

Original article:

“Combined general anaesthesia with paravertebral block versus general anaesthesia alone in modified radical mastectomy: a stress response to surgery”

MANOJ.GIRI,¹ SUMIT KUMAR,² RAJEEV.GAUTAM,³ L.S.MISHRA,⁴ RAGHAVENDRA VAGYANAVAR⁵

[1, 2, 3.Assistant Professors , 4.Prof & Head. , 5 Junior Resident]

Department Of Anaesthesiology and Critical Care,

Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India

Abstract:

Aim: The purpose of our study was to compare the stress response to surgery for patients undergoing modified radical mastectomy with combined general anaesthesia with paravertebral block versus general anaesthesia alone.

Methods: It was a prospective, randomized, controlled study conducted on 60 female patients, 30 in each group. Group A: combined general anaesthesia with paravertebral block and Group B: Patients received general anaesthesia alone. We compared hemodynamic parameters such as pulse rate, blood pressure and biochemical parameters such as blood glucose, plasma cortisol levels and effect on tissue oxygen saturation (pO_2) during peri-operative periods in both the groups.

Results: Decreased serum cortisol, blood glucose and increase in tissue oxygenation (pO_2) levels in intra and postoperative period in group A compared with group B ($p < 0.05$) and regarding intra-operative and post-operative hemodynamics tachycardia and hypertension were more common in group B compared with group A ($p < 0.05$).

Conclusion: Combination of general anaesthesia with paravertebral block provides better intraoperative and postoperative hemodynamic stability relative to general anaesthesia alone and decreased stress response to surgery and attenuates the physiologic response to surgery.

Key words: Paravertebral block, Modified radical mastectomy, Stress response

Introduction

Peri-operative stress response to surgery is major concern with general anaesthesia. A combination of regional anaesthesia with general anaesthesia is to reduce the requirement for analgesic and anesthetic agents. Intra-operative hemodynamic stability can be better achieved and the metabolic, endocrine and immunologic responses better suppressed.

General anaesthesia is currently the standard technique used for modified radical mastectomy used for surgical treatment of breast cancer. However it has its limitations in the form of poor postoperative pain control. Poor postoperative pain control in turn leads to greater incidence of nausea and vomiting and increased stress response to surgery. This complication prolongs stay in recovery room and prolonged hospitalisation. Parenteral narcotic use is

routine after emergence from anaesthesia and during the early postoperative period, which further increases the incidence of nausea, vomiting and sedation and results in prolonged hospital stays.

Regional anaesthesia using paravertebral block has been suggested as an ideal adjunct to general anaesthesia for modified radical mastectomy. Benefits include a reduction in postoperative pain relief indirectly leading to decreased stress response to surgery, a reduction of postoperative nausea and vomiting. Most importantly, by reducing postoperative pain, nausea and vomiting, paravertebral block markedly improves the quality of operative recovery for patients.

Ropivacaine is a long-acting amide-type local anaesthetic. In comparison with bupivacaine, ropivacaine is equally effective for subcutaneous infiltration, epidural and peripheral nerve block for surgery, obstetric procedures and postoperative analgesia.¹ ropivacaine, with its efficacy, lower propensity for motor block and reduced potential for CNS toxicity and cardio toxicity, appears to be an important option for regional anaesthesia and for the management of postoperative and labor pain.²

Our study is aimed to compare the stress response to surgery for patients undergoing modified radical mastectomy with combined general anaesthesia with paravertebral block versus general anaesthesia alone.

Material and methods

After approval from ethical committee, the study was conducted at S.R.N. Hospital (Associated to M.L.N. Medical College, Allahabad), over a period of one year. This prospective study was conducted on 60 adult female patients belonging to ASA physical status II, aged 30 to 60 years, scheduled for elective modified radical mastectomy used for surgical treatment of breast cancer. All cases were explained

the purpose of the study along with the procedure and thereafter a valid, informed and written consent was taken from all the patients undergoing study. We excluded patients with cardiovascular, pulmonary, endocrinediseases, who underwent radiotherapy and diseases requiring surgery within 24-48 hours of admission, pregnancy and patient refusal.

