SUBMITTED 15 APR 22
REVISION REQ. 15 JUN 22; REVISION RECD. 25 JUL 22
ACCEPTED 7 SEP 22
ONLINE-FIRST: September 2022
DOI: https://doi.org/10.18295/squmj.9.2022.057

Effect of Erector Spinae Block and PECS Block on Quality of Recovery and Analgesia After Modified Radical Mastectomy

A randomised controlled study

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Abstract

Objectives: Postoperative pain after modified radical mastectomy ranges from moderate to severe. Pectoralis block in comparison to Erector Spinae block have been found better in reducing pain scores and reducing consumption of rescue analgesic in postoperative period. This study aimed to compare the effect of Erector Spinae block and Pectoralis block on quality of recovery after Modified Radical Mastectomy using QoR-40 score. ***Methods***: After general anaesthesia, patients were given block according to computer generated randomization. Group-I-Pectoralis block including PEC I AND PEC II(PECS), Group-II-Erector spinae block(ESP) and Group III-Control Group (No intervention). Quality of recovery (QoR-40) score was observed on morning of surgery and at 24 hrs. Time to rescue analgesia and total consumption of rescue analgesia in first 24 hrs. were also observed. ***Results***: In the postoperative period at 24 hrs. Global QoR-40 scores were 183.64±6.36 in PECS group, 179.68± 6.38 in ESP group and 171.37±6.88 in control group. ($p<0.0001$) But, there was no statistically significant difference between QoR score of PECS & ESP group patients($p=0.0551$). The total requirement of rescue analgesic was significantly lesser in PECS group (137.28±31.46 mg) in comparison to ESP Group(189.46±42.98mg) and control

group (229.57±46.80 mg). (p<0.0001). Time to first rescue analgesia was significantly higher in PECS group (6.53±2.78 hrs) in comparison to ESP (4.05±2.91 hrs) and control group (2.15±1.51 hrs). (p<0.0001) ***Conclusion***: Both Erector Spinae block and Pectoralis block are effective for improving QoR score and reducing consumption of rescue analgesic after modified radical mastectomy.

Keywords: breast surgery, cancer, postoperative recovery, postoperative pain

Advances in Knowledge

- Both Erector Spinae Block and PECS block have been shown very promising results in providing postoperative analgesia after breast surgery. Our study based on these blocks helped us to get more data and knowledge as well as getting accustomed about these blocks.

Application to Patient Care

- These blocks providing post-operative analgesia resulted in patients being more comfortable post operatively, having a better feel of general over all wellbeing as well as better post operative outcomes.

Introduction

In year 2020 female breast cancer was diagnosed as most common cancer worldwide.[1,2] Radical or Modified Radical Mastectomy (MRM) is main treatment option for locally advanced lesions of breast.[3] MRM is usually done under general anaesthesia. Incidence of severe post-operative pain on the first post-operative day after MRM has been reported to be 60%.[4] Poor management of pain in the postoperative period may produce various acute and chronic detrimental effects.[5,6] So, adequate control of pain in postoperative period is very important to alleviate these detrimental effects. Also, getting adequate pain management is fundamental right of every patient. [7] Moreover, adequate control of pain in postoperative period can also have an impact on quality of recovery of patients.[8] QoR-40 score is a global score for assessing the status of recovery after anaesthesia and surgery. It includes 40 questions covering five domains: patient's psychological support, emotional status, physical comfort, physical independence in doing his work and severity of pain. In a number of surgical settings, the QoR-40 score has been shown to be a valid, and sensitive method, for measuring the dynamic and

multidimensional process of post-operative recovery.[9-11] Nair et al., in their study found that patients who received regional blocks during breast surgery had higher postoperative QoR scores.[11] Yao Y et al. also observed that preoperative ESP block improves postoperative QoR score and postoperative analgesia in patients undergoing MRM.[12] Sinha C et al compared PECS block and ESP after MRM and observed that PECS block patients had lower pain scores and consumptions of analgesics in the postoperative period in comparison to ESP block.[13] So we hypothesized that PECS block patient would also have better quality of recovery in comparison to ESP, and this study was done to compare the effect of ESP block and PECS block on post-operative quality of recovery after MRM using QoR-40 score. The primary objective of the study was to compare the Quality of Recovery Score (QoR-40) at 24 hrs. after surgery. The secondary objectives were total consumption of analgesics in the first 24hrs, time to rescue analgesia, postoperative VAS score and to compare intraoperative hemodynamic.

