

**A COMPARATIVE STUDY BETWEEN THORACIC
EPIDURAL ANESTHESIA AND GENERAL
ANESTHESIA FOR PATIENT WHO UNDERWENT
MODIFIED RADICAL MASTECTOMY WITH
AXILLARY LYMPH NODE DISSECTION IN DE LA
SALLE UNIVERSITY
MEDICAL CENTER**

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ABSTRACT

Objective: To compare the recovery time and other related clinical outcomes among patients who underwent Modified Radical Mastectomy (MRM) with axillary lymph node dissection under Continuous Thoracic Epidural Anesthesia (CTEA) and General Endotracheal Tube Anesthesia (GETA).

Material and Method: A retrospective cross-sectional study with 70 patients who underwent MRM in De La Salle University Medical Centre (DLSUMC), categorized into GETA and CTEA group consisted of 35 patients each. Per oral premedications 15 mg midazolam, 40 mg omeprazole and 10 mg metoclopramide were given 1 hour prior to surgery. Intraoperative hypotension/hypertension, tachycardia/bradycardia status, length of PACU and hospital stay, and PONV incidence were compared between 2 groups.

Results: Preoperatively, there were no significant differences between the groups in terms of subject characteristic. Intraoperatively, hypertension was more frequent in GETA group (28.6% vs 0%), while hypotension was more frequent in the CTEA (80% vs 57.1%). Tachycardia was more frequent in GETA group (46.6% vs 0%), meanwhile bradycardia was more frequent in CTEA (40% vs 17.1%). Postoperatively, the GETA group had shorter PACU stay than CTEA (230 mins vs 267 mins), but CTEA group had a shorter time of hospital stay compared to GETA (58.1 hours vs 67.7 hours). The incidence of PONV were comparable among the two groups (GETA 46.7% vs CTEA 50%). Statistically there were no significant differences between the two groups in all of the above characteristics.

Conclusion: CTEA technique has no effect on inducing hypertension and tachycardia, but hypotension and bradycardia may occur. Although GETA gives shorter PACU duration, CTEA gives shorter hospital stay. This gave impression that CTEA is an effective alternative technique to GETA in patients who underwent MRM with axillary dissection.

Key words: Modified radical mastectomy, general anesthesia, epidural anesthesia



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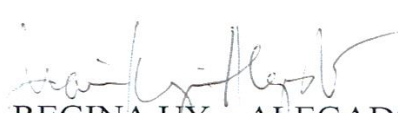
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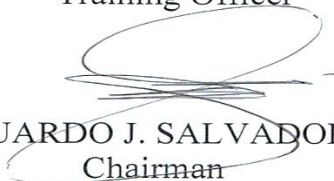
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Mastectomy with Axillary Lymph Node Dissection in De La Salle
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I. INTRODUCTION

Oncologic breast surgeries have been typically performed under general anesthesia for ages. Although they produce the desired state of unconsciousness, clinical studies showed that this technique (with exception of large dose of opioids) do not eliminate the surgical stress response; it may aggravate immunosuppression and may cause undesirable side effects such as nausea and vomiting up to 24 hours after surgery. The complication has been described by patient as being more debilitating than the mastectomy itself.¹⁻⁵

Thoracic epidural anesthesia is frequently used for aesthetic breast surgeries, but reports of its use for mastectomies with axillary lymph node dissection are very rare. Clinical evidences suggest that epidural anesthesia has been associated with fewer postsurgical recovery complications and shorter hospital stays, but the adequacy of thoracic and axillary blockade during lymph node dissection is still a problem.¹⁻⁵

Although several research were done using Continuous Thoracic Epidural Anesthesia (CTEA) as alternative of General Endotracheal Tube Anesthesia (GETA) technique during Modified Radical Mastectomy (MRM), they were all foreign studies. It is significant to know the clinical outcome among Filipino patients especially since there was no previous local study. Therefore, this study aimed to compare the recovery time and other related clinical outcomes such as intraoperative hemodynamics and Post-Operative Nausea and Vomiting (PONV) among MRM patients who underwent GETA and CTEA technique by measuring duration of stay in Post-Anesthesia Care Unit (PACU) and hospital postoperatively.

II. RESEARCH OBJECTIVES

II. 1 General Objectives

The main objective of this study is to compare the difference in the outcome between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy.

II.2 Specific Objectives

1. To determine intra-operative hemodynamic condition in patients undergoing MRM under CTEA and GETA.
2. To determine the incidence of nausea and/or vomiting in patients undergoing MRM under CTEA and GETA.
3. To determine the length of PACU stay in patient undergoing MRM under CTEA or GETA.
4. To determine the length of hospital stay in patient undergoing MRM under CTEA or GETA.
5. To determine the significant difference on the efficacy between CTEA and GETA for patients undergoing MRM in terms of the length of PACU stay and length of hospital stay.