GROUP A: Patients received combined general anaesthesia with paravertebral block [G.A+PVB].

GROUP B: Patients received general anaesthesia [GA group] alone.

On the day of surgery, after the arrival of the patient, paravertebral block was performed with patients of Group A in a sitting position. An 18 gauge Tuohy's epidural needle was inserted 2.5 cm lateral to the midline of spine at any space from T₂ to T₆ under local anaesthesia perpendicular to the skin. After the transverse process is contacted, the needle is withdrawn to the skin and redirected superior or inferior to "walk" off the transverse process 1 cm deeper to the transverse process. An epidural catheter was threaded in and 10 ml of 0.25% ropivacaine injected after negative aspiration of blood. Onset of sensory anaesthesia occurred 10-15 minutes after the injection. After confirming sensory anaesthesia following PVB, GA was induced.

For general anaesthesia both groups of all the patients were given inj. glycopyrrolate 0.01mg/kg, inj. fentanyl 2µg/kg, inj. midazolam 0.01mg/kg, i.v. as a premedication, 15 min. before induction. All the patients were pre-oxygenated with 100% O₂ for 3 min. Anaesthesia was induced with i.v injection of propofol 2.5 mg/kg until loss of response to verbal command. Vecuronium 0.1 mg/kg was given to facilitate the endotracheal intubation and anaesthesia was maintained with 50:50 (N₂O:O₂) & isoflurane (0.5%-1%) on soda lime closed breathing circuit.

Muscle relaxation was maintained with vecuronium 0.01mg/kg as and when required. After completion of surgery, residual paralysis was reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01mg/kg).

The patient will be monitored by keeping a close watch on NIBP, Heart rate, Pulse, Oxygen Saturation(SpO₂), Capnography(etCO₂) & three lead ECG trace.

Stress response surgery in peri-operative period assessed by hemodynamic parameters as pulse rate, blood pressure [Mean arterial blood pressure (M.A.P)] and biochemical parameters such as serum cortisol, blood glucose and effect on tissue oxygen saturation by measuring PO₂. Samples are collected before premedication, after 60 minutes (intra-operative) and 30 minutes after extubation (post-operative). S.cortisol estimated by chemiluminescent enzyme immunoassay method and PO₂ by arterial blood gas analyzer (ABG).

Statistical analysis was performed using Microsoft Excel 2010 and statistical software plug-ins. Continuous data was analyzed by student's t-test (Unpaired). Data are being represented as mean ± SD. Any possible significance has been determined considering it statistically significant if p value of <0.05.

Results

The two groups were similar regarding demographic profile (Table-1). There were no significant difference between baseline hemodynamic and biochemical parameters in both the groups (p>0.05). Decreased serum cortisol and blood glucose level in intra and post-operative period in group A compared to group B (p<0.05). Increase in tissue oxygenation (pO₂) level in intra and post-operative period in group A compared to group

B (p<0.05). Regarding intra and post-operative hemodynamics, tachycardia and hypertension were more common in group B compared with group A (p<0.05). Duration of surgery is same in both the groups (p>0.05), (Figures 1, 2, 3, 4, 5).

Discussion

Surgical stress leads to reproducible physiological metabolic and hormonal responses, characterized by an altered carbohydrate metabolism, a net loss of protein and an increased lipolysis. They are due to an increased secretion of catecholamines, ACTH, cortisol and cytokines. Regional anaesthesia prevents the hyperglycemic, cortisol and adrenocortical responses to surgery. The lipolysis and the loss of protein are also attenuated.