Methods

This randomized control study was conducted adhering to the Helsinki declaration, CONSORT recommendations for RCT from 20/12/2020 to 20/12/2021 after approval from the institutional ethical committee (***) and after clinical trial registry (***) in department of anaesthesia.

This study included patients between 18-60 years female with ASA grade I &II, who were planned for unilateral modified radical mastectomy for breast cancer. Written informed consent was obtained from all patients. Exclusion criteria were patient refusal, endocrine disorders (including I and II type of Diabetes Mellitus), any coagulation disorders, cognitive inability to understand QoR-40 questionnaire and allergies to local anaesthetics. 105 patients were assessed for eligibility. (Figure 1) Patients were randomly allocated to one of the following three groups using computer-generated random numbers. Group-I-Pectoralis block (PECS block), Group-II-Erector spinae block (ESP block) & Group III-Control Group. QoR-40 score was noted on the morning of surgery in each patient. After taking the patients in operation theatre, monitors were attached. The patients were monitored for heart rate, BP (SBP, DBP & MAP), SpO2, and ECG. After that intravenous line was taken in arm contralateral to surgery planned and an intravenous fluid was started. Preoxygenation was done for 3 mins and after that patient were induced with injection fentanyl 1ug/kg, injection propofol 2-2.5 mg/kg and

after confirming adequate bag and mask ventilation injection vecuronium 0.1mg/kg was given. After three minutes, either second generation supraglottic airway device or endotracheal tube was inserted. After confirmation of adequate ventilation by auscultation and capnography patients were put on volume-controlled ventilation mode. Anaesthesia was maintained with O2: N20(50:50) and sevoflurane. After that patient received respective block according to randomization.

The blocks were performed with Stimuplex® needle A100 (0.80 x 100mm (21G x 4") and Toshiba USG machine with a high frequency linear probe 38mm, 6-13 MHz. Hydro dissection (saline) was used to identify the correct position and plane before injecting the local anesthetic.

Pectoralis Block

The patient was positioned supine, with the arm ipsilateral to surgery site abducted to 90 degrees. The skin was prepared with 10% betadine solution. The sterile USG probe was put longitudinally at the mid clavicular level just below clavicle and was adjusted to identify axillary artery and vein. After that caudal edge of probe was turned laterally and USG probe was moved downwards to identify third rib, fourth rib, pectoralis major muscle, pectoralis minor muscle and serratus anterior muscle. The needle was introduced through an in-plane technique from cranial edge of probe and advances to lie in interfascial plane between pectoralis minor and serratus anterior muscle and 20 ml of .25% bupivacaine was administered (PECS II). After giving PECS II block, the needle was withdrawn slowly and adjusted to lie between pectoralis major and minor muscle and after confirmation by hydro dissection, 10 ml of 0.25% bupivacaine was deposited there (PECS I).

Erector Spinae Block

The patient was placed in lateral decubitus position and, following aseptic precautions, sterile USG probe was put longitudinally paramedian to thoracic spine and T4 transverse process was identified. Superficial to transverse process erector spinae, rhomboid major and trapezius muscles were identified. The needle was introduced through an in-plane cephalocaudal approach till the needle tip contacts the transverse process and after confirmation of correct plane by hydro dissection 20ml of 0.25% bupivacaine was given superficial to the transverse process and beneath the erector spinae muscle.

