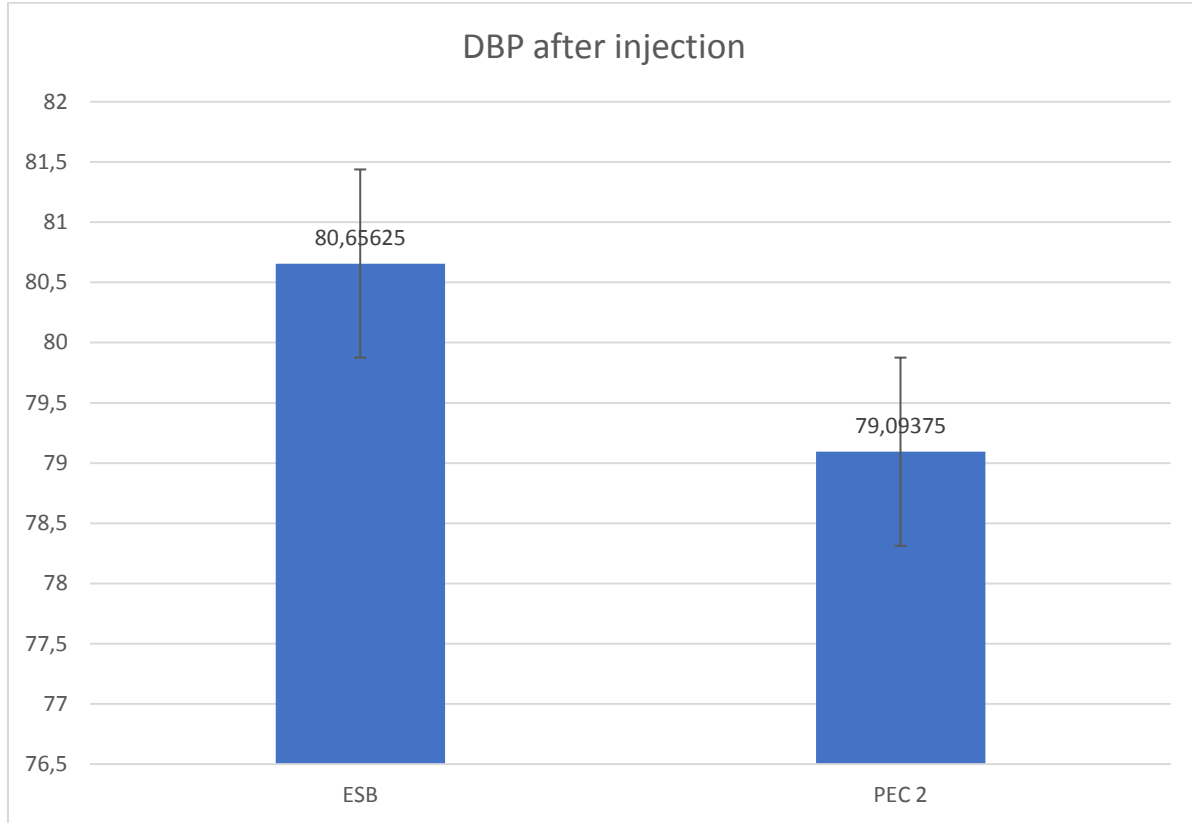
| DBP Preop | Mean | Standard Deviation | p value |
|-----------|----------|--------------------|---------|
| ESB | 80,15625 | 4.925964 | 1 |
| PEC 2 | 80,15625 | 4.033004 | |



