



A Prospective Randomised Observer Blinded Comparative Study Of Serratus Plane Block And Thoracic Paravertebral Block In Conjunction With General Anaesthesia In Modified Radical Mastectomy

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Abstract

Introduction: The Postoperative Analgesia for Breast surgery is Challenging; Previously Thoracic Epidural Analgesia was gold standard for Breast surgeries which was Replaced by Paravertebral Block. But both these Techniques has complications Like Pneumothorax, Vascular Injection. Now regional Blocks like Pectoral Nerve Blocks has been gradually coming into practice. With Recent use of USG in nerve blocks has improved the success rate of the blocks and less complications.

Aim Of The Study: To compare the efficacy of postoperative analgesia of usg guided thoracic paravertebral block and usg guided serratus plane block in ca breast patients undergoing MRM surgery.

Methods: This study was conducted at Government Stanley Medical College hospital, Chennai on 60 patients who have undergone elective Modified Radical Mastectomy surgeries for CA Breast in the year 2020-2021. This study is a randomized prospective interventional clinical Study Randomization was done by allocating the patients to either the Thoracic Paravertebral group (Group P) or Serratus Plane group (Group B) by sealed cover technique. Study was a single blinded study. The patients who met the inclusion and exclusion criteria were only included in the study. Patients were divided into 2 groups of 30 each. Group P: Patients receiving USG guided paravertebral block. Group S: Patients Receiving USG guided Serratus Plane block. : Non-invasive Blood Pressure (NIBP), ECG, Pulse oximetry, Capnography Intravenous access - starting of an intravenous line with 18G intravenous cannula on the under aseptic techniques. Premedication Injection midazolam 0.02 mg/kg mg, Injection glycopyrolate 4µG/kg, Injection Fentanyl 1µG/mL and Inj. Ondansetron, 0.1 mg/kg will be given intravenously before the procedure. Block given according to the group allocated after randomization.

Results: In Group P, the number of patients assessed under ASA-PSI were 2 with ASA-PS II 6 in number, with ASA – PS III were 22 in number. In Group B, the number of patients assessed under ASA-PS I were 3, with ASA – PS II were 4, with ASA – PS III were 23 in number. The p value was computed as 0.733, which is not statistically significant. Postoperative pain scores were measured using visual analogue scores in a 0-10cm scale. The visual analogue scores were compared between the two groups, Group P and Group S VAS scores were measured at Immediate, 30 minutes, 1hour, 2 hours, 6 hours, 12 hours, 18hours, 24hours. The p-value between the two groups for first 12h was low for Serratus plane group, indicating that the analgesia in Group S was more effective than Paravertebral group. After 12 hr p value was comparable between two groups. The pulse rate was comparable in both the groups at all time intervals. The p-value was significant up to 12hrs after

that p-value is comparable between two, indicating better postoperative analgesia in serratus plane group. It was found that the systolic blood pressure was low for first 12hrs in serratus plane block which indicates the analgesic efficiency superior to paravertebral block ($P < 0.001$) thereafter the mean p value is comparable in both the groups after 12hrs. Diastolic BP was measured over the 24 hours post operative period, at specified time intervals. The P value was found to be statistically significant up to 6hrs after which p value was comparable between two groups. Postoperative nausea and vomiting scores were measured over the 24hours. The scores were: No nausea = 0, moderate nausea = 2, vomiting = 3. Rescue antiemetic's were given if nausea score ≥ 2 . Nausea score was 2 in 16patients in group P. Vomiting was present in 9 patients in Group P. Nausea score was 2 in 1 patient in Group S. 2 patients had vomiting in Group S The p value was found to be comparable between two groups. In Group S, 2 patients recorded score 1 and 23 patients recorded score of 3. In group P patients, therapeutic failure rate was found in 2 out of 30 patients. In Group S therapeutic failure rate was found in 1 out of 30 patients. Rescue analgesics were provided when Visual Analogue Score (VAS) scores ≥ 4 , or on patient demand. Out of 30 patients in Group P, 16 of them required rescue analgesics, and in Group S also 4 patients required rescue analgesics. In Group P, 1 Patient developed hypotension out of 30 patients. Similarly in Group S, no patient developed hypotension. The P value was 0.000, which was statistically significant. The hypotension was treated with bolus of intravenous fluids after which Blood pressure returned to normal.

