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Original Research Article

Comparing the Efficacy of Ligasure System vs Conventional Electrocautery for Modified Radical Mastectomy in Breast Cancer Patients

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Abstract: *Modified radical mastectomy (MRM) is a standard surgical approach for breast cancer management. Conventional electrocautery and advanced vessel-sealing devices such as LigaSure Small Jaw are commonly used for dissection and hemostasis. However, their comparative efficacy regarding operative time, blood loss, and surgical outcomes remains an area of interest.* ***Objective:*** *To compare the efficacy of conventional electrocautery and LigaSure Small Jaw in breast cancer patients undergoing modified radical mastectomy.* ***Methodology:*** *A prospective study was conducted in the Oncology and Surgery Department of Nishtar Hospital from December 2023 to December 2024. A total of 100 female breast cancer patients with ASA scores 1 and 2 undergoing modified radical mastectomy were included in the study. The patients were divided into an electrocautery group, including 50, and the LigaSure SmallJaw group, including 50. The mastectomy was performed under general anesthesia. Axillary clearance was performed by either a monopolar diathermy probe or LigaSure SmallJaw.* ***Results:*** *Intraoperative outcomes significantly improved in the LigaSure group compared to the electrocautery group. The operative time was 120.9 ± 15.2 minutes in the electrocautery group and 110.2 ± 20.7 minutes in the LigaSure group (p=0.005). The blood loss was 189 ± 20.6ml and 118.3 ± 60.81 ml, respectively (p=0.002).* ***Conclusion:*** *Compared to conventional electrocautery, the LigaSure SmallJaw system has better efficacy and operative outcomes, including shorter surgery duration and intraoperative blood loss.*

Keywords: Breast cancer, Electrocautery, Mastectomy

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Introduction

Breast cancer is the most prevalent form of cancer globally, with over 1 million women diagnosed annually (1). In Asia, Pakistan has the highest rate of breast cancer in women, with every 1 in 9 women at risk throughout their lifetime (2). This rate is predicted to increase thrice in the next 25 years (3). Breast conservation therapy and radiotherapy have recently emerged for the management of breast cancer; however, modified radical mastectomy is the most opted procedure.

Modified radical mastectomy involves the removal of entire breast tissue, skin, areola, nipples, and auxiliary lymph nodes. The most commonly used methods to maintain hemostasis during surgery are conventional electrocautery and the LigaSure system. Electrocautery is an instrument used for dissection and maintenance of hemostatic parameters. However, it risks complications such as flap necrosis, infection, and prolonged drainage due to thermal spread. The risk of complications associated with electrocautery is related to a sizeable post-surgical bed, which can lead to infection, seroma, prolonged healing, disruption of lymphatic drainage due to cut lymphatics, and thermal damage to surrounding tissue by the electrocautery.

In comparison to electrocautery, an electrothermal bipolar vessel-sealing system has been shown to have lesser intraoperative and postoperative complications and shorter surgery duration (4, 5). LigaSure is a system that uses pressure and bipolar energy to fuse collagen and elastin in the vessels. The LigaSure Small Jaw is a sealing and cutting instrument usually used in open surgeries.

This study was conducted to compare the efficacy of conventional electrocautery and LigaSure Small Jaw in breast cancer patients undergoing modified radical mastectomy.

Methodology

A prospective study was conducted in the Oncology and Surgery Department of Nishtar Hospital from December 2023 to December 2024. A total of 100 female breast cancer patients with ASA scores 1 and 2 undergoing modified radical mastectomy were included in the study. Women with T1 breast cancer, undergoing neoadjuvant therapy, underwent previous breast procedures and diabetes mellitus were not included. All patients provided their informed consent to become a part of the study. The ethical board of the hospital approved the study.

The patients were divided into an electrocautery group of 50 and a LigaSure SmallJaw group of 50. The mastectomy was performed under general anesthesia. 200 mg of Ciprofloxacin was administered intravenously as an antibiotic preoperatively. The patient was placed in a supine position, 10% povidone-iodine solution was used as a disinfectant, and a Halested incision was made for a mastectomy followed by an oblique elliptical incision from inferomedial breast to the axilla. After freeing the anterior breast tissue from the skin, the pectoralis fascia was dissected medially and laterally. Axillary clearance was performed by either a monopolar diathermy probe or LigaSure SmallJaw. Upon complete removal, water was used to irrigate the wound, hemostasis was

confirmed, and a closed system drain was placed at the wound site to bulb suction after closing.