This study was double blinded as the patients were not aware of the intervention, they had received and the observer who observed the patient and collected data was also not aware of intervention each patient has received. 30 minutes before completion of surgery each patient was given PCM 1gm i.v. and thereafter 1gm i.v. at every 6 hours. If any patient had VAS score > 3 in postoperative period, rescue analgesic injection of Tramadol (100mg) i.v. was given. Time duration between two injection of tramadol was kept >4 hrs. Hemodynamic variables (Heart Rate, MAP, SBP, DBP, & SPO2) were recorded before surgery and after that every 15 minutes till completion of surgery. Time to rescue analgesia and total consumption of rescue analgesia in 1st 24 hrs. were also observed. Quality of recovery (QoR-40) score was observed again at 24 hrs. QoR-40 questionnaires were filled by observer who verbally translated the questionnaire to patients into the regional language.

Statistical analysis

Sample size is calculated on the basis of pilot study done on 10 patients in which SD was 7.12 for QoR-40 in control group. Assuming a difference of 10 would be clinically significant, minimum sample size was calculated to be 28 in each group. We took 30 patients in each group with the possibility of loss to follow up. Statistical analysis was performed using SPSS software (15.0 version). The continuous variables were evaluated by mean and standard deviation.. The dichotomous variables were presented in number and were analysed using Chi-square or Fisher Extract test. To compare the means between the two groups, Student t-test and for comparing three groups ANOVA tests were used. A p-value of < 0.05 was regarded as significant.

Results

In our study all groups had comparable demographic profile. (Table No.1) On comparing mean average global QoR-40(0-200) score preoperatively, there was no statistically significant difference between three groups ($p = 0.8360$). At 24 hrs there was a significant difference between three groups. In our study at 24 hours, Global QoR-40(0-200) score was highest in PECS group followed by Erector Spinae group and control group patients. The difference between three groups were statistically significant($p<0.0001$). But difference between PECS & Erector Spinae group patients was not significant statistically($P=0.0551$). (Table No.2)

The requirement of rescue analgesic was significantly lower in PECS group in comparison to Erector Spinae Group and Control group patients($p<0.0001$). Time to first rescue analgesic was significantly higher in PECS group in comparison to other two groups. (Table 3)
The gradual increase in VAS score was observed in all the three groups after surgery. VAS score was lowest in PECS group. The difference between groups was statistically significant at 6 hours, 12 hours and 24 hours. (Table-4)

There was no clinically significant difference between haemodynamic in three groups intraoperatively. (Fig 2,3)

Discussion

After MRM, patients report moderate to severe postoperative pain and various drugs and regional analgesic techniques are being used for providing postoperative pain relief. Opioids are the drugs which are most commonly used for providing postoperative analgesia but using opioid in cancer patients is related to suppression of cellular immunity and increase in cancer recurrence.[14] NSAIDs are the other class of drugs which are also commonly used for postoperative analgesia but their efficacy is limited to mild to moderate pain. Also, patients with MRM has high incidence of postoperative nausea and vomiting and using opioids and NSAIDs may increase the incidence of PONV.[15] Transdermal patch is a non-invasive method of providing postoperative analgesia and they have been found very effective in reducing pain scores in postoperative period in various other surgeries. But transdermal patches generally contain opioids and NSAIDs which can again increase the incidence of nausea and vomiting after MRM surgery. So, regional analgesia is best modality for providing postoperative analgesia in MRM patients. Further, it has also been found that using regional analgesia also decreases the incidence of chronic pain. [16]

Among, regional analgesia thoracic epidural and paravertebral blocks are still gold standard analgesic techniques.[17-19] But, sometimes it may be difficult to give thoracic epidural and paravertebral block and they are also associated with complications such as pneumothorax, vascular puncture, or nerve injury. So, there is always a need to find alternatives to these blocks, which are easy to give, having a higher safety profile and can provide equivalent pain relief. Both PECS block and ESP block are blocks which are easy to perform and with very less complications in expert hands. They also reduce the requirement of analgesia in postoperative period with decrease in pain scores. [20,21]