Conclusion: By comparing the outcome measures between two groups, it was found that patients of Serratus plane Group had better postop Analgesia and the time of requirement of analgesia was longer for serratus plane group when compared to thoracic paravertebral block group. Patient satisfaction score was better for serratus plane group when compared to paravertebral group. VAS scores were favorable in serratus plane group for first 12h, after which the scores were comparable. Also, the technique of serratus plane group is easier when compared to USG thoracic paravertebral. There are case reports that serratus plane block provides good analgesia for post thoracotomy pain and there is a decrease in incidence of recurrence of metastasis.

Keywords: Ultrasonogram, Visual Analog score, Pectoral nerve blocks, Paravertebral Block, Postoperative nausea and vomiting.

Introduction

The Postoperative Analgesia for Breast surgery is Challenging, Previously Thoracic Epidural Analgesia was gold standard for Breast surgeries which was Replaced by Paravertebral Block. But both these Techniques has complications Like Pneumothorax, Vascular Injection. Now regional Blocks like Pectoral Nerve Blocks has been gradually coming into practice.[1]With Recent use of USG in nerve blocks has improved the success rate of the blocks and less complications. More studies were conducted to compare USG guided Paravertebral block and pectoral nerve Blocks. Serratus plane block is now recently used technique for Postoperative Analgesia in breast Surgeries. We hypothesise that Serratus Plane block under USG guidance provides better analgesia and fewer complications compared to Thoracic Paravertebral block.[2]Ultrasonogram has a Increasing role in Regional Anaesthesia for nerve Blocks. It is a simple and non invasive Technique

provides accurates and localises the area. Modern USG machines are well compact with better Resolution and enhanced tissue penetration. Ultrasound Imaging can elucidate peripheral nerves and adjacent landmarks. The Typical Appearance of nerve will be Honey-comb formed by the nerve fibres. Many blind techniques can lead to complications like Pneumothorax can be avoided by USG, by full Visualisation of Needle and Its Proximity to Vital Structures.[3,4,5]

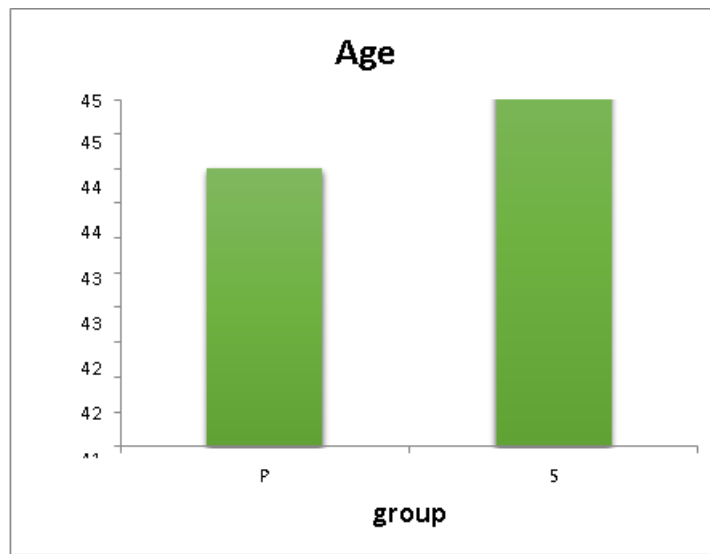
Methods: This study was conducted at Government Stanley Medical College hospital, Chennai on 60 patients who have undergone elective Modified Radical Mastectomy surgeries for CA Breast in the year 2020-2021. This study is a randomized prospective interventional clinical Study Randomization was done by allocating the patients to either the Thoracic Paravertebral group (Group P) or Serratus Plane group (Group B) by sealed cover technique. Study was a single blinded study. The

patients who met the inclusion and exclusion criteria were only included in the study. Patients were divided into 2 groups of 30 each. Group P: Patients receiving USG guided paravertebral block. Group S: Patients Receiving USG guided Serratus Plane block. : Non-invasive Blood Pressure (NIBP), ECG, Pulse oximetry, Capnography Intravenous access - starting of an intravenous line with 18G intravenous cannula on the under aseptic techniques. Premedication Injection midazolam 0.02 mG/kG mg, Injection glycopyrolate 4µG/kG, Injection Fentanyl