All data was analyzed using SPSS version 24. Continuous variables were presented by mean and standard deviation and compared by the Mann-Whitney U test. Categorical parameters were presented by percentage and compared by the Chi-Square test. A p-value less than 0.05 was considered significant.

Results

There was a significant difference between the demographic and clinical characteristics of both groups (Table I). The mean age in the electrocautery group was 40.48 ± 12.03 years; in the LigaSure group, it was 37.69 ± 13.67 years (p=0.052). The mean BMI was 31.2 ± 6.08 kg/m2 and 30.7 ± 5.19 kg/m2 in the electrocautery and LigaSure groups, respectively (p=0.776).

Similarly, the groups did not differ in pathology and tumor location, as shown in Table II. 45 (90%) of patients in the electrocautery group and 43 patients (86%) in the LigaSure group had infiltrative ductal carcinoma (p= 0.829). Most of the tumor was located in the upper lateral quadrant in both groups (66% vs 70%) (p=0.658).

Intraoperative outcomes were significantly improved in the LigaSure group than in the electrocautery group (Table III). The operative time was 120.9 ± 15.2 minutes in the electrocautery group and 110.2 ± 20.7 minutes in the LigaSure group (p=0.005). The blood loss was 189 ± 20.6ml and 118.3 ± 60.81 ml, respectively (p=0.002).

Table 1: Patients' Baseline Characteristics

Features	Electrocautery group	LigaSure SmallJaw group	Statistics test value	P
Age				
Mean	40.48 ± 12.03	37.69 ± 13.67	70 (Mann-Whitney U test	0.520
Median	40 (22-60)	35 (21-60)		
BMI				
Mean	31.2 ± 6.08	30.7 ± 5.19	-0.281 (t-test)	0.776
Median	(34-49)	(35-50)		

Table 2: Clinical Features of Cancer in Study Participants

Features	Electrocautery group	LigaSure SmallJaw group	X^2	P
Type of cancer				
Infiltrative ductal carcinoma	45 (90%)	43 (86%)	0.357	0.829
Infiltrative lobular carcinoma	5 (10%)	7 (14%)		
Position of cancer				
Upper lateral	33 (66%)	35 (70%)	0.741	0.658
Upper medial	12 (24%)	10 (20%)		
Lower lateral	5 (10%)	5 (10%)		

Table 3: Intraoperative Parameters

	Electrocautery group	LigaSure SmallJaw group	P
Operative time			
Mean	120.9 ± 15.2	110.2 ± 20.7	0.005
Median	124 (116-249)	106 (98-209)	
Blood loss			
Mean	189 ± 20.6	118.3 ± 60.81	0.002
Median	196 (149-219)	103 (69-249)	

Discussion

This study was conducted to compare the effectiveness of conventional electrocautery vs LigaSure system for modified radical mastectomy. The results showed that the LigaSure system yielded significantly better operative time and blood loss outcomes than electrocautery. These results are similar to previous studies (6-8)

There was no significant difference between patient characteristics of both groups, with the mean age in the electrocautery group being40.48 ± 12.03 years (range: 22-60), and in the LigaSure group, it was 37.69 ± 13.67 years (range 21-60). Previous studies assessing breast cancer patients also reported the same age groups (9, 10). The mean BMI was 31.2 ± 6.08 kg/m2 and 30.7 ± 5.19 kg/m2 in electrocautery group and LigaSure group, respectively. The groups had a high BMI, which is increasingly associated with breast cancer incidence (11). All-cause cancer mortality, especially related to breast cancer, is also highly prevalent in obese women as compared to breast cancer women with low BMI (12).

66% of patients in the electrocautery group and 70% in the LigaSure group had tumors in the upper lateral quadrant, showing no significant difference. Literature also shows that the upper lateral quadrant consists of most glandular tissue, which makes it more susceptible to breast cancer and benign pathologies (13). 90% of the electrocautery group and 86% of the LigaSure group suffered from invasive duct carcinoma and 15% from lobular carcinoma, with no significant difference in pathologies between both groups. Histopathological studies back these findings and report that invasive duct carcinoma is the most common form of breast cancer (14).

Study groups differ significantly concerning intraoperative outcomes, with 120.9 ± 15.2 minutes in the electrocautery group and 110.2 ± 20.7 minutes in the LigaSure group. Similarly, the blood loss was 189 ± 20.6ml and 118.3 ± 60.81 ml, respectively (p=0.002). These results show the superiority and efficacy of the LigaSure system in hemorrhage control through better sealing mechanisms and short operative time, as similar results were reported by other studies (15-17).

