Thoracic Epidural Anesthesia (TEA) with 0.2% Ropivacaine in Combination with Ipsilateral Brachial Plexus Block (BPB) for Modified Radical Mastectomy (MRM)

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Background: *Breast cancer is the 2nd most common tumors in Thai women. Until now, oncologic breast surgeries are typically performed by general anesthesia (GA). However, GA cannot provide adequate post-operative pain control and routine use of parenteral opioids aggravate postoperative sedation, nausea, emesis, impaired oxygenation and depressed ventilation. Thoracic epidural anesthesia (TEA) is one of the regional anesthetic techniques that can be done by using a low dose of local anesthetic in combination with ipsilateral brachial plexus block (BPB) for axillary node dissection. TEA can provide a better pain relief without potential paralysis of respiratory muscle and sedation.*

Material and Method: *Fifty ASA PS I-III patients undergoing MRM were randomly assigned to two study groups of 25 patients each. In the TEA group, an epidural catheter was inserted at T4 to T5, and 10-15 ml of 0.2% ropivacaine was injected, then interscalene BPB was done with 8 ml of 0.2% ropivacaine. Anesthesia was maintained with 5-10 ml of 0.2% ropivacaine per hour. GA was induced with 1 μg/kg of fentanyl followed by 1.5-2 mg/kg of propofol and was maintained with sevoflurane and 70% N_2O in oxygen. The authors evaluated the adequacy of anesthesia, surgical condition, postanesthetic recovery, postanesthetic analgesia and patients' satisfaction.*

Results: *The demographic data was similar in both groups. The number of patients immediately arrived at PACU with a sedation score of 1 was significantly greater in TEA group ($p = 0.003$) while the number of patients with an Aldrete score of 10 was greater but not statistically significant ($p = 0.25$). The verbal rating scale and analgesic requirement were significantly lower in the TEA group ($p < 0.001$ and $p = 0.002$ respectively). Patients' satisfaction was greater with TEA than with GA ($p = 0.014$). Surgical condition was similar in both groups.*

Conclusion: *The present study shows that TEA combined with BPB by using a low dose of 0.2% ropivacaine is a safe and reliable alternative technique for MRM. It can provide not only effective anesthesia but also better postoperative pain relief, faster anesthetic recovery and greater patient satisfaction than those of the GA technique.*

Keywords: *Thoracic epidural, Mastectomy*

J Med Assoc Thai 2005; 88(4): 513-20
Full text. e-Journal: *http://www.medassocthai.org/journal*

Epidural techniques are associated with improved operative outcome and postoperative analgesia[1]. Epidural anesthesia techniques offer numerous clinical benefits to many patients. Epidural anesthesia and analgesia, with a catheter inserted in the lumbar region, are commonly used for surgery in the lower abdomen and lower extremities while thoracic epidural anesthesia and analgesia are used less frequently.

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Clinical benefits associated with epidural anesthesia and analgesia are achieved with the thoracic approach, particularly with the appropriate use of local anesthetics. These include an effective postoperative analgesia, lower incidence of pulmonary complications, stabilization of endothelial coronary function, earlier return of bowel function, preservation of immunocompetence, early ambulation and a reduction in the costs of perioperative care[1-4].

Breast cancer is the second most common tumors in Thai women[2]. Modified radical mastectomy (MRM) is the common surgical procedure for breast cancer which removes a generous amount of skin, the entire breast, the axillary contents, but not the pectoralis major muscle[6,7]. Oncologic breast surgeries have commonly been performed under general anesthesia (GA) followed by 3-5 days inpatient hospitalization. However, general anesthesia (GA) does not eliminate the surgical stress response, can not provide effective postoperative pain control and may cause undesirable side effects. Postoperative pain is one of the most debilitating outcomes. The routine use of parenteral opioid is still inadequate and may further aggravate the unpleasant side effects such as nausea and vomiting, sedation, impaired oxygenation and depressed ventilation[8,9].