Quality of recovery of any patient after surgery may be related to quality of perioperative analgesia. Myles PS et al in their study observed that patient's quality of recovery after anaesthesia and surgery can be assessed effectively by using QoR-40 score.[10]

In our study at 24 hours, the Global QoR-40 score was 183.64±6.36 in PECS group, 179.68± 6.38 in ESP group, and 171.37±6.88 in control group and the inter mean difference between groups was statistically significant at 24 hours global QoR-40(0-200) ($p<0.0001$). However, the difference between PECS group and ESP group was statistically insignificant. Kamiya Y et al studied the effect of PECS block on postoperative pain and QoR score in breast cancer surgery patients and observed that pain score in PECS group was lower than control group till 24 hrs. [22] But there was no statistically significant difference between requirement of rescue analgesic and QoR-40 score in their study. In our study, we reported a significant difference between PECS and control group in requirement of rescue analgesic and QoR score. It may be because of that for PECS II block Kamiya Y,. et al injected the drug deep to serratus anterior muscle and in our study drug was administered superficial to serratus anterior muscle.

In a study conducted by Yao Y et al,. it was also found that ESP block improves pain score QoR score in the postoperative period.[12]

Similar to our study Sinha et al,. also observed that PECS block administered prior to MRM leads to decreased requirement of postoperative analgesics in first 24 hours. The mean duration of analgesia was 7.26 ±0. 69 hrs in patients with PECS block and 5.87 ±1.47 hrs in individuals with ESP block.[13]

Similar to our study Altiparmak B et al, also observed that PECS group patients had lower consumption of tramadol in postoperative period. In their study consumption of tramadol was 132.78 ± 22.44 mg in PECS group and 196 ± 27.03 mg in ESP group ($p = 0.001$).[23]

Gad M et al also observed that patients in PECS group had lower consumption of morphine in postoperative period in comparison to ESP block patients.[24]

Regarding complications, we have not encountered any procedure related complications in any of group which is similar to other studies.

The limitation of our study is that we used original version of QoR-40 score which is in English and score was filled by clinician verbally translating it into regional language. So it might have affected the interpretation of score. Other limitations of our study were its small sample size and single-centric approach. Another limitation was that the block was given after inducing the patients so we could not access the level of sensory block.

Conclusion

To conclude, both Erector Spinae and Pectoralis blocks in comparison to control group are effective for improving postoperative quality of recovery after modified radical mastectomy. But, in Pectoralis blocks group time to first rescue analgesic was higher and requirement of rescue analgesic was lesser in comparison to Erector Spinae Block. As our study is single centred, a multicentric study with large sample size is required for generalizability of results.

Conflicts of Interest

The authors declare no conflict of interests.

Funding

No funding was received for this study.

Author Contributions

Collection of data and drafting the manuscript was done by MHM. Analysis and interpretation of data were handled by MHM and RV. RV, H, DS, SS and KS contributed to the concept and design as well as the critical revision of the manuscript. All authors approved the final version of the manuscript.

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Figure 1: Consort flow chart