Para vertebral block (PVB) markedly improves the quality of recovery after breast cancer surgery.³ Patients receiving PVB in addition to general anaesthesia (GA) seem to have shorter recovery times, experience less postoperative pain^{4,5} require lesser analgesics^{6,7} and experience less postoperative nausea and vomiting^{7,8} than breast surgery patients operated on under general anaesthesia without PVB.

Para vertebral block in conjunction with general anaesthesia provides improved analgesia during the first 24 hours after breast surgery when compared with general anaesthesia alone. The improved analgesia may last as long as 72 hours after initial block.⁹ Three-fold increase in the GA group's requirement for supplementation of analgesics in the first hour in the recovery room compared with that used in the GA+PVB group has been observed. The analgesic effect of PVB appears to last longer than would be predicted based on local anaesthetic kinetics alone.¹⁰ The explanation for this prolonged effect is unclear. When compared with other forms of neuraxial blocks (e.g. epidural anaesthesia) PVB has

been shown to be uniquely effective in eliminating cortical responses to thoracic dermatomal stimulation. This may perhaps inhibit a central reflex involved in pain.¹¹

The thoracic paravertebral block is a technique of injecting local anaesthetic in the vicinity of the thoracic spinal nerves emerging from the intervertebral foramen with the resultant ipsilateral somatic and sympathetic nerve blockade. The resultant anaesthesia or analgesia is conceptually similar to a “unilateral” epidural anaesthesia. Higher or lower levels can be chosen to accomplish a unilateral band-like segmental blockade at the desired levels without significant hemodynamic changes. PVB has been suggested for surgery in patients undergoing modified radical mastectomy.¹² An important advantage of PVB with bupivacaine in patients undergoing modified radical mastectomy is the long lasting postoperative analgesia.

Yilmaz O et al.¹³ conducted a study on effects of a thoracic paravertebral block on postoperative analgesia in patients undergoing modified radical

mastectomy and concluded that a paravertebral block with a single dose of 150 mg levobupivacaine before general anaesthesia in patients undergoing modified radical mastectomy and axillary lymph node dissection decreases postoperative pain values and the need for analgesics during the postoperative 24 hours. In a study conducted by Pekka et al.¹⁴ a PVB with bupivacaine (1.5 mg/kg), performed before general anaesthesia in patients scheduled for MRM, resulted in less need for postoperative opioid analgesics in the first hours after surgery and in less overall intensity of pain on the first postoperative day. The fact that the initial postoperative analgesia was relatively good may have had certain beneficial consequences.

Conclusion

In conclusion our study shown that combined general anaesthesia with paravertebral block provides a better intra-operative and post-operative hemodynamic stability relative to general anesthesia alone and decreased stress response to surgery and attenuates the physiologic response to surgery.

TABLE 1: COMPARISON OF AGE, WEIGHT IN TWO GROUPS

| Demographic profile | GROUP A | GROUP B | P value |
|----------------------------|---------------|--------------|---------|
| AGE(Yrs.) (Mean±SD) | 38.5667±6.409 | 38.433±5.042 | 0.929 |
| RANGE (Yrs.) | 30 – 50 | 30 – 48 | |
| WT.(kg) (Mean±SD) | 51.334±5.208 | 50.667±6.171 | 0.649 |
| RANGE(kg) | 45– 60 | 45 – 60 | |