III. METHODOLOGY

III.1 Study Design

A retrospective cross-sectional study was done for patient who underwent MRM under thoracic epidural anesthesia and general anesthesia.

III.2 Study Population

This study reviewed MRM procedure performed in DLSUMC from July 2008 to June 2013 using either CTEA or GETA technique. A total of 91 patients' charts were gathered, listed and segregated into GETA group and CTEA group.

Sample size was computed using OpenEpi version 3.0.1., to detect 60% frequency of outcome factor in the population based on study done by Belzarena with confidence level of 95%. A total of 35 subjects were required for each group in this study. The random number tables were used to randomize the samples until 35 subjects were achieved for each group.

Adult woman with ASA classification I or II and no history of previous chemotherapy were included in this study. Meanwhile, patients who received intervention of combined GETA and CTEA, GETA with total intravenous anesthesia (TIVA) or GETA with combination of postoperative epidural morphine were excluded from the study.

III.3 Data Collection Methods

Preoperative, intraoperative, and postoperative data of each patient were obtained from anesthesia records, PACU notes, and chart progress notes. Data

concerning the patients, including age, diagnosis, type of anesthesia, length of hospital stay, postoperative nausea and/or vomiting, intraoperative hypotension/hypertension, and tachycardia/bradycardia. Data will also be collected on the number of successful and failed epidurals performed by individual anesthesiologist.

III.4 Plan for Data Analysis

Patients' demographic data such as age, weight, and duration of surgery was analyzed using descriptive analysis with 95% confidence interval and presented in means \pm sd. The intraoperative hemodynamic results were tabulated, compared and interpreted through cross tabulation method. The length of PACU stay and the length of hospital stay results were tabulated and represented through histogram. The comparisons of both techniques in terms of length of PACU and hospital stay were measured statistically using measurement of central tendency and t-test. All analyses were done with STATISTICA 6.1.

III.3 Operational Definition of Variables

a) CTEA technique: CTEA was performed using sterile technique, with the patient in left lateral decubitus position. The thoracic epidural space was identified by loss of resistance to air technique. Epidural catheter was inserted into the epidural space through an epidural Touhy needle G18 placed in one of the spaces between T6-T8 vertebrae. The patient was then placed in supine position. Twenty mL of 0.25% bupivacaine was administered in 5 mL fractions.

After testing the quality of anesthesia (adequate analgesia from the lower border of the clavicle to the inferior costal margin) using pin prick method, the surgery was initiated. Anesthesia was maintained by injecting 5 mL of 0.25% bupivacaine every 60 to 90 minutes through the epidural catheter. Titration of LA and sedation of 1-3 mg/kg/hr propofol infusion was continued during the surgical procedure.

- b) **GETA technique:** GETA was induced with intravenous midazolam, nalbuphine, and propofol. Rocuronium was given to facilitate tracheal intubation. Anesthesia was maintained with sevoflurane/desflurane/isoflurane in 100% oxygen. Supplementation of fentanyl was given as analgesia whenever necessary.
- c) **MRM:** removal of breast and axillary lymph nodes with the preservation of the pectoralis major muscle.
- d) **Duration of surgery:** the time in minutes from induction of anesthesia until operation ended.
- e) **Intraoperative hemodynamic:** hypotension and hypertension (>20% deviation from baseline), bradycardia (heart rate <60 beats/minute) and tachycardia (heart rate >100 beats/minute).
- f) **Nausea and/or vomiting:** postoperative dizziness or vomiting that treated or not treated with antiemetic.
- g) **Length of post anesthesia care unit (PACU) stay:** the time in minutes from the patient was received at recovery room (RR) until transferred back to room.

h) Length of hospital stay: the number of hours from the patient was operated until the surgeon discharged patients from the hospital on the basis of the usual discharge criteria, which includes no medical or surgical complications, adequate pain control while taking oral medications, and an ability to tolerate fluids without nausea or vomiting.

Preoperative data including age, ASA physical status, diagnosis, and type of anesthesia. Intraoperative data including patient hemodynamic condition and duration of surgery. Postoperative data including incidence of PONV, length of PACU stay and length of hospital stay.^{1,2,3,6}

IV. RESULTS

The data were categorized into two groups, the GETA group and the CTEA group as shown in Table I. The two groups were compared based on age, weight, ASA classification, duration of surgery, intra-operative hemodynamic, PONV, and the length of PACU and hospital stay.