According to the magnitude of surgery involved extrathoracic, TEA is one of the regional anesthetic techniques that can be done by using a low dose of local anesthetic which preserves the respiratory function. In previous studies, TEA did not adversely affect ventilatory mechanics in patients with normal lung function and in patients who have chronic obstructive pulmonary disease (COPD)[5]. TEA can provide excellent pain relief without potential paralysis of respiratory muscles. It may have beneficial effect to those who have a difficult airway, compromised cardiac and pulmonary reserve, and elderly patients[1,9,10].

In the case report by O'Connor PJ et al., TEA was done successfully in a Klippel-Feil Syndrome patient associated with a history of difficult airway who was presented for bilateral reduction mammoplasty[11]. Also, some studies have shown that TEA with local anesthetics coadministered with opioids provide better outcomes after breast surgery than GA[12,13].

The present study was designed to compare TEA in combination with brachial plexus block (BPB) with GA in MRM for adequacy of anesthesia, surgical condition, postoperative analgesia, anesthetic recovery and patient' satisfaction.

Material and Method

After obtaining consent from the institutional ethics committee and complete written informed consent of all patients, the authors prospectively enrolled 50 adult women, ASA physical status I- III who were scheduled for elective MRM. Before surgery, all patients were instructed regarding the use of either a TEA technique or GA for the operation. Twenty-five patients were assigned to the TEA group and the other 25 patients to the GA group by the use of random number tables. The nurse-anesthetist, who was blind to the treatment group, conducted postoperative data collection.

The authors excluded the patients with contraindications to regional anesthesia (eg. infection at the site of planned epidural placement, any coagulation disorder, or known allergy to ropivacaine or opioids) and had multiple attempts of endotracheal intubation.

All patients received premedication with midazolam 7.5 mg orally 1-2 hours before surgery. In the TEA group, Lactated Ringer's solution 500 ml was infused intravenously (IV) before anesthesia. TEA was performed with aseptic technique, in the sitting position. An 18 guage Tuohy needle was inserted in the posterior median or paramedian at the level of T4-T5, the thoracic epidural space was identified by means of a loss-of-resistance technique. An epidural catheter was inserted 3 to 5 cm into the epidural space through the Touhy needle. The initial titrated dose of 10-15 ml of 0.2% ropivacaine injected through the catheter resulted in bilateral complete anesthesia of thoracic wall in the area 1-2 cm below the clavicle superiorly and the costal arch inferiorly (T_1-T_{10}). The interscalene approach, BPB was performed at the same side of the surgery with 8 ml of 0.2% ropivacaine to supplement analgesia for axillary node dissection. Then, the loss of cold sensation was tested and compared between both shoulders. Supplemental oxygen 2 LPM was administered via a nasal cannula for the duration of the surgery. Mild sedation was given with 1-2mg/hour of midazolam IV. If a patient complained about discomfort or pain, 0.2 mg/kg of ketamine IV would be given and a second bolus dose was allowed ten minutes later. If the supplemental analgesia was inadequate, general anesthesia would be proceeded. During the operation, top up dose with 0.2% ropivacaine 5-10 ml/hour was injected through the epidural catheter.

Postoperative pain in the TEA group was controlled with epidural morphine 1.5 mg. The epidural

catheter was removed at the end of the surgery.

All patients in the GA group were induced with 1 μg/kg of fentanyl IV and followed by 1.5-2.5 mg/kg of propofol. Tracheal intubation was facilitated with a nondepolarizing muscle relaxant, 0.8 mg/kg of atracurium IV. Anesthesia was maintained with sevoflurane in combination with N_2O 70% in oxygen. Tracrium 0.2 mg/kg IV every 10-20 mins and fentanyl 0.5 μg/kg/hour IV were administered as clinically indicated. Neostigmine 0.05 mg/kg with atropine 0.02 mg/kg were used for neuromuscular blockade reversal. Postoperative pain management in GA group was provided with 50 mg of tramadol IV every 6 hours for the first 24 hours.