1µG/mL and Inj. Ondansetron,0.1 mG/kG will be given intravenously before the procedure. Block given according to the group allocated after randomization. **Inclusion Criteria:**All consented adult patients aged between 20-60 yrs belonging to ASA I, ASA II and ASA III physical status diagnosed cases of breast cancer scheduled for elective modified radical mastectomy. **exclusion criteria:**Patient with known bleeding disorders,Allergy to local anaesthetic,Infection at the injection site,Pregnancy or breast feeding females.

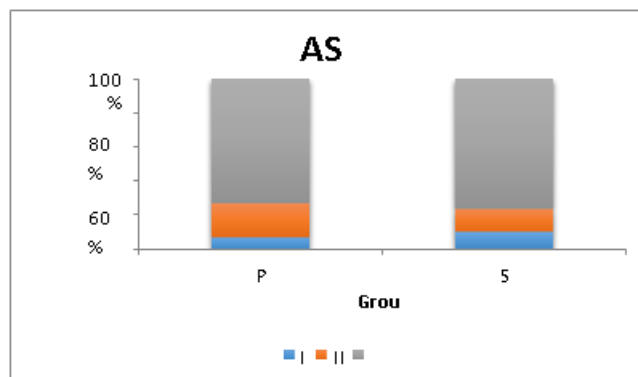
Results

Graph :1 Age Distribution:



Mean age in group S was 48 years and the standard deviation was 9.48 years. In Group P, Mean age was 47 years and the standard deviation being 9.34 years. These data were computed using students t-test and the P value was found to be 0.437. This difference is considered to be not statistically significant.

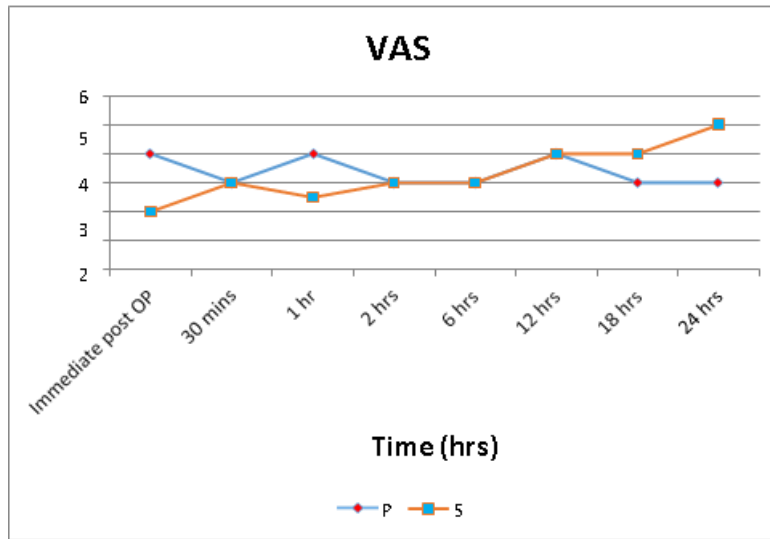
Graph :2 Asa Physical Status Distribution



In Group P, the number of patients assessed under ASA-PS I were 2 with ASA-PS II 6 in number, with ASA – PS III were 22 in number. In Group B, the number of patients assessed under ASA-PS I were 3, with ASA – PS