There were no significant differences between the groups in terms of age, weight and ASA physical status classification. Overall, the patients were older women, with 67% had coexisting morbid diseases (hypertension, ischemic heart disease, coronary arterial disease, diabetes, cerebrovascular disease, asthma, bronchitis, thyroid disorders, anxiety disorders and depression). All patients underwent a unilateral modified radical mastectomy with axillary lymph node dissection. There were no failures in the placement of the epidural catheter. The comparison of the duration of surgery showed that CTEA group had 30 minutes longer duration compared to GETA group.

The intraoperative hemodynamic results were tabulated and compared. The rate of hypertension was more frequent in GETA group (28.6% vs 0%), while hypotension was more frequent in the CTEA (80% vs 57.1%). Tachycardia was more frequent in GETA group (46.6% vs 0%). Meanwhile, bradycardia was more frequent in CTEA group (40% vs 17.1%).

Table IV.1 Subject Characteristics

Category	GETA (N = 35)	CTEA (N = 35)
Preoperative Results		
Age (years)	53.7 ±10.7	54.2±13.7
Weight (kgs.)	60.5 ±9.82	55.9±6.17
ASA	I = 10 (28.6%) II = 25 (71.4%)	I = 13 (37.1%) II = 22 (62.9%)
Intraoperative Results		
Duration of Surgery	196 ±48.5	226±52.3
Intra-operative Hemodynamic	Hypertension = 10 (28.6%) Hypotension = 20 (57.1%) Tachycardia = 17 (46.6%) Bradycardia = 6 (17.1%)	Hypertension = 0 (0%) Hypotension = 28 (80%) Tachycardia = 0 (0%) Bradycardia = 14 (40%)
Postoperative Results		
PONV	14 (46.7%)	15 (50%)

In terms of PONV, this study showed that there was no statistically significant difference between the two groups even though most studies stated that general anesthesia caused a greater frequency and severity of nausea and vomiting than regional anesthesia.

The length of PACU and hospital stay were the primary outcome that was measured to evaluate the patient recovery time. The result showed that GETA group had 37 minutes shorter PACU stay than CTEA group (230 ±91.2 minutes vs 267±104 minutes) (Figure 1). Although this gave impression that GETA was a better method than CTEA in terms of PACU stay, CTEA group had a shorter time of hospital stay compared to GETA group (58.1±12.4 hours vs 67.6±30.6 hours) (Table 1).

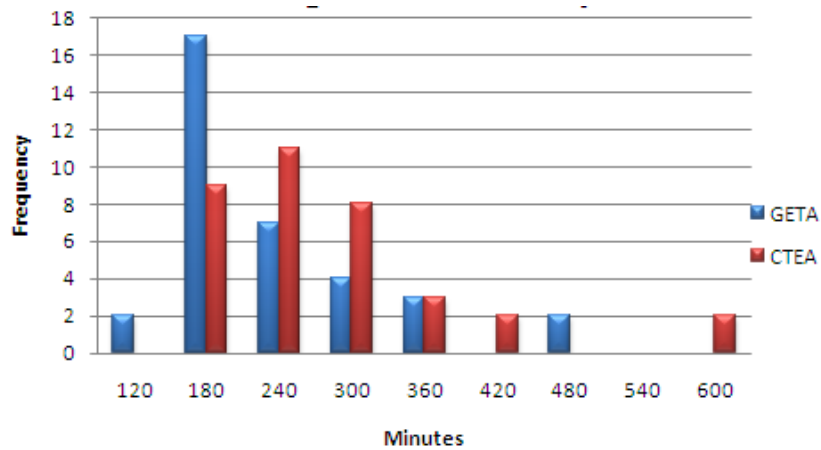


Figure IV.1. Length of PACU Stay

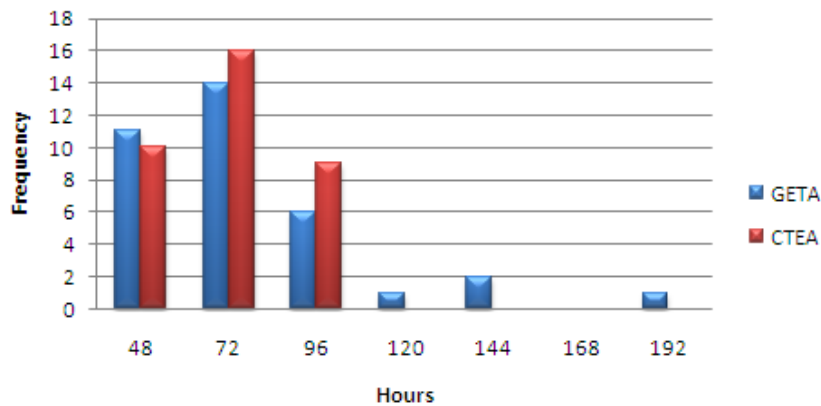


Figure IV.2. Length of Hospital Stay

In terms of hospital stay most of the patients in CTEA group was discharged after 3 days postoperatively and none of them were hospitalized more than 4 days as compared to GETA group (Figure 2).

