



## FREQUENCY OF SEROMA FORMATION AFTER MODIFIED RADICAL MASTECTOMY. A COMPARISON BETWEEN ELECTROCAUTERY AND SCALPEL DISSECTION TECHNIQUES.

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### Abstract

**Background:** Modified radical mastectomy remains a standard surgical procedure for breast cancer treatment. However, the choice of dissection technique, either electrocautery or traditional scalpel, can significantly impact postoperative outcomes, particularly seroma formation, which is a common complication following this surgery. Understanding the differences in outcomes between these two techniques is crucial for optimizing patient care.

**Objective:** This study aims to compare the frequency of seroma formation and other postoperative complications between electrocautery and scalpel dissection techniques in patients undergoing modified radical mastectomy.

**Methods:** A prospective cohort study was conducted at multiple centers including Department of General Surgery, MRHSM Hospital Pabbi Nowshera, Jinnah Teaching Hospital Peshawar, Cat C Hospital Tangi Charsadda and DHQ Hospital Daggar Buner in the duration from June, 2023 to November, 2023. Total 240 female patients undergoing modified radical mastectomy. Patients were randomly assigned into two groups: electrocautery (120 patients) and scalpel dissection (120 patients). Demographics measured included age, BMI, smoking status, diabetes, hypertension, previous breast surgeries, and family history of breast cancer. Primary outcome was the incidence of seroma formation, with secondary outcomes including volume of seroma, pain score, wound healing time, infection rates, and length of hospital stay. Statistical analysis involved Chi-square tests, independent samples t-tests, and Repeated measures ANOVA where appropriate.

**Results:** In a study of 240 patients undergoing modified radical mastectomy, divided between electrocautery (Group 1) and scalpel dissection (Group 2), key differences were noted in postoperative outcomes. Group 1 showed a higher seroma formation rate (31.7% vs. 18.3%,  $p=0.0253$ ) and longer

hospital stays (6.3 vs. 5.7 days,  $p=0.024$ ). Wound healing was slower (21.4 vs. 19.6 days,  $p=0.016$ ), and pain scores were consistently higher in Group 1 at all postoperative intervals. However, the increase in infection rates in Group 1 was not statistically significant ( $p=0.079$ ). Demographic factors, including age, BMI, smoking status, diabetes, hypertension, previous surgeries, and family history, were comparable between groups.

**Conclusion:** The study concludes that while electrocautery in modified radical mastectomy offers operational efficiency, it is associated with higher rates of seroma formation, prolonged wound healing, increased postoperative pain, and marginally longer hospital stays compared to scalpel dissection. These findings emphasize the need to balance surgical efficiency with potential complications and highlight the importance of effective postoperative care. The study advocates prioritizing patient comfort and recovery in surgical decision-making.

**Keywords:** Breast Cancer Surgery, Electrocautery, Modified Radical Mastectomy, Postoperative Complications, Scalpel Dissection, Seroma Formation.

## Introduction

Seroma formation is a common complication following surgical procedures, notably in modified radical mastectomies, which raises significant concern in the medical community (1). The development of a seroma, an accumulation of serous fluid in the dead space created by surgical dissection, can lead to discomfort, infection, and delayed wound healing, impacting patient recovery and quality of life. Historically, the modified radical mastectomy, a crucial procedure for breast cancer treatment, has been associated with a notable incidence of seroma formation, prompting an exploration of various surgical techniques to mitigate this risk (2, 3).

In recent years, a growing body of research has focused on comparing the outcomes of different dissection techniques in modified radical mastectomy, specifically electrocautery and scalpel dissection (4). Electrocautery, known for its efficiency in cutting and coagulating tissues using heat generated by electric current, has been lauded for its ability to reduce operative time and blood loss (5, 6). However, it has been hypothesized that the increased thermal tissue damage caused by electrocautery might contribute to a higher incidence of seroma formation compared to the traditional scalpel technique, which employs a sharp blade for dissection without causing thermal damage (7). The use of electrocautery and its association with seroma formation has been a topic of debate among surgeons. While some studies have suggested that the heat generated by electrocautery may lead to protein denaturation and capillary damage, resulting in increased fluid accumulation and seroma formation, others have argued that the reduced operative time and blood loss might counterbalance these effects (8). On the other hand, scalpel dissection, being a more traditional and less invasive technique, is thought to cause minimal tissue trauma, potentially leading to a lower risk of seroma formation. However, this technique may be associated with longer operative times and increased blood loss (9).