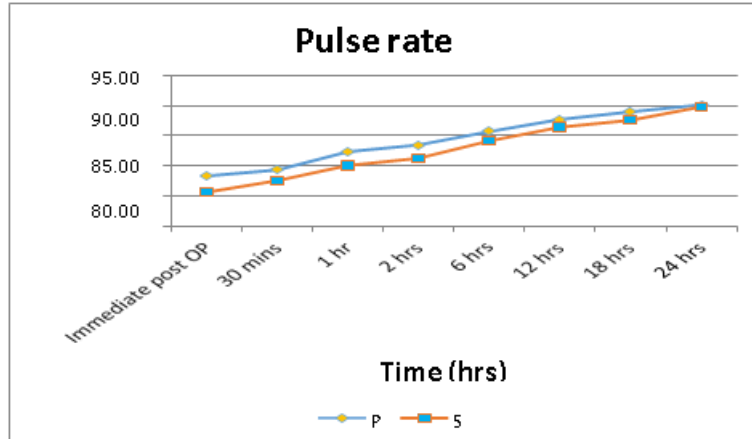
II were 4, with ASA – PS III were 23 in number. The p value was computed as 0.733, which is not statistically significant. Figure 13. ASA Physical Status Distribution

Graph :3 Vas Scoring



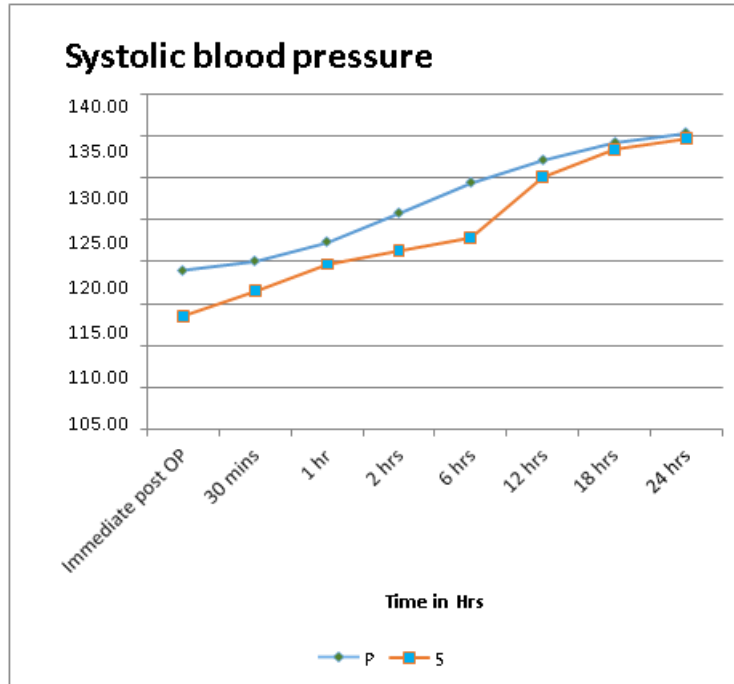
The average VAS scores at Immediate, 30 minutes, 1hour, 2 hours, 6 hours, 12 hours, 18hours, 24 hours, for both Group P and Group S are enumerated in table 6 and figure 6. The p-value between the two groups for first 12h was low for Serratus plane group, indicating that the analgesia in Group S was more effective than Paravertebral group. After 12 hr p value was comparable between two groups.

Graph :4 Pulse Rate



Pulse rate was monitored over a period of 24 hours, in the postoperative period in both Group P and Group S, at intervals of Immediate, 30 minutes, 1hour, 2 hours, 6 hours, 12 hours, 18hours, 24 hours, . The pulse rate was comparable in both the groups at all time intervals. The p-value was significant up to 12hrs after that p-value is comparable between two, indicating better postoperative analgesia in serratus plane group.