Statistical t-test was used to determine the significant of the two groups as regards patient recovery time based on the length of PACU and hospital stay as stated in Table II and Table III. These tables showed that the computed t-value

inside the critical value with 0.05 is the level of significance. Therefore, there was no significant difference between the two groups.

Table IV.2 Length of PACU Stay in Patient Undergoing Modified Radical Mastectomy under Thoracic Epidural Anesthesia and General Anesthesia.

Category	GETA n = 35	CTEA N = 35
Mean	230	267
Max	480	570
Min	120	150
Degrees of Freedom	68	
Critical Value	± 1.995	
T	-1.62	
Remark	No significant difference	

Table IV.3. Length of Hospital Stay in Patient Undergoing Modified Radical Mastectomy under Thoracic Epidural Anesthesia and General Anesthesia

Category	GETA n = 35	CTEA n = 35
Mean	67.6	58.1
Max	191	77
Min	41	43
Degrees of Freedom	68	
Critical Value	± 1.995	
T	1.70	
Remark	No significant difference	

V. DISCUSSION

Currently, breast cancer is the most common cancer in females and surgical intervention with axillary lymph nodes dissection is still the main treatment. Intervention using radical mastectomy (excision of the breast overlying skin, underlying pectoralis major and the regional lymph nodes) was largely used. Unfortunately, a large number of women still continued to die due to metastasis. Nowadays, randomized trials have demonstrated that intervention using MRM (removal of breast and axillary lymph nodes with the preservation of the pectoralis major muscle) had equivalent patient survival rate to the old radical mastectomy technique. Later, modern therapy evolved into both surgical resection and medical or radiation therapy for treating breast cancer patients. This has allowed dramatic reductions in extensive breast surgery and majority of patients have been now eligible for breast-conserving surgery.⁷⁻⁹

Current studies showed that CTEA was a safe and reliable alternative to GETA for women undergoing MRM. The factors which dictated the selection of surgical and anesthetic management were the type and extent of breast cancer, as well as the age, weight, comorbidities, and general condition of the patient.² Those preoperative subject characteristics in both groups were statistically comparable in this study.

In clinical practice, it is important to consider that either GETA or CTEA technique that will be used should provide adequate intraoperative anesthesia and good postoperative analgesia without collateral effects and with the minimum

hospitalization time.² As a matter of fact, the quality of anesthesia was adequate in all patients in this study intraoperatively.

When CTEA technique is selected, the problems related with thoracic and axillary innervations. In an axillary dissection, level I and II lymph nodes are removed. These nodes lie behind and lateral to the edge of the pectoralis minor muscle, in this part of surgery the sensory block should reach C4 dermatome. Thus, when it is tested, as in the present study, the blockade is well established below the clavicle.^{2,9} It explains why in this study there was no supplementation of LA infiltration during axillary lymph nodes dissection in CTEA group.

The data of the present study showed that up to C4 dermatome blockade could be consistently achieved with epidural catheter insertion at the level of low thoracic (T6-T8), threaded 4 cm cephalad, and administration of 20 mL 0.25% bupivacaine (~50 mg). This technique was supported by a study done by Visser et al. They concluded that the total dose of local anesthetic was the most important determinant factor for the extent of the blockade, while the site of epidural puncture controlled the pattern of distribution of sensory blockade. Epidural injection of 10-20 mL LA at lower thoracic segment (T6-L1) would give more cranially sensory blockade (C6-T1 to T11-L4) and combination of several patients and technical factors such as age, position, mode and speed of injection may aid in predicting LA dose requirements. As regards epidural catheter insertion, orienting the bevel of the Touhy needle caudal or cranial did not reliably predict final thoracic position related to the puncture site. However, the optional distance to thread a catheter suggested

4-6 cm in epidural space. Threading shorter or longer distances may result in inadequate analgesia or increase incidence of venous cannulation respectively.¹⁰

Groeben et al used 6.6 mL of 0.75% bupivacaine (~49.5 mg) to perform thoracic block in patients with severe COPD and asthma. There was no increase in airway obstruction and evoked only mild respiratory motor blocked.⁶ Fifty milligrams of bupivacaine that was used in this study was not considered a high dose because MRM procedure did not require intense muscle relaxation and this dose avoided respiratory compromise. All patients in CTEA group were maintained uneventfully with oxygen via face mask at 4-5 lpm perioperatively even patients with history of respiratory problem. Meanwhile, performing general anesthesia with tracheal intubation in patients with history of coexisting bronchial hyperreactivity could elicit life-threatening bronchospasm.