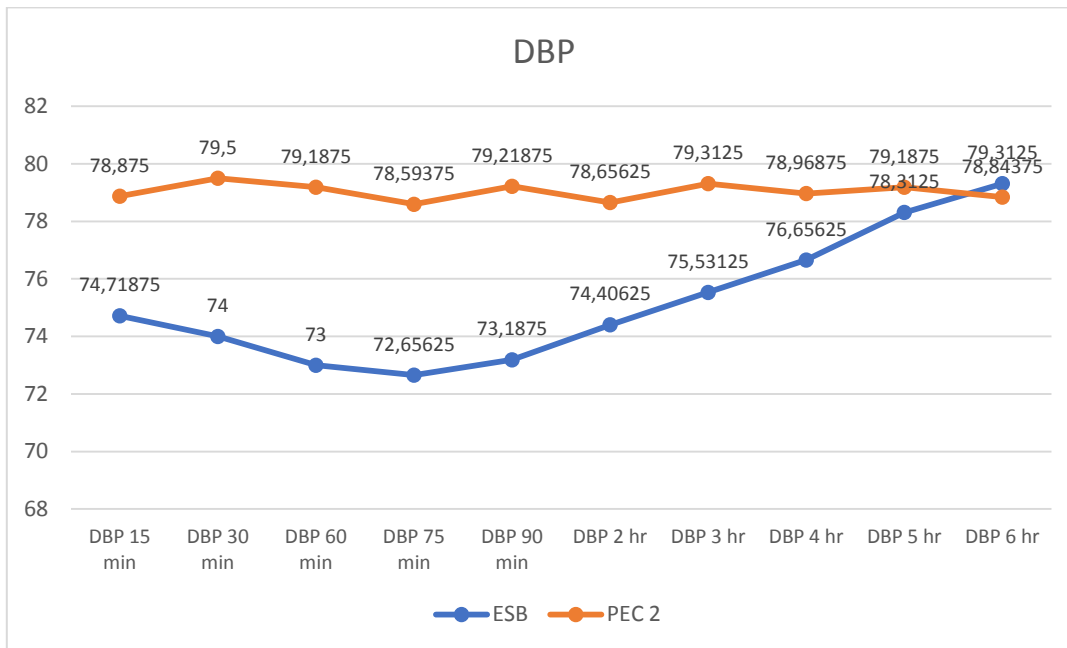
Diastolic Blood pressure after injection

Diastolic Blood pressure after injection seems to reduce following PEC-II block(mean of 79.09375) but not for ESP group.

| DBP after injection | Mean | Standard Deviation | p value |
|---------------------|----------|--------------------|----------|
| ESB | 80.65625 | 4.830076 | 0.149649 |
| PEC 2 | 79.09375 | 3.657598 | |