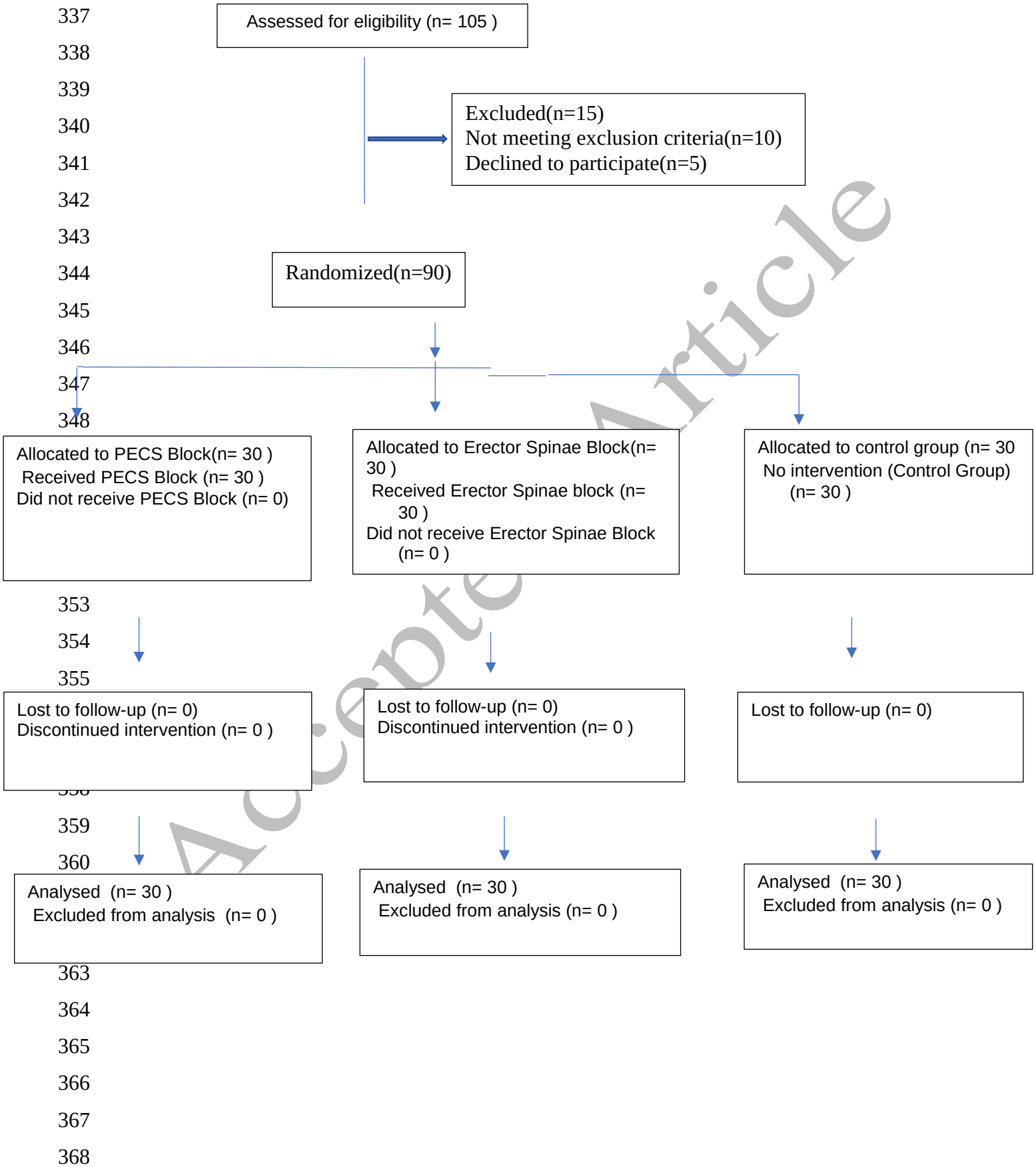

Table 1: Demographic Profiles

	Group-I(PECS group) [n=30]	Group-II(ESP group) [n=30]	Group-III(Control Group) [n=30]	p-value
Age(in years)	43.52±9.6	42.26±7.64	44.13±8.9	F=0.3563 p=0.7013#
Weight (in kg)	59.4±9.1	57.2±5.28	56.71±8.1	F=1.048 p=0.3551#
Height (in cms)	162.6±7.6	159.0±46.5	156.21±3.9	F=0.4132 p=0.66283#
BMI(kg/m2)	22.5±3.8	23.9±3.6	22.0±3.1	F=1.118 p=0.21963#
ASA I:II	24:6	26:4	25:5	X=0.48 p=0.7866#
Duration of Anaesthesia(in minutes)	86.8±18.1	89.4±19.4	87.7±17.5	F=0.1553 p=0.8564#