Hypotension and bradycardia were more frequent in CTEA group. This was correlated with the induction of anesthesia after giving loading dose of LA; however, hypotension was easily treated with fluid administration or a single bolus of 10 mg ephedrine if systolic blood pressure decreased below 80 mmHg. On the other hand, hypertension and tachycardia was noted in GETA group only. It was correlated with intubation and surgical stimulation especially after skin incision. Aside from increasing the depth of anesthesia, most of the patients in this group received intraoperative increment of boluses of fentanyl with a total of 50-100 µg to decrease the sympathetic response that took place due to surgical stimuli. General anesthesia, although they produce the desired state of unconsciousness, do not eliminate the surgical stress response because of its lack of analgesic properties.

Inhalational anesthetics, which was also used in this study, are the most common drugs used for the provision of general anesthesia. Adding a fraction of volatile anesthetic to the inspired oxygen will give a state of unconsciousness and amnesia, but when it is combined with intravenous adjuvants, such as opioids, a balanced technique is achieved that results in analgesia, further hypnosis and amnesia. During operation, large dose of opioid might be needed for maintenance of balance anesthesia in treating adrenergic responses due to noxious stimuli, especially in patients with coexisting cardiovascular disease. Stress associated with anesthesia and surgery results in increased catecholamine levels, increased left ventricular afterload, heart rate, and cardiac complications. Fentanyl is a potent and highly lipid soluble opioid, which has a rapid onset, predictable duration, and high margin of safety for use in clinical anesthesia. Fentanyl can reduce the MAC of volatile anesthetic, and administration of 1.5 µg/kg IV 5 minutes prior to skin incision will reduce the MAC-BAR of volatile anesthetic.^{1,2,5,11,12}

On the other hand, the benefits of thoracic epidural, which are to selectively block sensory and cardiac sympathetic fibers, attenuate surgical stress response, improve myocardial oxygen balance and stabilize intra-operative hemodynamics are particularly relevant for patients with coexisting cardiac morbidity.¹

Regional block has a lower incidence of nausea and vomiting, when compared to general anesthesia, which has been demonstrated in several procedures and studies.¹⁻⁶ But in this study, the incidence of this complication was statistically not significant. This might due to the opioids that were used for postoperative pain

control in both groups (intravenous oxycodone/tramadol in GETA group and epidural morphine in CTEA group).

Regarding the adjuvants drugs that were used in this study, such as opioids and propofol, nausea and vomiting are among the most distressing side effects of morphine and related opioids. The incidence of opioid-induced nausea and vomiting appears to be similarly irrespective of the route of administration. They induce nausea and vomiting by direct stimulation of the CTZ and also by increased vestibular sensitivity such as during postoperative ambulation.¹¹ In high frequency, it will be distressing to patients and potentially detrimental to their postoperative recovery.

Propofol possess antiemetic properties that can lower the incidence of PONV. In fact, subanesthetic doses of propofol (10 to 20 mg) have also been successfully used to treat nausea and vomiting in the early postoperative period.^{11,12} In this study, even though continuous propofol infusion was done intraoperatively in CTEA group, morphine-induced PONV still prevailed. The possible explanation might be that the antiemetic effects of propofol is more short-lived than the emetic effects of morphine due to accumulation of active metabolite morphine-6-glucuronide. In this group epidural morphine was ordered for 48 hours postoperative.

In this study, the CTEA group had 37 minutes longer PACU stay compared to GETA group. Although it was statistically not significant, some factors that might have influenced this result could be evaluated. Different drugs with different

elimination that were used intraoperatively in both groups could affect patient emergence time and would influence the length of PACU stay.

Continued propofol infusion to maintain sedation in CTEA group lasted for an average of 226 minutes surgical duration (~3-4 hrs). The emergence from intravenous hypnosis agents is dependent primarily on its redistribution in body compartments. A 50% decrease in plasma concentration is required for the awakening at the end of propofol infusion. Thus, duration of unconsciousness is affected by many things, such as context-sensitive half-life, amount of drug, co-administration with other drug (opioids, benzodiazepine) and patient's factors. Desflurane, sevoflurane, and isoflurane are the most popular potent inhaled anesthetics used in adult surgical procedure, and was also used in our GETA group. Inhaled anesthetics allow rapid emergence because of its easy titratability. Emergence from inhalational anesthesia depends on pulmonary elimination of the drug and MAC awake (the end-tidal concentration associated with eye-opening to verbal command) which is approximately 30% of MAC (desflurane 2.17%, sevoflurane 0.61%, isoflurane 0.39%). Time of emergence is quicker in gas with lower blood-gas solubility (desflurane 4 min, sevoflurane 7 min, isoflurane 11.5 min).¹¹⁻¹⁵