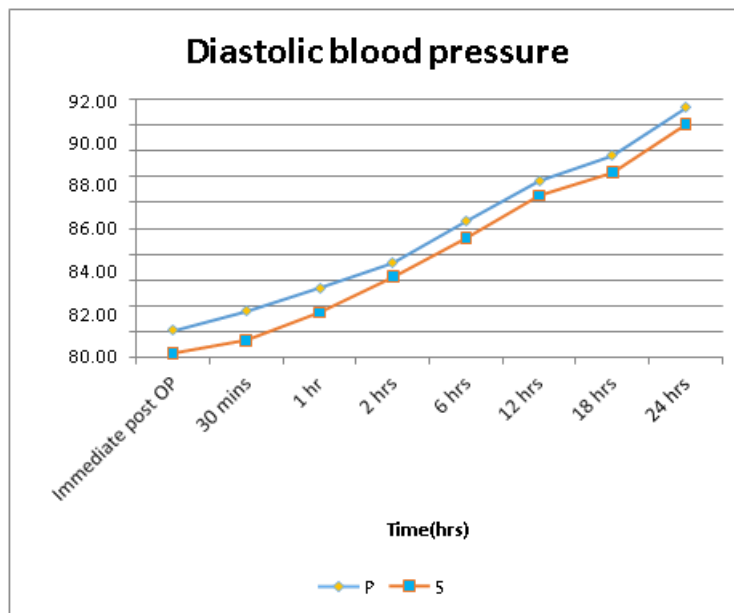
Graph :5 Systolic Blood Pressure



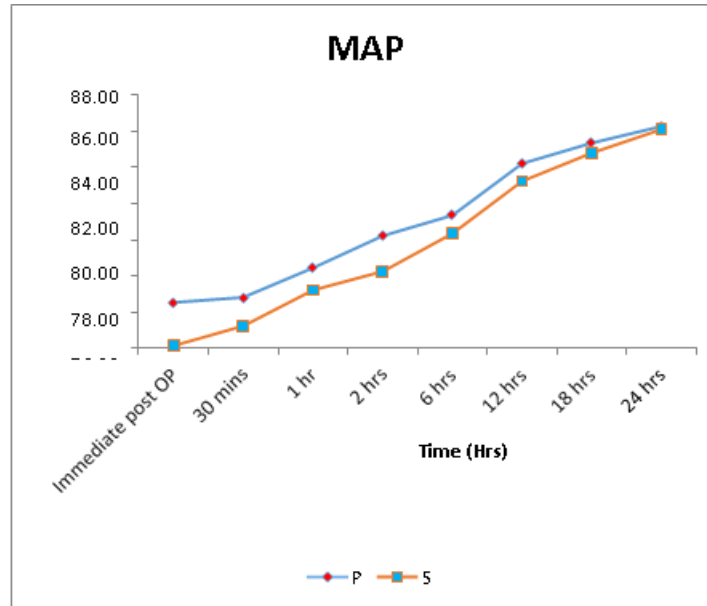
Systolic blood pressure was monitored over a period of 24 hours, in the postoperative period in both Group P and Group S, at intervals of Immediate, 30 minutes, 1hour, 2 hours, 6 hours, 12 hours, 18 and 24hrs. It was found that the systolic blood pressure was low for first 12hrs in serratus plane block which indicates the analgesic efficiency superior to paravertebral block ($P < 0.001$) thereafter the mean pvalue is comparable in both the groups after 12hrs.

Graph :6 Diastolic Blood Pressure

Diastolic BP was measured over the 24 hours post operative period, at specified time intervals. The P value was found to be statistically significant upto 6hrs after which p value was comparable between two groups.