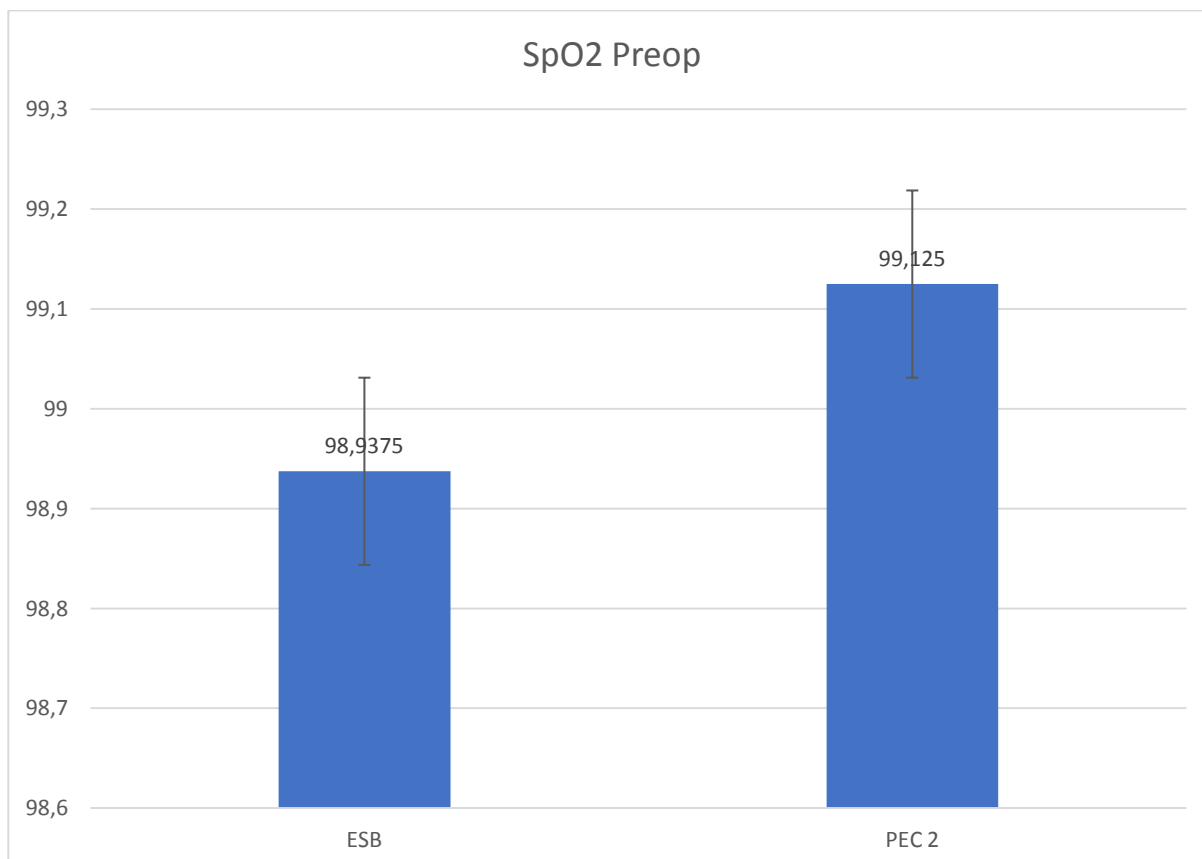
| Parameter | ESB | | PEC 2 | | p value |
|------------|----------|--------------------|----------|--------------------|----------|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| DBP | | | | | |
| DBP 15 min | 74.71875 | 4.820885 | 78.875 | 3.498848 | 0.000205 |
| DBP 30 min | 74 | 4.758693 | 79.5 | 3.885457 | 3.93E-06 |
| DBP 60 min | 73 | 4.778986 | 79.1875 | 3.745427 | 2.77E-07 |
| DBP 75 min | 72.65625 | 4.756045 | 78.59375 | 3.545641 | 4.12E-07 |
| DBP 90 min | 73.1875 | 5.006045 | 79.21875 | 3.405256 | 4.56E-07 |
| DBP 2 hr | 74.40625 | 5.387317 | 78.65625 | 3.375523 | 0.000353 |
| DBP 3 hr | 75.53125 | 5.339955 | 79.3125 | 3.67588 | 0.001608 |
| DBP 4 hr | 76.65625 | 5.319528 | 78.96875 | 3.771578 | 0.049215 |
| DBP 5 hr | 78.3125 | 5.509157 | 79.1875 | 3.37388 | 0.446468 |
| DBP 6 hr | 79.3125 | 5.509157 | 78.84375 | 3.538811 | 0.686896 |



SpO2 pre-operative period

SpO2 in the pre-operative period almost identical in the 2 groups

| SpO2 Preop | Mean | Standard Deviation | p value |
|------------|---------|--------------------|----------|
| ESB | 98.9375 | 0.840027 | 0.350294 |
| PEC 2 | 99.125 | 0.751343 | |



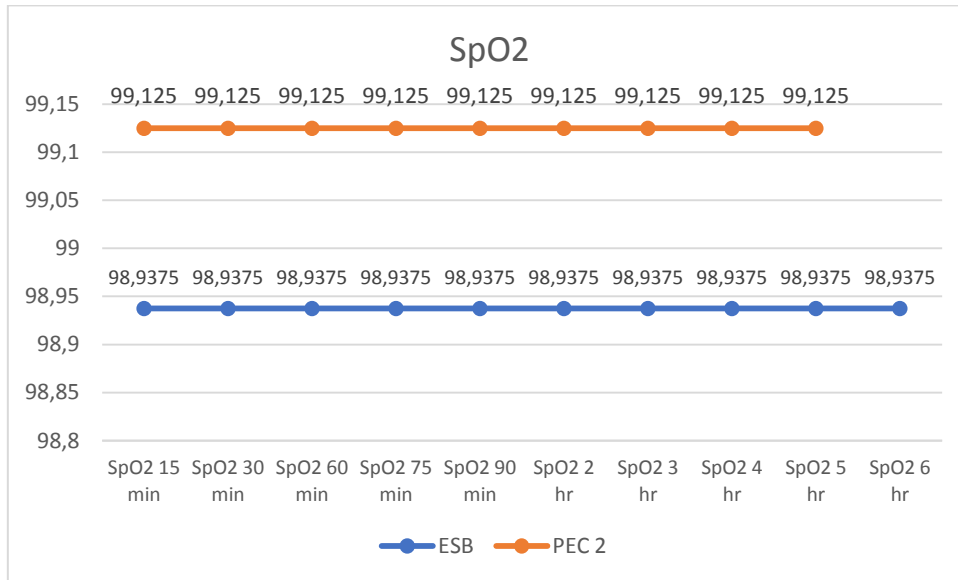
SpO2 after injection:

SpO2 after injection not altered following the blocks in both the groups.

| SpO2 after injection | Mean | Standard Deviation | p value |
|----------------------|---------|--------------------|----------|
| ESB | 98.9375 | 0.840027 | 0.350294 |
| PEC 2 | 99.125 | 0.751343 | |



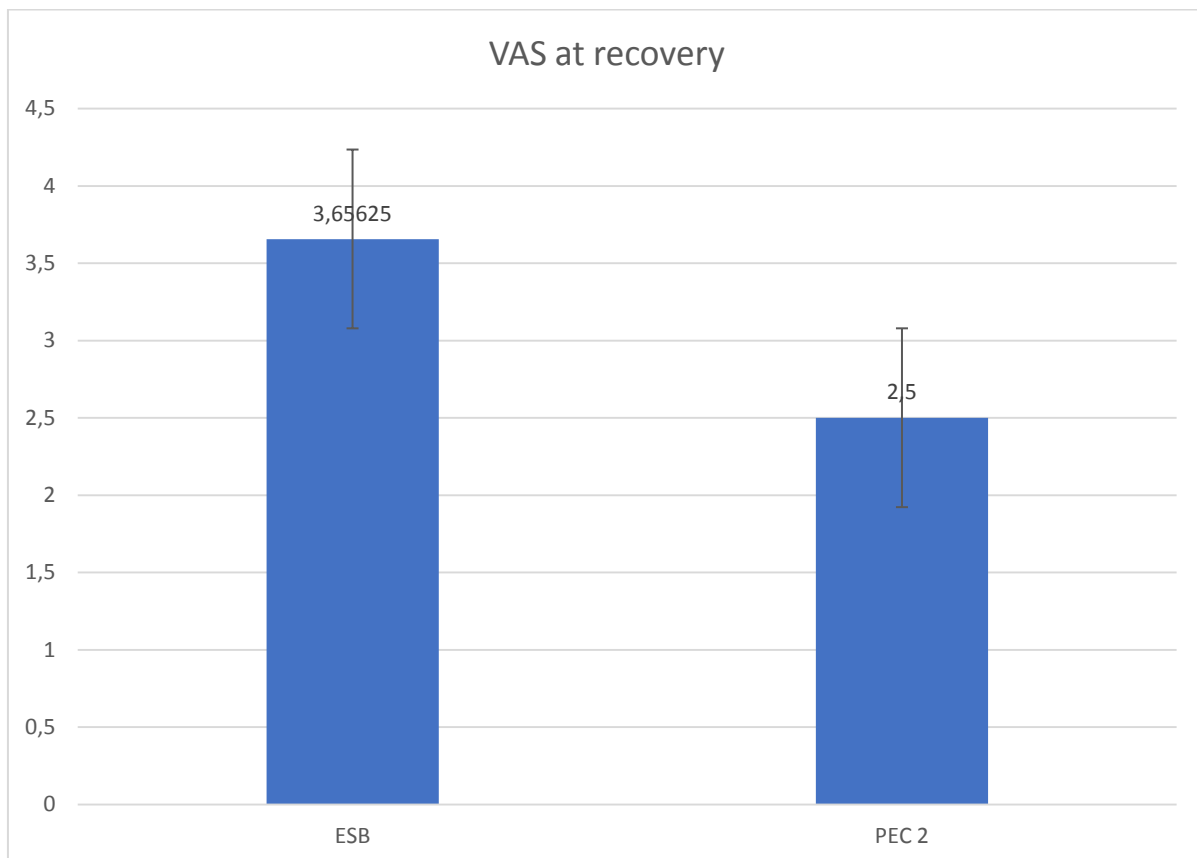
| Parameter | ESB | | PEC 2 | | p value |
|-------------|---------|--------------------|--------|--------------------|----------|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| SpO2 | | | | | |
| SpO2 15 min | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 30 min | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 60 min | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 75 min | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 90 min | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 2 hr | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 3 hr | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 4 hr | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 5 hr | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |
| SpO2 6 hr | 98.9375 | 0.840027 | 99.125 | 0.751343 | 0.350294 |