Patient monitoring included noninvasive blood pressure measurement, heart rate, respiratory rate, electrocardiogram and pulse oximetry. In all patients, intraoperative hypotension and hypertension (± 30% deviation from baseline), bradycardia and tachycardia (± 30% deviation from baseline) were recorded. Hypotension was treated with 5 mg of ephedrine IV and bradycardia was treated with 0.3-0.6 mg of atropine IV. Anesthetic time was recorded, (in the TEA group, from time of local anesthetic injection to the end of surgery whereas in the GA group, from time of IV anesthetic induction to the end of surgery).

Immediately after the operation, the surgeon was asked to evaluate the operating condition in both groups on a scale of good, satisfactory and poor. The incidence of postoperative side effects (eg. nausea, vomiting, dizziness, sorethroat) was documented in the postanesthetic care unit (PACU) and in the ward. Postanesthetic recovery was evaluated immediately at PACU by using the Aldrete score system and original Wilson sedation score. Aldrete score involved the level of consciousness, motor activity, respiration, circulation, and oxygenation. Original Wilson sedation score was a 5-point scale (1 = fully awake and oriented, 2 = drowsy, 3 = eyes closed but rousable to command, 4 = eyes closed but rousable to mild physical stimulation, and 5 = eyes closed but unrousable to mild physical stimulation)[14]. Pain intensity was assessed in PACU with a simple, categorical verbal rating scale 0-10. Subsequently, patients were evaluated every 12 hours during the first 24 hours.

Postoperatively, all patients in both groups were advised to have bed rest for least 8 hours and were monitored for signs of respiratory depression (defined as respiratory rate less than 8 breaths/min). Then, 2 tablets of 500 mg acetaminophen were administered every 4 hours. Rescue analgesia with 25 mg of tramadol IV was given as patients requested. If the patients had nausea or vomiting, 10 mg of metoclopramide IV was given, and 10 mg of chlorpheniramine IV for itching. Patients' satisfaction with the anesthetic experience was also evaluated. All were asked to rate their overall experiences with the anesthetic techniques as good, satisfactory and poor.

Statistical analysis was performed with Stata version 8. Demographic data and anesthetic time were analysed by using Student's t–test. Postanesthetic recovery, postanesthetic pain, and patients' satisfaction were analysed by using Chi-square or Fisher's exact test as appropriate. Probability values of < 0.05 were considered to be statistically significant.

Results

Fifty patients were included in the present study. No patient was withdrawn from the study. Patients' demographic data and anesthetic time are listed in Table 1. There was no significant difference between the two groups.

In the present study, coexisting morbid diseases (eg. hypertension, coronary artery disease, obesity, Parkinson's disease, myasthenia gravis, and diabetes mellitus) were found in 40 percent of the

Table 1. Patient characteristics and anesthetic time

	GA Group (n = 25)	TEA Group (n = 25)	p-valve
Age (yr)	52.80±12.17	51.28±9.50	0.6249
Height (cm)	155.04±4.93	152.38±4.90	0.060
Weight (kg)	55.52±9.14	52.84±8.49	0.289
ASA (1:2:3)	9:13:3	12:11:2	0.670
Baseline SBP (mm Hg)	132.08±23.75	128.60±17.74	0.560
Baseline DBP (mm Hg)	75.68±10.60	72.56±12.77	0.35
Baseline HR (bpm)	73.16±11.32	72.64±9.86	0.86
Anesthetic time (min)	145 (60-235)	115 (75-240)	0.0581

Data are mean ± SD and median (range)

patients. All patients underwent a unilateral MRM with axillary node dissection. Estimated blood loss was minimal in all patients; none of them required blood transfusion.

Intraoperative hemodynamic effects were recorded (Table 2). There was no statistical significance between the groups. Hypertension and tachycardia were noted in the GA group only.

In the TEA group, the placement of the epidural catheter was successful in all patients. All patients had adequacy of anesthesia. None of them needed a supplementary drug or conversion to GA. The mean of respiratory rate was 18.4 $\pm$ 1.47 breaths/min. There was no incidence of intraoperative respiratory discomfort, hypoxemia (SpO2 < 90%), nausea, and vomiting. The average dose of ropivacaine used was 75.88 mg/case.

Fig. 1 illustrates the percentages of patients from both groups achieving an Aldrete score of 10 and sedation score of 1 immediately at postanesthetic care unit (PACU).