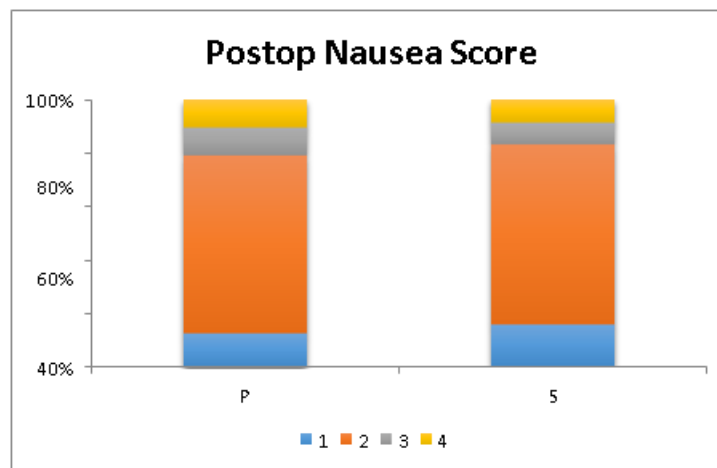


Graph :7 Mean Arterial Pressure



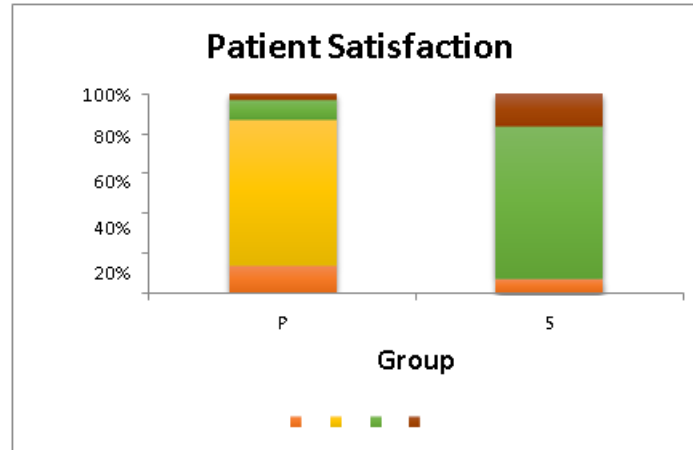
MAP was measured over the entire 24 hours postoperative period, at specified time intervals. The mean arterial pressure was found to be comparable in both the groups at all time intervals as depicted. The P – value was found to be statistically significant upto 12hrs.

Graph :8 Postoperative Nausea And Vomiting



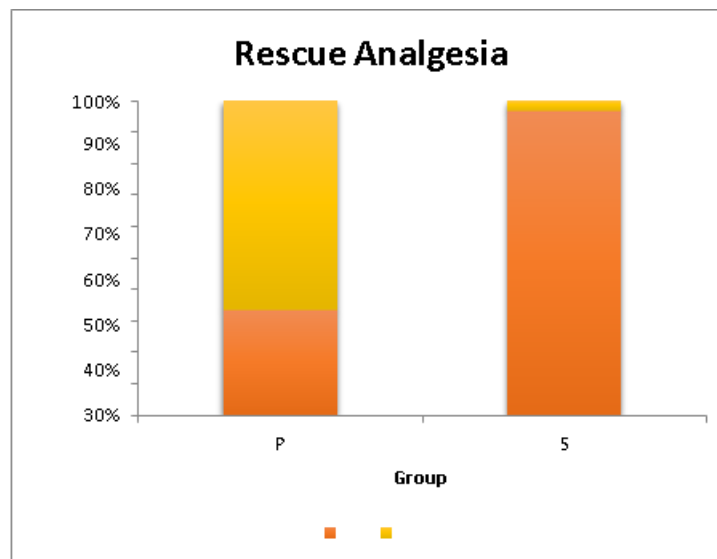
Postoperative nausea and vomiting scores were measured over the 24hours. The scores were : No nausea = 0, moderate nausea = 2, vomiting = 3. Rescue antiemetic’s were given if nausea score \geq 2. Nausea score was 2 in 16patients in group P. Vomiting was present in 9 patients in Group P. Nausea score was 2 in 1 patient in Group S. 2 patients had vomiting in Group S The p value was found to be comparable between two groups.

Graph:9 Post Operative Satisfaction



Postoperative satisfaction scores were poor = 1, fair = 2, Good = 3 and excellent = 4. In group P, 4 patients recorded 1 score and 22 patients scored 2. In Group S, 2 patients recorded score 1 and 23 patients recorded score of 3.

