

# Comparison of Seroma Formation with Harmonic Scalpel Versus Monopolar Electrocautery in Axillary Dissection following Modified Radical Mastectomy

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## ABSTRACT

**Background:** Breast cancer is cancer that forms in the cells of the breasts. Despite of the emergence of the breast conservation technique modified Radical Mastectomy still remains the most commonly performed surgery for CA Breast. The Harmonic scalpel is a surgical instrument used to simultaneously cut and cauterize tissue.

**Aim:** To compare the frequency of seroma formation with harmonic scalpel versus monopolar electrocautery in axillary dissection following modified radical mastectomy.

**Methods:** This randomized control trial was conducted in the Department of General Surgery, Lahore General Hospital and Ghurki Trust Teaching Hospital, Lahore. 60 patients were enrolled. Two groups were made by applying lottery method. One group is treated with harmonic scalpel and other with electrocautery. All surgeries were done under general anesthesia by two surgical teams. After surgery, patients shifted in post-surgical wards and will be followed- up there for 7 days. Seroma formation was noted. All the collected data was entered and analyzed on SPSS version 21.

**Results:** The mean age in harmonic scalpel group was  $49.87 \pm 8.67$  years and in electrocautery group was  $49.87 \pm 8.67$  years. The seroma formation in harmonic scalpel group was noted in 5(16.7%) patients whereas the seroma formation in electrocautery group was found in 11(36.7%) patients ( $p$ -value=0.080).

**Conclusion:** This study concluded that the harmonic scalpel group showed lower rate of seroma formation than to electrocautery group, however statistically both groups are equally effective

**Keywords:** Harmonic Scalpel, Seroma Formation, electrocautery

## INTRODUCTION

Breast cancer is the common malignancy in females. It accounts for 18% of all female cancers. One million new cases with this morbidity have been noted per year. In our country, CA breast is common in younger age group females as compared to the Western world. In comparison to other Asian countries, Pakistani women have a much greater rate of morbidity<sup>1,2</sup>. Despite of the emergence of the breast conservation technique (surgery) modified Radical Mastectomy (MRM) still remains the most commonly performed surgery for CA Breast. The conventional method of dissection in which surgeons use monopolar diathermy (i.e. electrocautery) is associated with 35% to 50% of seroma formation post operatively<sup>3,4</sup>.

The harmonic scalpel is a trying to cut medical device that vibrates at 55.4 kHz and may produce 3 synergistic effects: cavitation, clotting & cutting to achieve excellent hemostasis & tissue dissection at a specific site. It is stated that using a harmonic scalpel minimizes heat spread, lowering the rate of tissue damage<sup>2,5</sup>. Electrocautery causes lateral thermal injury to the tissue due to extremely high heat<sup>5,6</sup>. When compared to standard electrocautery, The use of a harmonic scalpel dissection offers substantial benefits in terms of reducing postoperative drainage, in MRM for malignancy, there is less seroma formation and fewer wound problems, without lengthening the operative period. In MRM, the harmonic scalpel can also be recommended as a preferred surgical instrument<sup>5</sup>. Harmonic Focus makes axillary lymph node dissection possible, safe, and more comfortable for the surgeon<sup>7</sup>.

Anlar B, et al (2013) in which 120 cases were studied, Showed that seroma formed in 28.2% females with harmonic scalpel while 65.9% with electrocautery ( $P < 0.05$ )<sup>8</sup>. But Dmanai SR et al (2013) in which 50 cases were studied, in this study seroma was formed in 8% females with harmonic scalpel while 24% with electrocautery and the difference was insignificant ( $P > 0.05$ )<sup>9</sup>.

The rationale of the study to compare the frequency of seroma formation with harmonic scalpel versus monopolar

electrocautery in axillary dissection following MRM. Literature showed that harmonic scalpel has less chances of seroma formation. But debatable results have been retrieved from the literature. Hence, we are unable to decide which method is more beneficial which has less chances of postoperative seroma formation, which can lead to delayed healing and poor prognosis of patients. So, we want to conduct study to confirm the more appropriate method to implement results of this study in local setting for future.