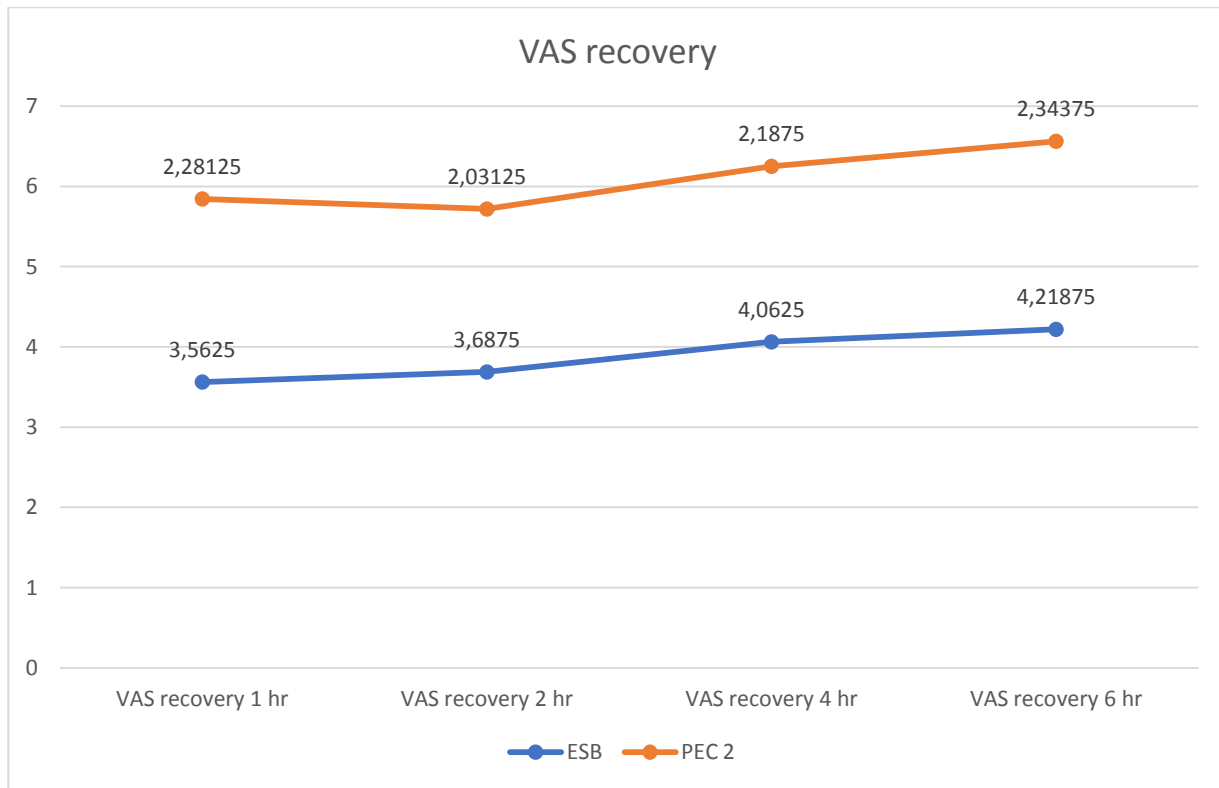
Visual Analog Score at recovery

PEC-II group recorded a better VAS recovery score than the ESP group(mean value 2.5 vs 3.65625)

| VAS at recovery | Mean | Standard Deviation | p value |
|-----------------|---------|--------------------|----------|
| ESB | 3.65625 | 1.180743 | 0.000105 |
| PEC 2 | 2.5 | 1.04727 | |