Another factor that might prolong PACU stay are the incidence of PONV and human factors such as late discharge order from attending anesthesiologist. The length of hospital stay in CTEA group was 9.5 hours shorter than GETA group. This is important in measuring patient recovery time since the patient could readily return to their families and social environment. Unfortunately, in a deeper statistical

analysis this time difference showed no statistical significance. The use of opioids for postoperative analgesia in both groups for 24-48 hours might explain the delay of patients' recovery time. Although it gave adequate postoperative pain control in both groups, it also caused prominent nausea and vomiting that prevented the patient to have early ambulation and oral feeding. Study by Doss et al also gave the same result as this study, but instead of epidural morphine they used intravenous hydromorphone or meperidine for postoperative analgesia in both GETA and CTEA groups.^{1,11}

VI. CONCLUSION

Preoperatively, subject characteristics between the two groups in this study were comparable. Intraoperative hemodynamic results suggested that CTEA technique has no effect on inducing hypertension and tachycardia, but hypotension and bradycardia may occur. Although GETA has a shorter duration than CTEA in terms of PACU stay, CTEA had a shorter time of hospital stay compared to GETA. This gave impression that CTEA was a safe and reliable alternative technique to GETA for patient undergoing MRM with axillary dissection. Successful use of CTEA in MRM surgery could avoid problems of difficult tracheal intubation, stress of anesthesia and surgery and hemodynamic changes associated with tracheal intubation. Nevertheless, it is important to always remember that patients' general condition and the extensiveness of surgery should become main consideration as regards the selection of anesthetic management.

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APPENDICES

TABULATED DATA

Table 1 - Patients who underwent GETA

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
1	73	55	2	150	hypotension	180	48
2	40	45	2	180	hypertension tachycardia	300	43
3	61	52	2	160	hypotension tachycardia vomiting	300	92
4	45	60	1	155	hypotension tachycardia	240	45
5	56	59	1	185	hypotension bradycardia vomiting	180	44

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
6	43	50	1	175	hypertension tachycardia nausea vomiting	180	72
7	64	54	2	210	hypertension tachycardia	180	55
8	64	84	2	180	hypotension tachycardia	150	70
9	56	54	2	260	hypotension tachycardia nausea vomiting	360	74
10	58	60	2	215	hypotension vomiting	480	123
11	41	60	2	200	hypotension	180	49

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
12	64	68	2	225	hypotension bradycardia nausea	180	95
13	41	70	2	245	tachycardia	240	74
14	54	64	2	255	hypertension tachycardia	300	51
15	53	53	1	145		150	41
16	51	48	1	195	hypotension	240	52
17	44	64	2	145	hypotension tachycardia	240	43
18	41	53	2	250	hypotension bradycardia	180	48
19	59	63	2	195	hypertension hypotension tachycardia	480	80

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
20	60	57	2	105	hypotension tachycardia nausea vomiting	360	65
21	61	67	2	180	hypotension	180	74
22	48	56	2	150	hypertension	150	47
23	47	54	1	185	hypertension tachycardia	210	52
24	34	51	1	180	hypotension bradycardia	180	101
25	67	62	2	130		150	46
26	50	90	2	215	tachycardia	150	72

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
27	77	60	2	190	hypotension tachycardia bradycardia	180	125
28	54	60	1	140	hypertension vomiting	300	46
29	46	58	1	270	hypertension tachycardia	120	43
30	58	75	2	345	hypotension	240	191
31	61	72	2	250	hypertension tachycardia	240	54
32	43	74	2	195	vomiting	360	66

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
33	73	53	2	175	hypotension	180	68
34	53	60	2	260	hypertension	120	67
35	39	52	1	180	hypotension tachycardia	180	50

Table 2 - Patients who underwent CTEA

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
1	47	68	2	185	hypotension bradycardia nausea vomiting	210	48
2	50	62	2	280	hypotension	240	76
3	30	55	1	135		180	77
4	58	62	2	360	Hypotension bradycardia	240	71
5	70	56	2	260	hypotension	270	76
6	89	49	2	260	hypotension vomiting	570	71
7	56	60	2	245	hypotension	360	46
8	54	57	2	220	hypotension bradycardia	300	53

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
9	74	68	2	185	hypotension bradycardia	240	53
10	51	51	2	225	hypotension bradycardia	420	73
11	64	60	2	265	bradycardia nausea	300	77
12	57	50	3	190	hypotension	180	61
13	42	56	1	290		240	50
14	49	57	2	175	hypotension	300	48
15	55	44	1	180	hypotension	240	48
16	38	50	1	260	hypotension	210	49
17	41	56	1	175	hypotension nausea vomiting	210	75