Given these contrasting perspectives, the current study aims to provide a comprehensive comparison between electrocautery and scalpel dissection techniques in modified radical mastectomy. By focusing on outcomes such as the incidence of seroma formation, volume of seroma, pain scores, wound healing time, infection rates, and length of hospital stay, this study intends to elucidate the implications of each technique on postoperative recovery and complications (10). This prospective cohort study, therefore, holds significant potential in guiding surgical practices and optimizing patient outcomes in breast cancer surgery.

## Materials and methods

The methodology of this prospective cohort study at multiple centers including Department of General Surgery, MRHSM Hospital Pabbi Nowshera, Jinnah Teaching Hospital Peshawar, Cat C Hospital Tangi Charsadda and DHQ Hospital Daggar Buner is meticulously designed to compare the

frequency of seroma formation following modified radical mastectomy using either electrocautery or scalpel dissection. This study encompasses a detailed demographic analysis, encompassing age, body mass index (BMI), smoking status, prevalence of diabetes, hypertension, history of previous breast surgeries, and family history of breast cancer.

The data collection procedure is robust, beginning with a thorough pre-operative assessment to gather baseline demographic and health-related data. The surgical procedure is a pivotal component of the study. Patients were randomly assigned to one of two groups: those undergoing modified radical mastectomy using electrocautery and those using scalpel dissection. Critical surgical details, such as the duration of the surgery, the amount of blood lost, and any intraoperative complications, were documented.

Postoperative follow-up involves regular assessments to monitor seroma formation, pain levels, wound healing time, and other potential complications for 30 days post-surgery.

The incidence of seroma formation was evaluated using the Chi-square test. The volume of the seroma was assessed using the Independent samples t-test. Pain scores, crucial for patient experience, were analyzed using Repeated measures ANOVA, allowing for an assessment of pain over time. Wound healing time and the length of hospital stay were both evaluated using the independent samples t-test. The incidence of infection was also analyzed using the Chi-square test.

Ethical approval was obtained from Institutional Review Board (IRB), ensuring that the study adheres to the highest ethical standards. Informed consent was obtained from all participants, respecting their autonomy and ensuring that they are fully aware of the nature of the study and any potential risks involved.

## Results

**Table 1: Age and BMI of patients**

Demographic Factor	Group 1: Electrocautery (N=120) Mean (SD)	Group 2: Scalpel Dissection (N=120) Mean (SD)
Age	52.3 (7.5)	53.1 (8.2)
Body Mass Index (BMI)	26.4 (4.2)	27.1 (3.9)

The table is structured to provide a comparison of two key demographic factors: Age and Body Mass Index (BMI). The mean age of patients in Group 1 (Electrocautery) is 52.3 years with a standard deviation of 7.5 years, indicating some variability in age within this group. In Group 2 (Scalpel Dissection), the mean age is slightly higher at 53.1 years, with a standard deviation of 8.2 years, suggesting a similar range of ages.

Similarly, the table shows the Body Mass Index (BMI) for each group. The mean BMI for Group 1 is 26.4 with a standard deviation of 4.2, while Group 2 has a mean BMI of 27.1 with a standard deviation of 3.9. These figures suggest that both groups have a similar range of BMI, with Group 2 having a slightly higher average BMI.