| Parameter | ESB | | PEC 2 | | p value |
|-------------------|---------|--------------------|---------|--------------------|----------|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| VAS recovery 1 hr | 3.5625 | 1.105339 | 2.28125 | 1.14256 | 2.47E-05 |
| VAS recovery 2 hr | 3.6875 | 1.029798 | 2.03125 | 1.031265 | 2.07E-08 |
| VAS recovery 4 hr | 4.0625 | 1.605183 | 2.1875 | 1.255632 | 2.33E-06 |
| VAS recovery 6 hr | 4.21875 | 1.496973 | 2.34375 | 1.285386 | 1.23E-06 |



Visual analog recovery score is the symbolic representation of the alleviation of post-operative pain. The comparison between the groups revealed the PECTORAL NERVE BLOCK-II performed better than the ERECTOR SPINAE BLOCK in all the recored periods namely,

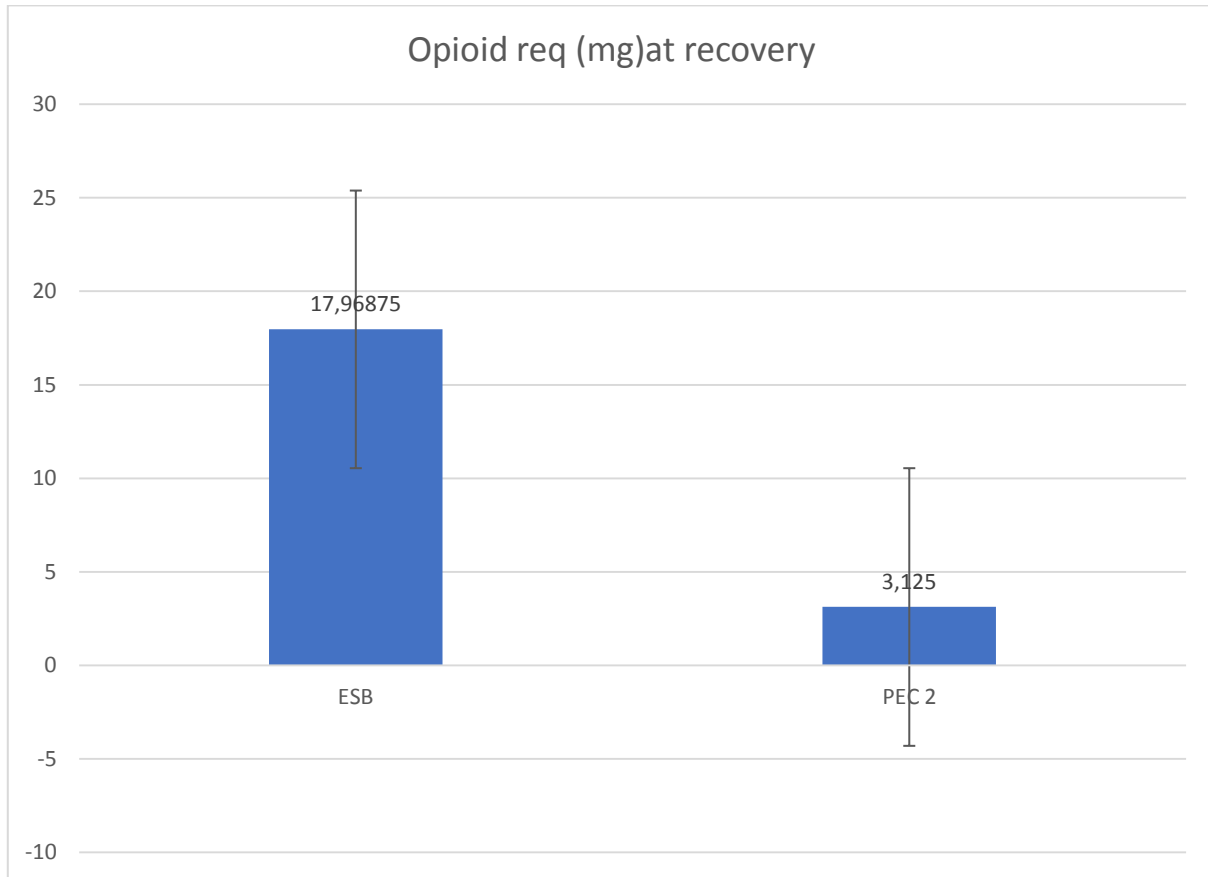
- 1 hour
- 2 hours
- 4 hours
- 6 hours

Hence giving the absolutely better outcome og PEC-II block compared with ESR block.