Graph :10 Rescue Analgesic Requirement



Rescue analgesics were provided when Visual Analogue Score (VAS) scores ≥ 4 , or on patient demand. Out of 30 patients in Group P, 16 of them required rescue analgesics, and in Group S also 4 patients required rescue analgesics

Discussion

Thoracic Epidural Anesthesia there may be wide alteration in hemodynamic parameters, because of epidural local anesthetic injection at the level of mid-thoracic level which may lead to hypotension. Strict monitoring of vital parameters is an important part in Thoracic epidural Analgesia. This technique cannot be used in patients with ischemic heart disease, also alteration in coagulation profile which is a contraindication for this technique. [6] Several advantages over Thoracic epidural technique are

analgesia by this technique is comparable with that of thoracic epidural, less risk of neurological complication in paravertebral block, incidence of hypotension is less when compared to that of epidural, intense blockade of sympathetic discharge, tumour recurrence after surgery is inhibited, less perioperative morbidity. But this technique is associated with complications like Pneumothorax, Epidural spread of local anaesthetic is possible may lead to hypotension. total spinal anaesthesia is a rare but dreadful complication, also vascular injection of

local anaesthetic, ipsilateral horner's syndrome may be seen in thoracic nerve blocks. [7]Also certain contraindications to this technique like patient refusal, coagulopathy, tumours in the paravertebral space, severe respiratory disease, severe spinal deformity like scoliosis, kyphosis limits the use of this technique. The use of Ultrasonogram in nerve blocks has revolutionised the success rate of Blocks and helps in reducing the incidence of complications. By using ultrasonogram the time for administering the block is minimised. By using ultrasonogram the nerves and close proximity of other structures are also visualised. The nerves appears as characteristic honey comb appearance.[8]The echogenicity of the nerve is better visualised if the sound beam is perpendicular to the axis of the nerve. The technique of in-plane needle has advantages because the entire needle is visualised. So accidental vascular injection or pleural puncture may be prevented by using this technique. The advantages of using ultrasonogram in nerve blocks are lower incidence of accidental puncture of vital structures like pleura, vascular structures, it minimises the number of needle passages, paresthesia occurring during block is reduced, volume of local anaesthetic used for nerve block is reduced using ultrasound because the spread of local anaesthetic is visualised while administering block, also provides long lasting analgesia. So under the guidance of ultrasound the use of thoracic paravertebral block to provide analgesia for breast surgery has increased recently.[9]The technique of ultrasound guided thoracic paravertebral block is by using a high frequency transducer the desired thoracic spine level is identified the transducer is positioned in such a way that it is lateral to the spinous process of the thoracic vertebra, then the ribs and the transverse process are visualised as a hyperechoic structures after identification of these structures the thoracic paravertebral space is identified as a wedge shaped which appears as a hyperechoic structure that is demarcated by the pleura below and the inner intercostal membrane above. [10]The ultimate goal of using ultrasound in thoracic paravertebral block is while injecting local anaesthetic in the thoracic paravertebral space there is a downward spread of the pleura²³ which indicates correct administration of the drug. The USG guided thoracic paravertebral technique is a simple and superficial technique but it is essential to visualise the

entire needle path during administering the block because this space is bounded by pleura so accidental pleural puncture is possible so ideally in-plane needle technique is used frequently. So the idea is by using 18G needle in in-plane technique introducing the needle slowly after identifying the pleura after the feeling of pop-off of piercing the costotransverse ligament aspiratio should be done to avoid vascular puncture ideally 15-20ml of local anaesthetic is used. The use of USG guided Thoracic Paravertebral block has minimised the incidence of complications like Pneumothorax and vascular injections although these are not completely prevented, also hemodynamic instability is a fact to be considered in Paravertebral blocks and thoracic epidural techniques.[11]Even though use of ultrasonogram has reduced such complications there is no studies that this complications can be prevented completely. The technique of serratus plane block is similar to that of pecs block, after getting consent from the patient, patient is placed in supine position arm is placed by the side, by USG guidance transducer is placed in the midaxillary line at the level of 5th rib, similar anatomical structures identified the serratus anterior muscle and latissimus dorsi muscle are identified, based on patient's weight long acting local anaesthetic ropivacaine or bupivacaine (0.125-0.25%) is injected superficial to serratus anterior muscle. The technique of serratus plane block is technically easier when compared to pecs block 1 & 2. Also serratus plane block provides anesthesia of entire hemithorax. [12]Based on these views we conducted a Randomised observer blinded study comparing the Analgesic Efficacy of USG guided Thoracic Paravertebral Block vs USG guided Serratus Plane Block in CA Breast patients undergoing MRM surgery. Patients from groups 'P' & 'S' were analyzed for the demographic profile. Patients' mean age and standard deviation were comparable between the two groups. Sex distribution was also comparable. The mean weights between the two groups were also similar and P value computed using Student's *t* test was insignificant. [13]USG guided Thoracic Paravertebral Block and serratus plane block were given before induction of anaesthesia in both the groups. After Extubation Patients were shifted to PACU for observation. The primary outcome measures that were compared between both the groups were VAS scores. The VAS