Conclusion

LigaSure SmallJaw system has better efficacy and operative outcomes, including shorter surgery duration and intraoperative blood loss compared to conventional electrocautery.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-NMNCM-033-24)
Consent for publication
Approved
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Conflict of interest

The authors declared the absence of a conflict of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. Smolarz B, Nowak AZ, Romanowicz H. Breast cancer—epidemiology, classification, pathogenesis and treatment (literature review). Cancers. 2022;14(10):2569.
2. Satagopan JM, Stroup A, Kinney AY, Dharamdasani T, Ganesan S, Bandera EV. Breast cancer among Asian Indian and Pakistani Americans: A surveillance, epidemiology, and end results-based study. International journal of cancer. 2021;148(7):1598-1607.
3. Houghton SC, Hankinson SE. Cancer progress and priorities: breast cancer. Cancer epidemiology, biomarkers & prevention. 2021;30(5):822-844.
4. Zia MI, Malik S, Anum S, Zahara FT, Anum Z. Comparison of outcomes of Ligasure system and conventional electrocautery in patients undergoing modified radical mastectomy for breast cancer. The Professional Medical Journal. 2023;30(01):107-112.
5. Park HS, Lee J, Kim JY, Park JM, Kwon Y. A prospective randomized study to compare postoperative drainage after mastectomy using electrosurgical bipolar systems and conventional electrocautery. Journal of Breast Cancer. 2022;25(4):307.
6. Ökten M, Okur B, Akbaba M, Şenay Ş, Karabulut H. Comparison of electrocautery and LigaSure™ vessel sealing system in radial artery harvesting as coronary artery bypass surgery conduit: A prospective, randomized study. Cardiovascular Surgery and Interventions. 2021;8(2):098-102.
7. Irfan S, Randhawa SR, Qadir H, Iqbal MS, Akhtar N, Latif T. Comparison of Electrocautery and Ligasure in Per-Operative Blood Loss in Modified Radical Mastectomy. Annals of Punjab Medical College. 2023;17(1):14-17.
8. Elkilany M, Israel R. A COMPARATIVE STUDY OF USING LIGASURE VERSUS MONOPOLAR ELECTROCAUTERY IN BREAST CANCER PATIENTS.
9. Eochagain CM, Battisti NML. Reporting of older subgroups in registration breast cancer trials 2012–2021. Breast Cancer Research and Treatment. 2023;202(3):411-421.
10. Elimimian EB, Samuel TA, Liang H, Elson L, Bilani N, Nahleh ZA. Clinical and demographic factors, treatment patterns, and overall survival associated with rare triple-negative breast carcinomas in the US. JAMA Network Open. 2021;4(4):e214123-e214123.
11. Tzenios N, Tazanios ME, Chahine M. The impact of BMI on breast cancer–an updated systematic review and meta-analysis. Medicine. 2024;103(5):e36831.
12. Lohmann AE, Soldera SV, Pimentel I, Ribnikar D, Ennis M, Amir E, et al. Association of obesity with breast cancer outcome about cancer subtypes: a meta-analysis. JNCI: Journal of the National Cancer Institute. 2021;113(11):1465-1475.
13. Granoff MD, Pardo J, Shillue K, Fleishman A, Teller P, Lee BT, et al. Variable anatomy of the lateral upper arm lymphatic channel: an anatomical risk factor for breast cancer–related lymphedema. Plastic and Reconstructive Surgery. 2023;152(2):422-429.
14. Zhao H. The prognosis of invasive ductal carcinoma, lobular carcinoma, and mixed ductal and lobular carcinoma according to molecular subtypes of the breast. Breast Cancer. 2021;28:187-195.
15. Wienerroither V, Hammer R, Kornprat P, Schrem H, Wagner D, Mischinger H, et al. Use of LigaSure vessel sealing system versus conventional axillary dissection in breast cancer patients: a retrospective comparative study. BMC surgery. 2022;22(1):436.
16. Imran M, Ali M, Umar TP, Ali S, Khalil S, Irfan H, et al. Efficacy and Safety of LigaSure in Breast Surgery With Axillary Lymph Node Dissection in Patients With Breast Cancer: A Systematic Review and Meta-Analysis. Surgical Innovation. 2024:15533506241305892.
17. Riaz O, Akthar N, Khan SM, Alamgir AR, Sultan S, Ejaz H. Comparison between electrocautery and ligasure regarding preoperative blood loss in a modified radical mastectomy in carcinoma breast. The Professional Medical Journal. 2024;31(02):155-159.