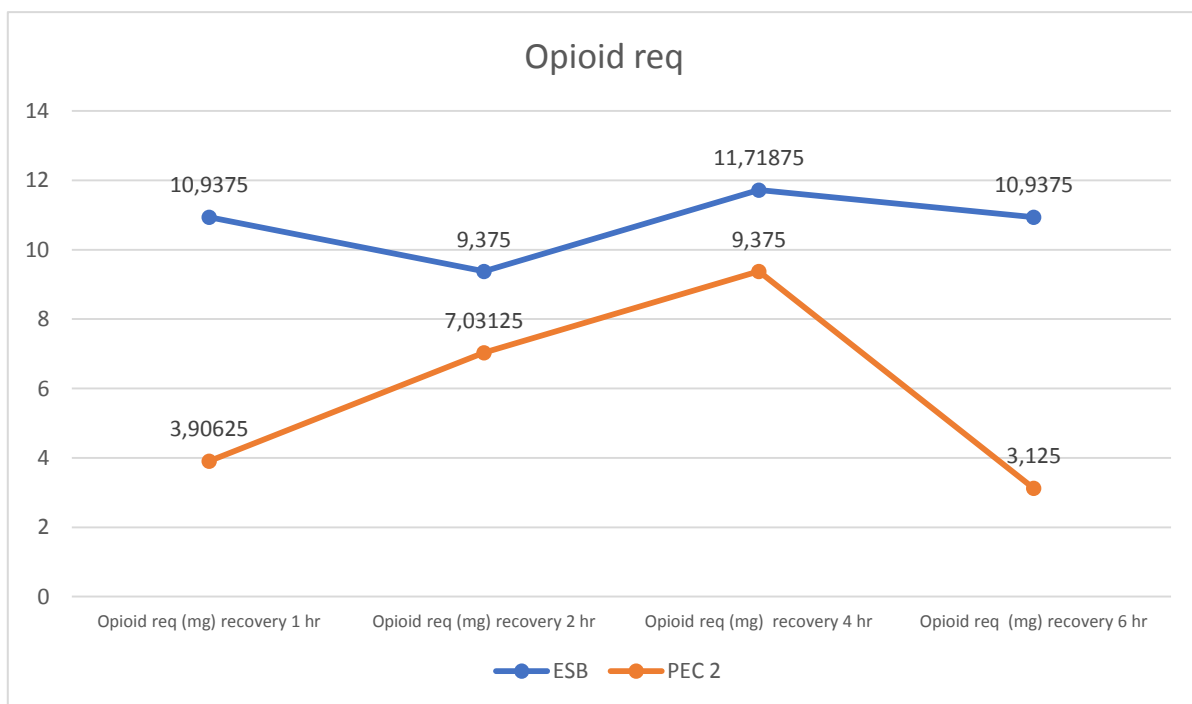
Opioid requirement at recovery:

Again pectoral block II group gives a standout performance in terms of post-operative requirement of opioid drugs(mean of 3.125 for PEC-II) on comparison with Erector Spinae Group(mean 17.96875 for ESP group)

| Opioid req (mg)at recovery | Mean | Standard Deviation | p value |
|----------------------------|----------|--------------------|----------|
| ESB | 17.96875 | 22.21084 | 0.001126 |
| PEC 2 | 3.125 | 10.53029 | |



| Parameter | ESB | | PEC 2 | | p value |
|-------------------------------|----------|--------------------|---------|--------------------|----------|
| | Mean | Standard Deviation | Mean | Standard Deviation | |
| Opioid req (mg) recovery 1 hr | 10.9375 | 16.72537 | 3.90625 | 11.19723 | 0.052593 |
| Opioid req (mg) recovery 2 hr | 9.375 | 17.67767 | 7.03125 | 15.85516 | 0.57863 |
| Opioid req (mg) recovery 4 hr | 11.71875 | 19.03348 | 9.375 | 17.67767 | 0.611586 |
| Opioid req (mg) recovery 6 hr | 10.9375 | 17.89023 | 3.125 | 8.400269 | 0.028956 |