score was graded on a 0 to 10 cm scale. VAS scores were observed over a period of 24 hrs at the following intervals: immediate, 30 mins, 60 mins, 2 hrs, 6 hrs, 12 hrs, 18 hrs, 24 hrs. While the serratus plane block has a good Vas score till first 12hrs. This explains that Plane blocks always have good analgesic action when compared to paravertebral block.[14]The mean VAS scores at all the time intervals measured and was found that the P value was statistically significant and the VAS scores were lower in serratus plane group at 1h, 6h and 12h ($p = 0.008$ and <0.001 respectively). Also it has been observed that plane blocks have shorter duration of action when compared to paravertebral block.[15]The time for first request of analgesia was monitored it was found that it was more in serratus plane group when compared to thoracic paravertebral group .One of the secondary outcome measures that was analyzed was the postoperative nausea and vomiting. Rescue antiemetics were given with injection Ondansetron, 4 mg intravenously, when PONV scores were ≥ 2 . It was found that PONV scores were comparable between two groups. [16]The next outcome measure was Postop patient satisfaction it was found that Patient satisfaction was better for Serratus plane Group than Paravertebral Group.The therapeutic failure rates were comparable between both the groups, with the p value being 0.646. Out of the two patients who underwent failure, 1 patient in each group the patient was obese so the anatomy could not be well established. For the patients who had failure, rescue analgesia was given.[17] Rescue analgesia was given as per the patient requirement and on patients demand. Rescue analgesia was given if VAS scores were greater than or equal to 4. Injection Ondansetron 4 mg intravenously was given before administering tramadol. Rescue analgesia was required in 19 of the 30 patients in the Paravertebral and 4 of the 30 patients in the serratus plane group. So requirement of rescue analgesia was more in paravertebral block. There was no incidence of bradycardia, respiratory depression, urinary retention in both the groups. But there was recorded hypotension in 1 patient in paravertebral group. 1 of the 30 patients from Group P had hypotension that is defined as mean arterial pressure $< 20\%$ from baseline parameters. Episodes of hypotension were treated with fluid boluses of normal saline or ringer lactate.[18] Patient responded to crystalloids. The

diffusion of local Anaesthetic into epidural space from paravertebral space is responsible for hypotension in paravertebral group.[19]As far as the hemodynamic parameters are concerned the systolic blood pressure, as well as mean arterial pressure and pulse rate were recorded more inn PVB group was found to be better for serratus plane groupwhen compared to thoracic paravertebral block first 12 hrs , indicating that plane blocks have good analgesic action when compared to thoracic paravertebral block .Because of the proximity to the operating site and the nerves that are responsible for the pain sensation are blocked it has been found that serratus plane block has good patient acceptance and postoperative pain relief.After 12 hrs the hemodynamic parameters were found to be similar between two groups after which parameters were comparable between two groups.[20]

Conclusion: By comparing the outcome measures between two groups, it was found that patients of Serratus plane Group had better postop Analgesia and the time of requirement of analgesia was longer for serratus plane group when compared to thoracic paravertebral block group. Patient satisfaction score was better for serratus plane group when compared to paravertebral group. VAS scores were favorable in serratus plane group for first 12h, after which the scores were comparable. Also, the technique of serratus plane group is easier when compared to USG thoracic paravertebral. There are case reports that serratus plane block provides good analgesia for post thoracotomy pain and there is a decrease in incidence of recurrence of metastasis

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