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
18	68	57	2	265	hypotension bradycardia	270	53
19	38	69	1	180	hypotension nausea vomiting	210	47
20	50	58	1	150	hypotension	180	47
21	49	59	2	175	hypotension	180	51
22	70	50	2	155	hypotension bradycardia	330	43
23	51	53	1	285		150	53
24	55	65	2	285	hypotension	180	49

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
25	51	54	2	190	hypotension bradycardia vomiting	180	53
26	47	50	1	175	hypotension bradycardia vomiting	150	46
27	37	47	1	180		300	75
28	64	60	2	265	bradycardia nausea	300	77
29	38	50	1	260	hypotension	210	49
30	68	57	2	265	hypotension bradycardia	270	53

Patient	Age	Weight (kgs.)	ASA	Duration of Surgery (mins.)	Intraoperative Hemodynamic	Length of PACU Stay (mins.)	Length of Hospital Stay (hrs.)
31	89	49	2	260	Hypotension vomiting	570	71
32	42	56	1	290		240	50
33	47	50	1	175	hypotension bradycardia vomiting	150	46
34	56	60	2	245	hypotension	360	46
35	51	51	2	225	hypotension bradycardia vomiting	420	73

STATISTICAL ANALYSIS

Length of PACU stay

1. Claim: The significant difference on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of PACU stay.
2. Null Hypothesis: $H_0 = H_1$. There were no significant differences on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of PACU stay.
Alternative Hypothesis: $H_0 \neq H_1$. There were significant differences on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of PACU stay.
3. The significance level is 0.05. Using sample data, we will conduct t-test.
4. The test statistic is the t - test.

$$t = -1.62$$

$$sdev = 97.5$$

degrees of freedom = 68 The probability of this result, assuming the null hypothesis, is 0.11

Group A: Number of items = 35

120. 120. 150. 150. 150. 150. 150. 180. 180. 180. 180. 180. 180. 180. 180.

180. 180. 180. 180. 210. 240. 240. 240. 240. 240. 240. 300. 300. 300. 300.
360. 360. 360. 480. 480.

Mean = 230.

95% confidence interval for Mean: 196.8 thru 262.6

Standard Deviation = 91.2

Hi = 480. Low = 120.

Median = 180.

Average Absolute Deviation from Median = 65.1

Group B: Number of items= 35

150. 150. 150. 180. 180. 180. 180. 180. 180. 210. 210. 210. 210. 210. 240.
240. 240. 240. 240. 240. 270. 270. 270. 300. 300. 300. 300. 300. 330. 360.
360. 420. 420. 570. 570.

Mean = 267.

95% confidence interval for Mean: 234.5 thru 300.3

Standard Deviation = 104.

Hi = 570. Low = 150.

Median = 240.

Average Absolute Deviation from Median = 72.0

5. Critical values: t-critical = 1.955
6. Decision: accept $H_0 = H_1$.
7. Interpretation: Since -1.62 is not between -1.955 and +1.955 and it is inside the acceptance region, therefore accept the null hypothesis. Generally, : $H_0 = H_1$.

There were no significant differences on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of PACU stay.

Length of Hospital stay

1. Claim: The significant difference on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of hospital stay.
2. Null Hypothesis: $H_0 = H_1$. There were no significant differences on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of hospital stay

Alternative Hypothesis: $H_0 \neq H_1$. There were significant differences on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of hospital stay.

Data

3. The significance level is 0.05. Using sample data, we will conduct t-test.
4. The test statistic is the t - test.

t= 1.70

sdev= 23.3

degrees of freedom = 68 The probability of this result, assuming the null hypothesis, is 0.094

Group A: Number of items= 35

41.0 43.0 43.0 43.0 44.0 45.0 46.0 46.0 47.0 48.0 48.0 49.0 50.0 51.0 52.0 52.0
54.0 55.0 65.0 66.0 67.0 68.0 70.0 72.0 72.0 74.0 74.0 74.0 80.0 92.0 95.0 101.
123. 125. 191.