The number of patients with Aldrete score of 10 and sedation score of 1 was greater in the TEA group. Only the difference in the sedation score of 1 reached statistical significance between the groups ($p = 0.003$).

The results of postoperative pain intensity as recorded by verbal rating scale (VRS), for statistical purposes were dichotomized as a "substantial" (VRS > or = 5: moderate pain and severe pain) versus a "nonsub-stantial" (VRS < 5: no pain and mild pain) pain at PACU, 12 hours, and 24 hours postoperatively. The analysis shows (Fig. 2) that the GA patients experienced significantly more substantial pain than the TEA patients at PACU and 12 hours postoperatively ($p < 0.001$ in both periods). The number of patients who required rescue analgesia (Table 3) in the GA group was greater than the TEA group both at PACU and in the ward ($p = 0.002$ and $p < 0.001$ respectively).

Regarding postoperative adverse effects (Table 4), there was no difference in the incidences of nausea, vomiting, and shivering between the two groups. In the TEA group, there was no incidence of respiratory depression, pneumothorax, pruritus, backpain, and urinary retention. Sorethroat was noted in 24 percent of the patients in the GA group.

Surgical condition evaluated by surgeons was in the rating of "good" in all patients. Patient satisfaction with anesthetic experience is shown in Table 5. A significantly greater percentage of patients was satisfied with the TEA technique than the GA group ($p = 0.014$).

Table 2. Intraoperative hemodynamic effects

Hemodynamic effect	GA group (n = 25)	TEA Group (n = 25)	p-valve
Hypotension	1 (4%)	4 (16%)	0.349
Hypertension	5 (20%)	0 (0%)	0.050
Bradycardia	3 (12%)	5 (20%)	0.702
Tachycardia	3 (12%)	0 (0%)	0.235

Table 3. Postoperative analgesic requirement

	GA Group (n = 25)	TEA Group (n = 25)	p-valve
AT PACU	12 (48%)	2 (8%)	0.002
AT WARD	14 (56%)	1 (4%)	<0.001

Table 4. Postoperative adverse effects

	GA Group (n = 25)	TEA Group (n = 25)	p-valve
Nausea/vomiting			
- PACU	2 (8%)	3 (12%)	1.000
- WARD	13 (52%)	15 (60%)	0.569
Shivering at PACU	0 (0%)	1 (4%)	1.000

Table 5. Patients' Satisfaction

	GA Group (n = 25)	TEA Group (n = 25)	p-valve
Good	9 (36%)	19 (76%)	
Satisfactory	11 (44%)	5 (20%)	
Poor	5 (20%)	1 (4%)	0.014

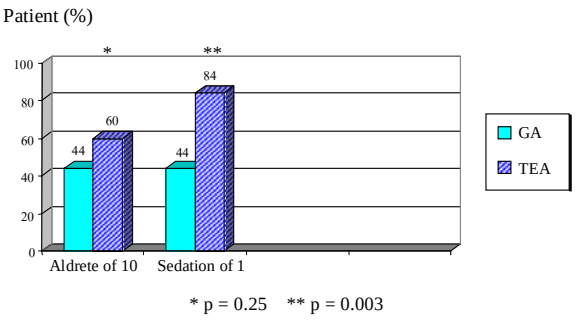

Fig. 1 Percentages of patients achieving an Aldrete score of 10 and sedation score of 1 at postanesthetic care unit

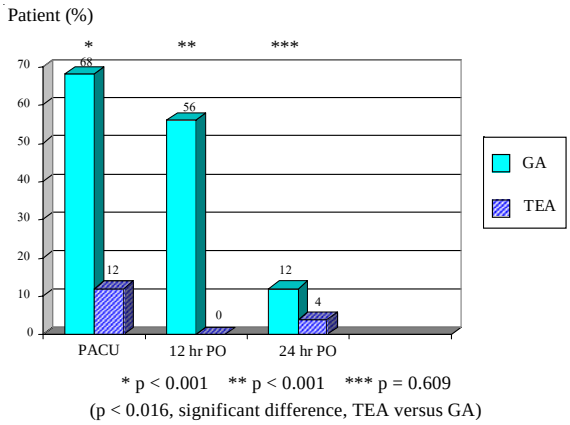

Fig. 2 Percentages of patients scoring a verbal rating scale (VRS) of moderate to severe pain at PACU, 12 hour and 24 hour postoperatively