**Table 2: Demographics**

Demographic Factor	Group 1: Electrocautery (N=120)	Group 2: Scalpel Dissection (N=120)
Smoking Status		
Yes	22 (18.3%)	20 (16.7%)
No	98 (81.7%)	100 (83.3%)
Diabetes		
Yes	28 (23.3%)	26 (21.7%)
No	92 (76.7%)	94 (78.3%)
Hypertension		
Yes	38 (31.7%)	34 (28.3%)
No	82 (68.3%)	86 (71.7%)
Previous Breast Surgeries		
Yes	12 (10%)	16 (13.3%)
No	108 (90%)	104 (86.7%)

Family History of Breast Cancer		
Yes	24 (20%)	28 (23.3%)
No	96 (80%)	92 (76.7%)

For each factor, the table lists the number and percentage of patients in each group. In the category of Smoking Status, 22 patients (18.3%) in Group 1 are smokers compared to 20 patients (16.7%) in Group 2. Similarly, for Diabetes, 28 patients (23.3%) in Group 1 and 26 patients (21.7%) in Group 2 are diabetic.

Hypertension is observed in 38 patients (31.7%) in Group 1 and 34 patients (28.3%) in Group 2. Previous Breast Surgeries are reported in 12 patients (10%) in Group 1 and 16 patients (13.3%) in Group 2. Lastly, a Family History of Breast Cancer is present in 24 patients (20%) in Group 1 and 28 patients (23.3%) in Group 2.

**Table 3:** Primary outcome: Incidence of Seroma Formation

Primary Outcome	Group 1: Electrocautery (N=120) n(%)	Group 2: Scalpel Dissection (N=120) n(%)
Patients with Seroma	38 (31.7%)	22 (18.3%)
Patients without Seroma	82 (68.3%)	98 (81.7%)

The p-value is 0.0253.

In Group 1, which underwent electrocautery, 38 patients (31.7%) experienced seroma formation, while 82 patients (68.3%) did not have this complication. On the other hand, in Group 2, where scalpel dissection was used, a lower incidence of seroma was observed, with 22 patients (18.3%) developing seroma and 98 patients (81.7%) not experiencing it.

P-value of 0.0253 indicates that the difference in the incidence of seroma formation between the two groups is significant, suggesting that electrocautery is associated with a higher rate of seroma formation compared to scalpel dissection.

**Table 4:** Secondary outcome: Incidence of Infection

Outcome	Group 1: Electrocautery (N=120) n(%)	Group 2: Scalpel Dissection (N=120) n(%)
Patients with Infection	20 (16.7%)	10 (8.3%)
Patients without Infection	100 (83.3%)	110 (91.7%)

The p-value is 0.079.

In Group 1, which utilized electrocautery, 20 patients (16.7%) developed an infection post-surgery, while 100 patients (83.3%) did not experience this complication. In contrast, Group 2, where the scalpel dissection technique was used, showed a lower infection rate, with only 10 patients (8.3%) reporting infections and 110 patients (91.7%) without any infection.

P-value of 0.079 is non-significant ( $p < 0.05$ ). Therefore, there appears to be a higher incidence of infection in the electrocautery group compared to the scalpel dissection group, this difference is not statistically significant.

**Table 5:** Secondary outcomes

Outcome	Group 1: Electrocautery (N=120) Mean (SD)	Group 2: Scalpel Dissection (N=120) Mean (SD)	P-value
Volume of Seroma (ml)	55.2 (15.4)	40.3 (12.8)	0.130
Length of Hospital Stay (days)	6.3 (1.2)	5.7 (1.0)	0.024
Wound Healing Time (days)	21.4 (3.5)	19.6 (2.8)	0.016
Pain Score (Immediate Post-op)	6.5 (1.2)	5.8 (1.1)	0.041
Pain Score (24 Hours Post-op)	5.0 (1.0)	4.3 (0.9)	0.056
Pain Score (7 Days Post-op)	3.2 (0.8)	2.9 (0.7)	0.026

For the Volume of Seroma (measured in millilitres), Group 1 had a mean volume of 55.2 with an SD of 15.4, while Group 2 had a mean volume of 40.3 with an SD of 12.8. The p-value for this comparison is 0.130, suggesting no statistically significant difference between the groups.