Mean = 67.6

95% confidence interval for Mean: 59.73 thru 75.47

Standard Deviation = 30.6

Hi = 191. Low = 41.0

Median = 55.0

Average Absolute Deviation from Median = 20.2

Group B: Number of items= 35

43.0 46.0 46.0 46.0 46.0 47.0 47.0 48.0 48.0 48.0 49.0 49.0 49.0 50.0 50.0 51.0
53.0 53.0 53.0 53.0 53.0 53.0 61.0 71.0 71.0 71.0 73.0 73.0 75.0 75.0 76.0 76.0
77.0 77.0 77.0

Mean = 58.1

95% confidence interval for Mean: 50.24 thru 65.99

Standard Deviation = 12.4

Hi = 77.0 Low = 43.0

Median = 53.0

Average Absolute Deviation from Median = 9.97

5. Critical values: $t\text{-critical} = 1.955$
6. Decision: accept $H_0 \neq H_1$.
7. Interpretation: Since 1.72 were not between -1.955 and +1.955 and it was inside the acceptance region, therefore accept the null hypothesis and reject the alternative hypothesis. Generally, $H_0 \neq H_1$. There were no significant differences on the efficacy between thoracic epidural anesthesia and general anesthesia for patients undergoing modified radical mastectomy in terms of the length of hospital stay

Age

Student's t -Test: Results

$t = -0.166$

sdev = 12.3

degrees of freedom = 68 The probability of this result, assuming the null hypothesis, is 0.87

Group A: Number of items = 35

34.0 39.0 40.0 41.0 41.0 41.0 43.0 43.0 44.0 45.0 46.0 47.0 48.0 50.0 51.0 53.0

53.0 54.0 54.0 56.0 56.0 58.0 58.0 59.0 60.0 61.0 61.0 61.0 64.0 64.0 64.0 67.0

73.0 73.0 77.0

Mean = 53.7

95% confidence interval for Mean: 49.55 thru 57.82

Standard Deviation = 10.7

Hi = 77.0 Low = 34.0

Median = 54.0

Average Absolute Deviation from Median = 8.77

Group B: Number of items= 35

30.0 37.0 38.0 38.0 38.0 41.0 42.0 42.0 47.0 47.0 47.0 49.0 49.0 50.0 50.0 51.0

51.0 51.0 51.0 54.0 55.0 55.0 56.0 56.0 57.0 58.0 64.0 64.0 68.0 68.0 70.0 70.0

74.0 89.0 89.0

Mean = 54.2

95% confidence interval for Mean: 50.03 thru 58.31

Standard Deviation = 13.7

Hi = 89.0 Low = 30.0

Median = 51.0

Average Absolute Deviation from Median = 10.0

Weight

Student's *t*-Test: Results

$t = 2.35$

sdev= 8.20

degrees of freedom = 68 The probability of this result, assuming the null

hypothesis, is 0.022

Group A: Number of items= 35

45.0 48.0 50.0 51.0 52.0 52.0 53.0 53.0 53.0 54.0 54.0 54.0 55.0 56.0 57.0 58.0
59.0 60.0 60.0 60.0 60.0 60.0 60.0 62.0 63.0 64.0 64.0 67.0 68.0 70.0 72.0 74.0
75.0 84.0 90.0

Mean = 60.5

95% confidence interval for Mean: 57.72 thru 63.25

Standard Deviation = 9.82

Hi = 90.0 Low = 45.0

Median = 60.0

Average Absolute Deviation from Median = 7.11

Group B: Number of items= 35

44.0 47.0 49.0 49.0 50.0 50.0 50.0 50.0 50.0 50.0 51.0 51.0 53.0 54.0 55.0 56.0
56.0 56.0 56.0 57.0 57.0 57.0 57.0 58.0 59.0 60.0 60.0 60.0 60.0 62.0 62.0 65.0
68.0 68.0 69.0

Mean = 55.9

95% confidence interval for Mean: 53.12 thru 58.65

Standard Deviation = 6.17

Hi = 69.0 Low = 44.0

Median = 56.0

Average Absolute Deviation from Median = 4.86

Duration of surgery

Student's *t*-Test: Results

$t = -2.46$

$sdev = 50.4$

degrees of freedom = 68 The probability of this result, assuming the null hypothesis, is 0.016

Group A: Number of items = 35

105. 130. 140. 145. 145. 150. 150. 155. 160. 175. 175. 180. 180. 180. 180. 180.
185. 185. 190. 195. 195. 195. 200. 210. 215. 215. 225. 245. 250. 250. 255. 260.
260. 270. 345.

Mean = 196.

95% confidence interval for Mean: 179.4 thru 213.4

Standard Deviation = 48.5

Hi = 345. Low = 105.

Median = 185.

Average Absolute Deviation from Median = 36.0

Group B: Number of items = 35

135. 150. 155. 175. 175. 175. 175. 175. 180. 180. 180. 185. 185. 190. 190. 220.
225. 225. 245. 245. 260. 260. 260. 260. 260. 265. 265. 265. 265. 280. 285. 285.
290. 290. 360.

Mean = 226.

95% confidence interval for Mean: 209.1 thru 243.2

Standard Deviation = 52.3

Hi = 360. Low = 135.

Median = 225.

Average Absolute Deviation from Median = 45.4