Discussion

Despite substantial advances in the knowledge of acute pain mechanisms and their treatments, postoperative pain is generally not effectively treated. Improved understanding of peripheral and central mechanisms of pain offers new treatment options. In addition to humanitarian reasons for improving postoperative pain treatment especially in patients with cancer, there is convincing evidence that ineffective analgesia may result in harmful physiological and psychological effects. These adverse effects may result in significant morbidity and even mortality[15,16]. Regional anesthesia has a protective effect against the perioperative stress response and the beneficial effects have been attributed to the changes in physiology induced by neuroxial anesthesia and better pain management[15].

TEA has become increasing the practiced in recent years. High TEA can be used to avoid endotracheal intubation and offer less postoperative pulmonary complications when compared to systemic postoperative analgesia[17]. Reducing hypoxemia episodes in the postoperative period may help to reduce the incidence of myocardial ischemia in high-risk patients.

In the present series, breast cancer patients were older women and some of them had coexisting morbid diseases eg. hypertenstion (HT), coronary artery disease (CAD), diabetes mellitus (DM). All patients underwent a unilateral MRM with axillary node dissection, with the use of low dose 0.2% ropivacaine. None of them needed analgesic supplementation as TEA can provide adequate anesthesia with minimal hemodynamic or respiratory effect and without patient discomfort. Because surgery of the breast does not require motor blockade, it allows surgeons to use low concentration of the local anesthetic to produce a full sensory anesthesia sufficient for the surgery. Doss et al[8] used continuous TEA with 0.2% ropivacaine for perioperative management of MRM by inserting the epidural needle at the level of T6 to T7 with the catheter 3-5 cm in the epidural space. Although the site of puncture highly correlated with the cephalad extent of blockade, higher puncture sites resulted in less cephalad spread and more caudad spread[18]. Therefore, in the present study, the authors chose T4 to T5 level to favor cephalad spread of local anesthetic reaching up to T1 or T2 level[19].

In the present study, BPB was done to supplement the analgesia for axillary node dissection and facilitate the surgical condition smoothly. According to Doss NW et al, some patients in the TEA group required axillary local anesthetic supplementation. But in the authors' previous pilot study, it was found that TEA alone was ineffective and woke patients up with pain. The reason for using low dose and a small volume of ropivacaine was to minimize the incidence of Horner's syndrome and motor blockade. Although motor power of the blocked arm was diminished in 40 percent of the patients, they were still able to grip their hands and move their arms in the horizontal plane. None of them developed Horner's syndrome.

Intraoperative hemodynamic effects were minimal in both groups. However, bradycardia and hypotension were noted more often in the TEA group and were treated with only a single dose of 0.3 mg atropine or 5 mg ephedrine while tachycardia and hypertension were found only in the GA group. It may be correlated with patients' coexisting diseases or surgical stimulation, so it was corrected by antihypertensive agents and an increase in depth of anesthesia respectively. One of the presented patients had severe cardiac diseases (old age, CAD, old myocardial infarction, marked cardiomegaly, functional class III) and the surgery was done under TEA and was uneventful. Infact, the value of TEA for patients with severe cardiac disease has been reported[8,20,21].

Postanesthetic recovery was assessed by a sedation score of 1 and an Aldrete score of 10 immediately at PACU. The majority of patients in the TEA group were fully awake and oriented; 40 percent of them did not obtain Aldrete score of 10 due to partial motor blockade of the blocked arm so the Aldrete score was reduced by one. Eventhough the use of a low dose 0.2% ropivacaine was to minimize the motor

blockade effect after BPB, the incidence of motor weakness still was found. The anesthetic-analgesic effect of small dose BPB with ropivacaine for axillary node dissection has not been defined. The optimal dosage has to be established and needs further study. However, the overall postanesthetic recovery score was higher in the TEA group and was considered evidence for faster anesthetic recovery than GA.