FIGURE 1: CHANGES IN PULSE RATE IN TWO GROUPS IN PERI-OPERATIVE

PERIOD

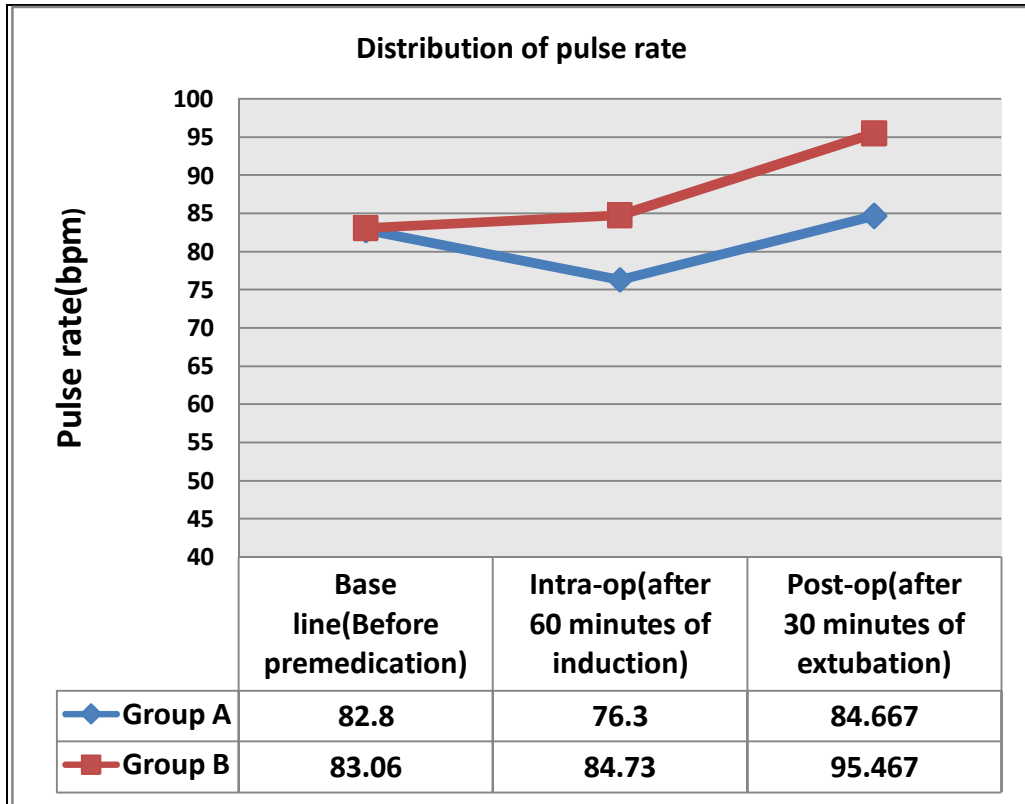
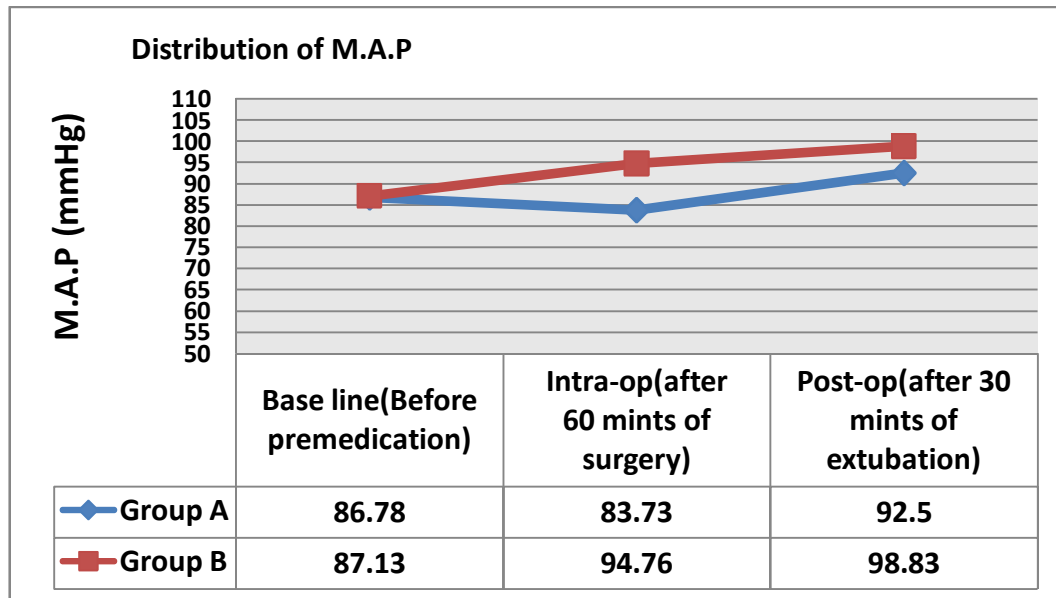