## METHODOLOGY

This randomized controlled trial was conducted 28-08-2018 to 28-02-2021 from General Surgery Department, General Hospital, Lahore and Ghurki Trust teaching Hospital Lahore after LMDC Ethical Committee permission. Total 60 sample size; 30 cases in each group was calculated with 5% level of significance, 80% power of test & taking expected percentage of seroma formation i.e. 28.3% with harmonic Z scalpel and 65.9% with electrocautery used for axillary dissection in MRM.<sup>8</sup> Female with age of 30-65 years undergoing MRM through axillary dissection (to remove some or complete breast due to presence of carcinoma) were included from the study. Patients with metastatic carcinoma, recurrent carcinoma breast, radiotherapy of chest wall for breast carcinoma and with ASA III and IV Patients with hemodynamically unstable (PT>20sec, INR>2, Hb<10mg/dl), diabetes (BSR>200mg/dl) were excluded.

An informed written consent was obtained. Patients were randomly divided in to two groups by using lottery method. In group A, axillary dissection done by using harmonic scalpel. In group B, axillary dissection done by using electrocautery.

All operations were done under general anesthesia by two surgical teams with the help of researcher. After 1 surgery, patients were shifted to post-surgical wards & monitored for 7 days. After 7 days, drain removed and wound condition was also assessed and seroma formation assessed if present. All information collected through a specially designed proforma.

All data was analyzed through SPSS V21. The quantitative variables like age and duration of diagnosis will be presented as mean & SD. Anatomical side and seroma formation presented as

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percentage & frequency. Both groups were compared for seroma formation by using chi-square. Data was stratified for age, duration of diagnosis & anatomical side. Post-stratification chi-square was applied to compare seroma formation in groups for each strata. P – value < 0.05 was considered as significant.

**RESULTS**

Total 60 patients were included, 30 were from harmonic scalpel group and 30 were from electro cautery group. The mean age of harmonic scalpel was 49.87± 8.67 years & in electrocautery group was 49.87± 8.67 years. The average duration of diagnosis in harmonic scalpel group was 8.23±4.04 months while in electrocautery group was 7.33±4.19 months (Table 1).

Harmonic scalpel group the left side breast involved in 17(56.7%) patients while the right side breast involved in 13(43.3%) patients. Similarly in electro cautery group the left side breast involved in 13(43.3%) patients while the right side breast involved in 17(56.7%) patients (Table 2).

The study results showed that out of 60 patients, the seroma formation was found in 16(26.67%) patients. Figure: 2 Seroma formation in harmonic scalpel group was noted in 5(16.7%) patients whereas the seroma formation in electro cautery group was found in 11(36.7%) patients. This difference was statistically insignificant i.e. p-value=0.080 (Table 3).

Patients with age ≤50 years the seroma formation in harmonic scalpel group noted in 3(20%) patients and the seroma formation in electro cautery group noted in 8(44.4%). There was insignificant difference statistically i.e. p-value=0.138. Also, patients with age >50 years the seroma formation in harmonic scalpel group noted in 2(13.3%) patients and the seroma formation in electro cautery group noted in 3(25%). This difference was insignificant statistically. P-value = 0.438 (Table 3).

Among patients with left side breast involvement the seroma formation in harmonic scalpel group noted in 2(11.8%) patients and the seroma formation in electro cautery group noted in 7(53.8%). There was difference significant statistically i.e. P-value=0.013. Similarly, Patients with right side breast involvement the seroma formation in harmonic scalpel group noted in 3(23.1%) patients and the seroma formation in electro cautery group noted in 4(23.5%). This difference was insignificant. P-value > 0.999 (Table 3).

The study results showed that among patients with duration of diagnosis ≤ 9 months the seroma formation in harmonic scalpel group noted in 4(23.5%) patients and the seroma formation in electro cautery group noted in 6(31.6%). This statistically difference was insignificant i.e. p-value=0.590. Similarly, among patients with duration of diagnosis >9 months the seroma formation in harmonic scalpel group noted in 1(7.7%) patients and the seroma formation in electro cautery group noted in 5(45.5%). This difference was insignificant. P – value = 0.061 (Table 3).