**p value< 0.05= significant, #p value> 0.05= non-significant*

Table 2: Tabular presentation of mean global QoR-40(0-200) of Group-I, Group-II and Group-III patients

Global QoR-40 (0-200)	Group-I(PECS group) [n=30]	Group-II(ESP group) [n=30]	Group-III(Control Group) [n=30]	p-value
Pre-OP	186.63±7.78	185.53±6.73	186.34±7.56	F=0.1795 p=0.8360
	¥p=0.8322, €p=0.9873, £p=0.9051			
At 24 hrs	183.64±6.36	179.68± 6.38	171.37±6.88	F=27.47 p<0.0001*
	¥p=0.0551, €p<0.0001*, £p<0.0001*			

**p value< 0.05= significant, #p value> 0.05= non-significant*

¥Group-I Vs Group-II, € Group-I Vs Group-III, £ Group-II Vs Group-III

Table 3: Time to first rescue analgesic requirement and total rescue analgesic in first 24 hrs

	Group-I(PECS group) [n=30]	Group-II(ESP group) [n=30]	Group-III(Control Group) [n=30]	p-value
Time to first rescue analgesics requirement(hrs)	6.53±2.78	4.05±2.91	2.15±1.51	F=23.5 p<0.0001*
	¥p=0.0006*,€p<0.0001*,£p=0.0108*			
Total rescue analgesics requirement (in mg) in first 24 hrs	137.28±31.46	189.46±42.98	229.57±46.80	F=38.34 p<0.0001*
	¥p<0.0001*,€p<0.0001*,£p=0.0008*			

**p value< 0.05= significant, #p value> 0.05= non-significant,*

¥Group-I Vs Group-II, € Group-I Vs Group-III, £ Group-II Vs Group-III

Table 4: Tabular presentation of mean VAS score of Group-I, Group-II and Group-III patients

VAS Score	Group-I(PECS group) [n=30]	Group-II(ESP group) [n=30]	Group-III(Control Group) [n=30]	p-value
At 1 Hour	0±0	0±0	0±0	---
At 2 Hour	0±0	0±0	0±0	---
At 4 Hour	0.52±0.37	0.54±0.82	0.59±0.21	F=0.1371 P=0.8721
At 6 Hour	1.04±0.19	2.01±0.54	4.13±1.45	F=92.48 P<0.0001*
At 12 Hour	1.44±0.54	2.28±0.90	4.80±1.09	F=120.2 P<0.0001*
At 24 Hour	2.10±1.14	3.41±1.19	4.94±1.95	F=27.9 P<0.0001*