FIGURE 2: CHANGES IN M.A.P (MEAN ARTERIAL BLOOD PRESSURE) BETWEEN TWO GROUPS IN PERI-OPERATIVE PERIOD



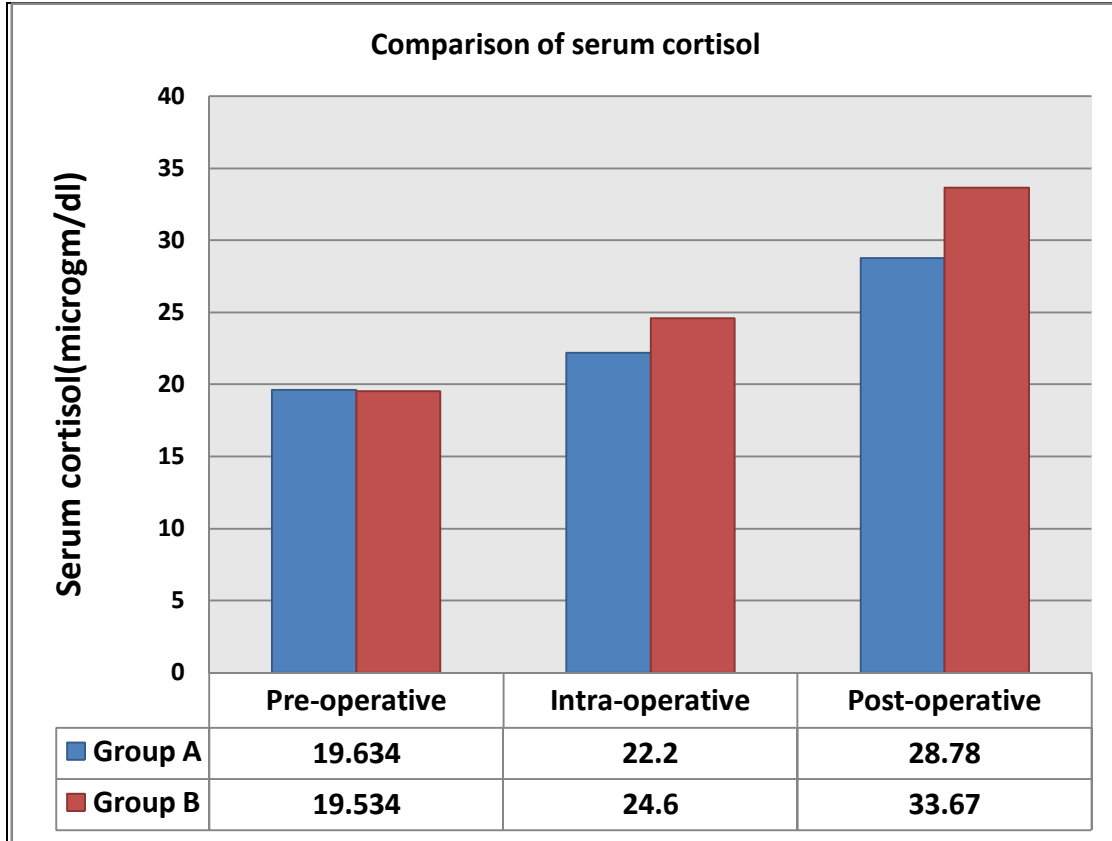
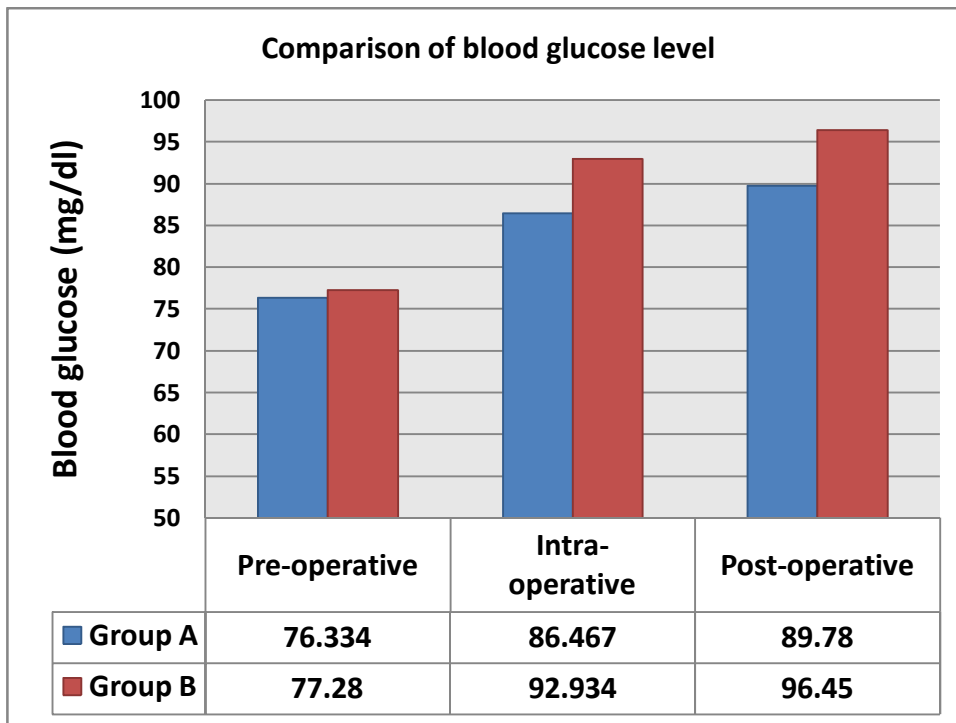
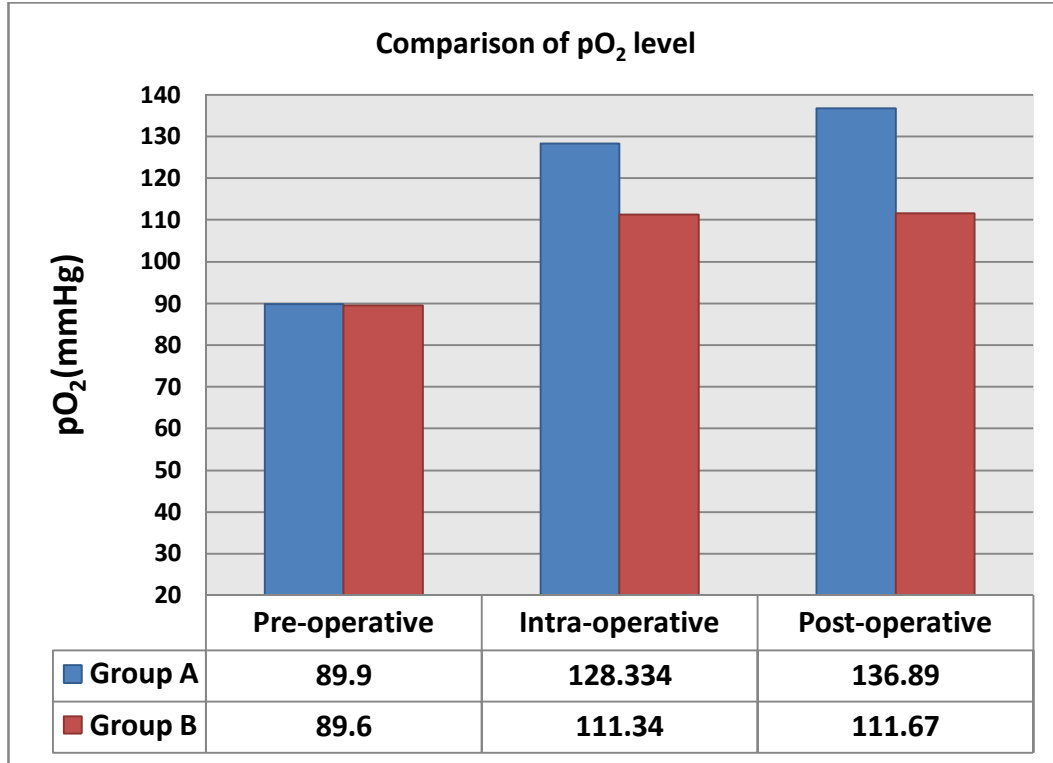