Postoperative analgesia was more effective and less parenteral analgesic treatment was required in the TEA group, both in the PACU and at ward. Since the first use of epidural opioid in 1979, this technique has become widely accepted for the management of moderate to severe postoperative pain. Because of their high benefit-to-risk ratio (production of maximum analgesia with few side effects), it makes them ideal for managing of postoperative pain. Whether given as a single injection at the time of anesthesia through an indwelling epidural catheter, epidural opioids can provide prolonged and intense pain relief[22]. Indeed, the dynamic nature of postoperative pain means that the dosage required on the day of surgery may be higher than the dosage required on subsequent days. In the present study, the authors used epidural morphine 1.5 mg as a single injection for this operation which would have severe pain which usually lasted no longer than 24 hours. Therefore, pain intensity at 24 hours was minimal in both groups and did not show statistical significance. With such a dose, urinary retention, pruritus or respiratory depression were not found. The incidence of nausea and vomiting was not different in both groups. The episodes of nausea and vomiting in the TEA group were usually associated with the time to transfer the patients from bed to bed. Orthostatic hypotension might be the part of its cause. However, the severity of nausea and vomiting was less in the TEA group as indicated by the requirement of antiemetic treatment (n = 3 in TEA group and n = 8 in GA group). In GA group, intravenous tramadol was chosen due to lesser emetic effect than morphine.

In everyday practice should physicians consider the economically significant cost of a particular drug, new piece of equipment or technique the authors intend to use? The mean actual cost of the anesthetic technique in the TEA group was on average about 1,916.60 $\pm$ 43.24 baht and that in the GA group was about 3,327.40 $\pm$ 36.57 baht: or 40 percent lesser cost in the TEA group. It could be assumed that TEA is potentially cost saving.

Any invasive medical procedure with an inherent risk requires a thorough assessment of the risk and benefit ratio. The most common complication of epidural anesthesia is accidental dural perforation. Reports on the incidences of neurological complications vary greatly. The incidence of paresthesia and neurologic injuries is approximately 0.01-0.001 percent[1,23,24]. Vandermeulen et al concluded, "continuous awareness should enable us to make anesthetic practice safer without withholding anesthetic techniques from patients who would most certainly benefit from them"[1,25]. TEA combined with BPB can be used as an alternative technique for MRM and offers numerous beneficial effects especially for those patients who have potential risks of general anesthesia such as difficult intubation, chronic obstructive pulmonary disease, cardiovascular disease and elderly patients.

As a pain-free operation is one of the most exciting and rewarding moments in medicine, there is no circumstance for a patient to experience severe pain, amenable to safe intervention, when under a physician's care.

Conclusion

The present study shows that TEA combined with BPB by using a low dose of 0.2% ropivacaine is a safe and reliable alternative technique for MRM. It can provide not only effective anesthesia but also better postoperative pain relief, faster anesthetic recovery and greater patient satisfaction than those of the GA technique.

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การให้ยาชาระงับความรู้สึกทาง Thoracic epidural (TEA) ด้วย 0.2% Ropivacaine ร่วมกับการทำ Brachial Plexus Block (BPB) สำหรับการผ่าตัด Modified Radical Mastectomy (MRM)

เพชรา สุนทรฐิติ, กรวีร์ พสุธารชาติ, เยาวนุช คงด่าน, เพชรเอง สุรนัคครินทร์

บทนำ: *โรคมะเร็งเต้านมพบบ่อยเป็นอันดับ 2 ของโรคมะเร็งในสตรีไทย โดยทั่วไปการรักษาด้วยการผ่าตัดเต้านมในปัจจุบัน ใช้วิธีให้ยาระงับความรู้สึกทั่วไป (General anesthesia: GA) แบบใส่ท่อหายใจ แต่ข้อด้อยก็คือวิธีนี้ยังไม่สามารถให้การระงับความปวดภายหลังการผ่าตัดได้อย่างมีประสิทธิภาพ การบริหารยาระงับปวดกลุ่ม opioid ทางหลอดเลือดดำก็มักจะเกิดผลข้างเคียงเช่น คลื่นไส้อาเจียน และง่วงซึม*