Table 1: Descriptive of Age and Duration of Diagnosis

		Study Groups	
		Harmonic Scalpel	Electrocautery
Age	Mean±SD	49.87±8.67	47.17±7.41
Duration of diagnosis	Mean±SD	8.23±4.04	7.33±4.19

Figure 1: Seroma Formation

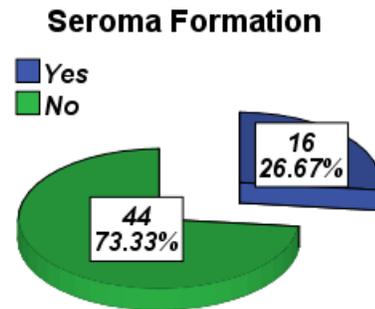


Table 2

		Groups	
		Harmonic Scalpel	Electro-cautery
Side	Left	17(56.7%)	13(43.3%)
	right	13(43.3%)	17(56.7%)
Seroma Formation	Yes	5(16.7%)	11(36.7%)
	No	25(83.3%)	19(63.3%)

Table 3: Comparison of seroma formation with study groups

		Study Groups		P value
		Harmonic Scalpe	Electro-cautery	
Seroma Formation	Yes	5(16.7%)	11(36.7%)	0.080
	No	25(83.3%)	19(63.3%)	
Age (Years)	<50	Yes	3(20%)	0.13
		No	12(80%)	
	>50	Yes	2(13.3%)	0.43
		No	13(86.7%)	
Side	Left	Yes	2(11.8%)	0.013
		No	15(88.2%)	
	Right	Yes	3(23.1%)	1.00
		No	10(76.9%)	
Duration of Diagnosis	<9	Yes	4(23.5%)	0.59
		No	13(76.5%)	
	>9	Yes	1(7.7%)	0.60
		No	12(92.3%)	

**DISCUSSION**

This randomized control trial was carried out at general surgery department, Lahore General Hospital, Lahore to compare the frequency of seroma formation with harmonic scalpel against monopolar electrocautery in axillary dissection following MRM. Breast cancer affects one out of every nine Pakistani women, the highest frequency in Asia.<sup>10</sup> For mastectomy surgeries, scalpels with disposable knives have usually been used. Electrocautery has now been regarded as a safe alternative to the scalpel in terms of

decreased blood loss and operating time over the previous two decades. The harmonic scalpel has become a main part of various surgeries, because of its benefits such as exact dissection, dependable hemostasis & relatively small number of damage of tissue.<sup>11</sup> Though, Many doctors who prefer to be using cold knives are concerned about the increased risk of seroma development & flap necrosis<sup>7,12,13</sup>.

In this study the seroma formation found in 16(26.67%) patients. In harmonic scalpel group was noted in 5(16.7%) patients whereas the seroma formation in electro cautery group was found

in 11(36.7%) patients. According to this the harmonic scalpel group showed less seroma formation than to electrocautery group. However, this difference was insignificant. P-value=0.080.

Jinbo Huang et al<sup>5</sup> presented that compared to traditional electrocautery, the use of a harmonic scalpel dissection offers substantial benefits in terms of reducing postoperative drainage, development of seroma, In MRM for cancer, intraoperative loss of blood and wound problems are common, without extending the operative period. In MRM, the harmonic scalpel may be recommended as a preferred surgical instrument. According to recent meta- analysis, dissection of harmonic scalpel & standard electrocautery found to have same effects in the setting of mastectomy<sup>14</sup>.

Dmanai SR et al (2013) in which 50 cases were studied, in this study seroma was formed in 8% females with harmonic scalpel while 24% with electrocautery and the difference was insignificant (P>0.05).<sup>9</sup> In 2015 study show that Once compared to electrocautery, the harmonic scalpel required fewer drain days & produced less total drainage volume<sup>15</sup>.

In 2018 study, The use of harmonic and electrocautery in MRM was studied, and it was discovered that using a harmonic scalpel in MRM reduced axillary dissection time, drainage volume and length of hospital stay<sup>16</sup>.

Allah Nawaz et al conducted a study to compare the Axillary dissection in cancer breast, the harmonic scalpel against electrocautery. When comparing the use of harmonic scalpel with electrocautery in axillary dissection, the author found that using a harmonic scalpel resulted in lower total average axillary drain output and a reduced axillary numbness frequency<sup>3</sup>. The harmonic scalpel, according to Archana's findings, lowers the overall drainage seromas volume, the numeral of drain days, intra-operative loss of blood, surgery duration, post-operative pain<sup>4</sup>.