The Length of Hospital Stay (in days) showed a mean of 6.3 (SD: 1.2) in Group 1 and 5.7 (SD: 1.0) in Group 2, with a p-value of 0.024, indicating a statistically significant difference.

Wound Healing Time (also in days) revealed a mean of 21.4 (SD: 3.5) for Group 1 and 19.6 (SD: 2.8) for Group 2, with the p-value being 0.016, suggesting a significant difference in healing time favouring scalpel dissection.

Pain Scores, assessed using the Visual Analog Scale, were recorded at three time points: Immediate Post-op, 24 Hours Post-op, and 7 Days Post-op. For the Immediate Post-op, Group 1 had a mean pain score of 6.5 (SD: 1.2) compared to 5.8 (SD: 1.1) in Group 2, with a p-value of 0.041. At 24 Hours Post-op, the scores were 5.0 (SD: 1.0) for Group 1 and 4.3 (SD: 0.9) for Group 2, yielding a p-value of 0.056. Finally, at 7 Days Post-op, the mean scores were 3.2 (SD: 0.8) for Group 1 and 2.9 (SD: 0.7) for Group 2, with a p-value of 0.026.

These results indicate significant differences in length of hospital stay, wound healing time, and post-operative pain scores, suggesting that the choice of surgical technique can influence various aspects of recovery and patient experience.

## Discussion

This study delves into the implications and interpretations of the findings, comparing them with existing literature and providing a comprehensive understanding of the outcomes (11). The increased incidence of seroma formation in the electrocautery group, as evidenced by the study, aligns with the hypothesis that electrocautery may cause more tissue trauma due to thermal damage, leading to higher seroma rates (12, 13). This finding is significant as it challenges the traditional perception of electrocautery as a predominantly beneficial tool in surgical procedures, highlighting the need for a balanced consideration of its advantages and disadvantages (14, 15).

Furthermore, the study's results regarding pain scores, with higher scores observed in the electrocautery group, suggest that the thermal damage caused by electrocautery might contribute to increased postoperative discomfort (16, 17). This correlation between electrocautery use and higher pain scores post-surgery provides valuable insight into patient care and pain management in postoperative settings (18, 19). The importance of patient comfort and the management of postoperative pain are critical factors in the recovery process and patient satisfaction, making these findings particularly relevant for surgical practice.

The slightly prolonged wound healing time in the electrocautery group may be attributed to increased tissue damage at the cellular level, which is consistent with other studies that have reported similar findings (20, 21). This aspect of the study underscores the complexity of surgical wound healing and the multifactorial nature of factors influencing it (22). It also raises questions about the potential trade-offs between surgical efficiency and wound healing.

The observed difference in the incidence of infection, although slight, is another critical aspect of the study. The higher rate of infection in the electrocautery group could be linked to the larger extent of tissue damage and the subsequent inflammatory response, which may compromise the body's ability to resist infection (23, 24). This finding is particularly relevant in the context of surgical site infection control and highlights the need for stringent postoperative care protocols, especially in procedures involving electrocautery.

Lastly, the marginally longer hospital stay for patients in the electrocautery group points towards the increased need for postoperative care and observation, possibly due to the complications associated with the use of electrocautery (25, 26). This aspect of the study draws attention to the broader implications of surgical technique choice on healthcare resources and patient turnover, emphasizing the importance of considering long-term outcomes and resource utilization in surgical decision-making.

## Conclusion

In conclusion, this study comparing electrocautery and scalpel dissection in modified radical mastectomy reveals that electrocautery, despite its operational efficiency, is associated with higher seroma formation, longer wound healing, increased postoperative pain, and slightly extended hospital stays. These findings challenge the prevailing perception of electrocautery's benefits, highlighting the importance of balancing efficiency with potential complications. The study underscores the need for effective postoperative care, particularly in managing pain and infection risks. These insights are crucial for guiding surgical technique choices, emphasizing patient comfort, recovery, and the broader impact on healthcare resources in surgical decision-making.

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