FIGURE 4: COMPARISON OF BLOODGLUCOSE BETWEEN TWO GROUPS.





References:

- 1) Zink W, Graf BM:Benefit-risk assessment of ropivacaine in the management of postoperative pain; Drug saf,2004; 27(14):1093-114.
- 2) Simpson D,Curran MP,Oldfield V,Keating GM:Ropivacaine: a review of its use in regional anaesthesia and acute pain management.Drugs;2005;65(18):2675-717
- 3) EamonnCoveney, Christina R .Weltz, Roy Greengrass, J, Dirk Iglehart,George s. Leight, Susan M Steele and H Kim Lyerly:Use of paravertebral block anaesthesia in the surgical management of breast cancer- Annals of Surgery vol 227, no 4 ,496-501.
- 4) Klein SM, Berg A, Steele SM,et al. Thoracic paravertebral block for breast surgery. Anaesthesia Analog 2000; 90:1402-5.
- 5) WeltzCR, Greengrass RA, Lyerly Ilk. Ambulatory surgical management of breast carcinoma using paravertebral block, AnnSurg1995; 222:19-26.
- 6) Pusch F, Freitag H, Weinstabl C, et al. Single injection paravertebral block compared to general anaesthesia in breast surgery. ActaAnaesthesio Scand1999; 43:770-4.
- 7) Hersch J. Impact of postoperative nausea and vomiting in the surgical setting Anaesthesia 1994;49:30-33.
- 8) I lanington-Kiff JG. Measurement of recovery from outpatient general anaesthesia With a simple ocular test .BMJ 1970; 3:132-5.
- 9) Stephen M Klein, Arthur Bergh,Susan M Steele,Gregory S Georgiade ,Roy A,Greengrass : Thoracic paravertebral block for breast surgery AnaesthesiaAnalg 2000; 90:1402-5.

- 10) Cheung S, Booker P, Franks R, Pozzi M. Serum concentrations of bupivacaine during prolonged continuous paravertebral infusion in young infants. *BJA* 1997; 79:9-13.
- 11) Richardson J, Jones J, Atkinson R. The effect of thoracic paravertebral blockade. *Anaesth Analg* 1998; 87:373-6.
- 12) Coveney E, Weltz CR, Greengrass R, Iglehart JD, Leight GS, Steele SM, Lyerly HK: Use of paravertebral block anaesthesia in the surgical management of breast cancer: experience in 156 cases. *Ann Surg* 1998; 227:496-501.
- 13) Yilmaz O, Saracoglu A, Bezen O, Sengul T: Effects of a thoracic paravertebral block on postoperative analgesia in patients undergoing modified radical mastectomy; *Agri*. 2014 Oct; 26(4):179-83. doi: 10.5505/agri.2014.65982.
- 14) Pekka M, Kairaluoma, Martina S Bachmann: Single injection PVB before GA enhances analgesia after breast cancer surgery. *Anaesth Analg* 2004; 99:1837-43.