**p value< 0.05= significant, #p value> 0.05= non-significant,*

¥Group-I Vs Group-II, € Group-I Vs Group-III, £ Group-II Vs Group-III

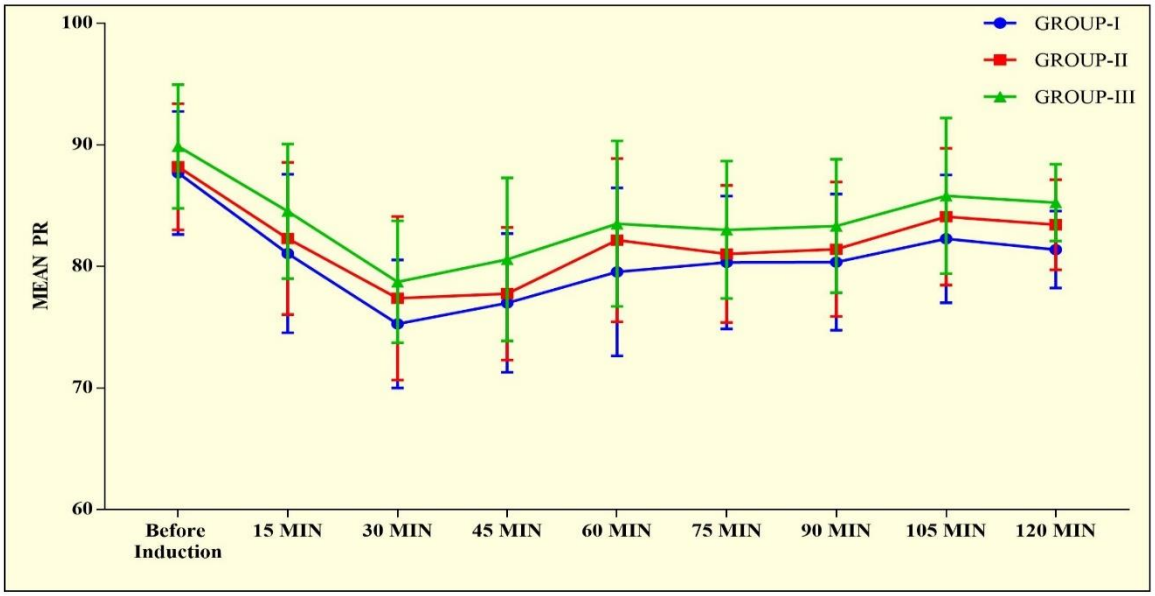

Figure 2: Mean Pulse Rate in beats per minute between three groups

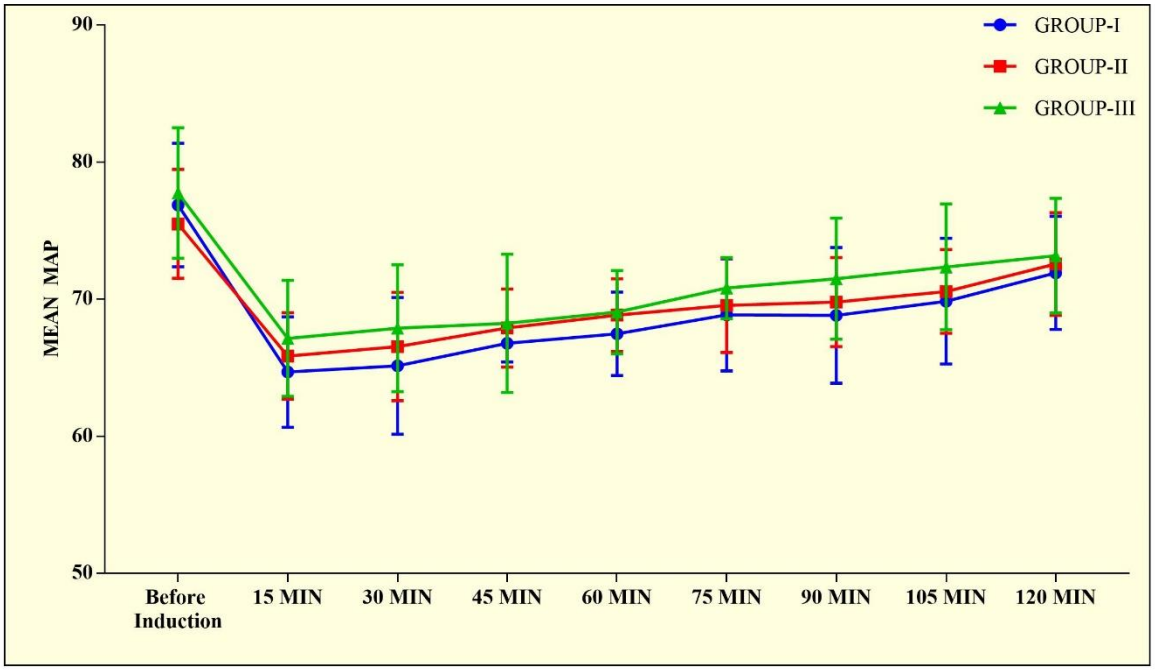

Figure 3: Mean Arterial Pressure in mm of Hg between three groups