Discussion

Satisfactory postoperative pain management is a critical part in surgical patient care. Compelling postoperative pain the board not just further develops the patient's degree of comfort and fulfillment yet additionally is related with earlier mobilization, less cardiopulmonary complications, decreased danger of thromboembolism, earlier return of bowel function, faster recovery, and reduced hospital costs. Traditionally, opioid analgesics that follows up in treating postoperative pain. While narcotic drugs, including morphine, hydromorphone, fentanyl, and meperidine, are exceptionally successful analgesics, they are likewise connected with various adverse effects that incorporate drowsiness, respiratory depression, cardiac instability including hypotension and bradycardia, and nausea, vomiting, pruritus, and constipation

A modification of PVB block is ESP block which was introduced by Forero *et al.* He used this simple interfascial plane block in cases of severe neuropathic pain post trauma/malignancy/thoracotomy. The local anaesthetic deposited between the two muscles (rhomboidus major and erector spinae) is speculated to penetrate anteriorly through costotransverse foramina and enter the thoracic paravertebral space. The ventral and dorsal rami and rami communicants get subsequently blocked.

In 2019 Altiparmik *et al.* published a study where they compared PECS block with ESP in 40 patients undergoing MRM surgery. They concluded PECS block is better than ESP block with lower tramadol intake and lower pain scores in the postoperative period. They analysed median pain scores were significantly lower in PECS group at the postoperative 60th min, 120th min, 12th hour and 24th hour They speculated that the better analgesic profile was due to the blockade of medial, lateral pectoral and long thoracic and thoracodorsal nerves. These results were similar to our studies..

As per the study by Orcun Sercan *et.al.*, Postoperative VAS scores were significantly

lower which is same as that of our study in both groups. No block-related complications were observed in their study which reflected our study as well.

In a study by Gürkan *et al.*, 32% of patients in an ESP group and 40% of patients in a control group had nausea in the postoperative period. The incidences of nausea in the present study were very similar to those reported by Gürkan *et al.*

Postoperative opioid consumption is believed to be the most important reason for PONV, with a reported incidence as high as 79% following opioid use. In the present study, the ESP and PEC II block performed with a higher concentration of bupivacaine significantly reduced postoperative tramadol consumption and rescue analgesic consumption

Bakshi *et al.* have reported difficulty during surgery due to fluid filled spaces after PECS block. We did not encounter this problem in any of our patients. This could be explained due to the time gap between the block and the surgery (>30 minutes) which could have led to the absorption of local anaesthetic.

Singh *et al.*, in their study, reported less pain scores and less morphine usage in patients receiving ESP preoperatively in MRM surgeries.

Results of Sinha *et al* showed, total morphine consumption in 24 hours was less in PEC II (4.40 ± 0.94 mg), compared to ESP group (6.59 ± 1.35 mg; $P = 0.000$). The mean duration of analgesia in patients of PEC II was 7.26 ± 0.69 hours while that in the ESP was 5.87 ± 1.47 hours (P value = 0.001). 26 patients in group II (PECS) had blockade of T2 as compared to only 10 patients in group I. (P value = 0.00). There was no incidence of adverse effects in either group.

Du H *et al.* observed the hemodynamic parameters, that is, MAP, HR, and SpO₂ preoperatively, at intraoperative 30 minutes and postoperatively and observed modest elevation of MAP and HR same as our study.

Conclusion

Ultrasound guided Modified Pecs block or PEC-II Block is a safe and effective analgesic procedure during breast cancer surgeries especially modified radical mastectomy with or without reconstruction. It shows lower intra and postoperative opioid consumption than Erector spinae block procedure, and has better alleviation of post-operative pain which is evident in the form of better Visual Analog scales.

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