การผ่าตัดมะเร็งเต้านมสามารถให้ยาชาเฉพาะที่ขนาดต่ำเพื่อระงับความรู้สึกทาง thoracic epidural ร่วมกับการทำ BPB ข้างเดียวกับที่จะเลาะต่อมน้ำเหลืองบริเวณรักแร้ ซึ่งเทคนิคนี้สามารถให้ผลการระงับปวดได้ดีกว่าโดยที่ผู้ป่วยไม่เกิดปัญหาการหายใจหรือง่วงซึม

วัสดุและวิธีการ: *ทำการศึกษาในผู้ป่วยหญิง 50 คน ASA Physical Status I-III ที่มารับการผ่าตัด MRM โดยแบ่งผู้ป่วยเป็น 2 กลุ่ม โดยการสุ่ม ในกลุ่ม TEA จะใส่สาย epidural ที่ระดับ T_4-T_5 ให้ยาชา 0.2% Ropivacaine 10-15 มิลลิลิตร จากนั้นทำ BPB ด้วยวิธี interscalene โดยใช้ 0.2% ropivacaine 8 มิลลิลิตร ระหว่างผ่าตัดให้ยาชา 0.2% ropivacaine ทาง epidural 5-10 มิลลิลิตรต่อชั่วโมง ส่วนกลุ่ม GA นำสลบด้วย fentanyl 1 ไมโครกรัมต่อกิโลกรัม ตามด้วย propofol 1.5-2 มิลลิกรัมต่อกิโลกรัมทางหลอดเลือดดำ ระหว่างผ่าตัดผู้ป่วยได้รับไนตรัสออกไซด์70%ในออกซิเจนร่วมกับ sevofluraneและยาหย่อนกล้ามเนื้อตามความเหมาะสม ผู้ทำการศึกษาจะประเมินความเพียงพอของการให้ยาระงับความรู้สึก การฟื้นตัว การระงับปวดหลังผ่าตัดและความพึงพอใจของผู้ป่วย*

ผลการศึกษา: *ข้อมูลพื้นฐานของผู้ป่วยทั้งสองกลุ่มไม่แตกต่างกัน ผู้ป่วยกลุ่ม TEA ที่มี sedation score = 1 เมื่อมาถึงห้องพักฟื้นมีจำนวนมากกว่ากลุ่ม GA อย่างมีนัยสำคัญ ($p = 0.003$) ในขณะที่ผู้ป่วยกลุ่ม TEA ที่มี Aldrete score = 10 ที่ห้องพักฟื้นก็มีจำนวนมากกว่ากลุ่ม GA แต่ไม่พบว่ามีนัยสำคัญทางสถิติ ($p = 0.25$) ผู้ป่วยกลุ่ม TEA มี verbal rating scale (VRS) ในเรื่องความปวดต่ำกว่าและต้องการยาระงับปวดน้อยกว่ากลุ่ม GA อย่างมีนัยสำคัญ ($p < 0.001$ และ $p = 0.002$ ตามลำดับ) นอกจากนี้ผู้ป่วยกลุ่ม TEA ยังมีความพึงพอใจสูงกว่ากลุ่ม GA อีกด้วย ($p = 0.014$)*

สรุป: *การศึกษานี้แสดงให้เห็นว่า การทำ TEA ร่วมกับ BPB โดยใช้ 0.2% ropivacaine เป็นอีกทางเลือกหนึ่งที่สามารถให้การระงับความรู้สึกในการผ่าตัด MRM ได้อย่างปลอดภัย มีประสิทธิภาพ และให้ผลการระงับปวดหลังการผ่าตัดได้ดีกว่า การฟื้นตัวจากการให้ยาระงับความรู้สึกเร็วกว่า และผู้ป่วยมีความพึงพอใจสูงกว่า เมื่อเทียบกับผู้ป่วยที่ได้ยาระงับความรู้สึกแบบทั่วไป*