Sarwar G et al., on the other hand, found that the harmonic scalpel caused much less intraoperative blood loss in MRM patients than electrocautery.<sup>2</sup> Anlar B, et al (2013) in which 120 cases were studied , Showed that seroma formed in 28.2% females with harmonic scalpel while 65.9% with electrocautery (P<0.05).<sup>8</sup>

## CONCLUSION

This study concluded that the harmonic scalpel group showed lower rate of seroma formation than to electrocautery group, however statistically both groups are equally effective in the management of seroma formation in patients with axillary dissection following MRM.

**Conflict of interest:** Nil

## REFERENCES

- Muhammad R, Johann KF, Saladina JJ, Harlina MLN, Niza ASS. Ultracision versus electrocautery in performing modified radical mastectomy and axillary lymph node dissection for breast cancer: A prospective randomized controlled trial. *Med J Malaysia*. 2013;68(3):205.
- Sarwar G, Sheikh TH, Nadeem M. Comparison of blood loss between harmonic scalpel and monopolar electrocautery in modified radical mastectomy. *PJMHS*. 2016;10:649-51.
- Nawaz A, Waqar S, Khan A, Mansoor R, Butt UI, Ayyaz M. Harmonic scalpel versus electrocautery in axillary dissection in carcinoma breast. *J Coll Physicians Surg Pak*. 2015;25(12):870-3.
- Archana A, Sureshkumar S, Vijayakumar C, Palanivel C. Comparing the harmonic scalpel with electrocautery in reducing postoperative flap necrosis and seroma formation after modified radical mastectomy in carcinoma breast patients: a double-blind prospective randomized Control Trail. *Cureus*. 2018;10(4).
- Huang J, Yu Y, Wei C, Qin Q, Mo Q, Yang W. Harmonic scalpel versus electrocautery dissection in modified radical mastectomy for breast cancer: a meta-analysis. *PLoS One*. 2015;10(11):e0142271.
- Derriks J, Hilgersom N, Middelkoop E, Samuelsson K, van den Bekerom M. Electrocautery in arthroscopic surgery: intra-articular fluid temperatures above 43° C cause potential tissue damage. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2020;28(7):2270-8.
- Manjunath S, Ramesh RS, Shivakumar K, Goel V. Ultrasonic shears versus electrocautery in axillary dissection for breast cancer—a randomized controlled trial. *Indian journal of surgical oncology*. 2014;5(2):95-8.
- Anlar B, Karaman N, Dogan L, Ozaslan C, Atalay C, Altinok M. The effect of harmonic scalpel, electrocautery, and scalpel use on early wound complications after modified radical mastectomy. *European Surgery*. 2013;45(6):286-90.
- Damani SR, Haider S, Shah SSH. Comparison of modified radical mastectomy using harmonic scalpel and electrocautery. *Journal of Surgery Pakistan (International)*. 2013;18:2-6.
- Asif HM, Sultana S, Akhtar N, Rehman JU, Rehman RU. Prevalence, risk factors and disease knowledge of breast cancer in Pakistan. *Asian Pacific journal of cancer prevention*. 2014;15(11):4411-6.
- Yang X, Cao J, Yan Y, Liu F, Li T, Han L, et al. Comparison of the safety of electrotome, Harmonic scalpel, and LigaSure for management of thyroid surgery. *Head & neck*. 2017;39(6):1078-85.
- Mazouni C, Mesnard C, Cloutier A-S, Amabile M-I, Bentivegna E, Garbay J-R, et al. Quilting sutures reduces seroma in mastectomy. *Clinical breast cancer*. 2015;15(4):289-93.
- Gambardella C, Clarizia G, Patrone R, Offi C, Mauriello C, Romano R, et al. Advanced hemostasis in axillary lymph node dissection for locally advanced breast cancer: new technology devices compared in the prevention of seroma formation. *BMC surgery*. 2019;18(1):1-9.
- Janis JE, Khansa L, Khansa I. Strategies for postoperative seroma prevention: a systematic review. *Plastic and reconstructive surgery*. 2016;138(1):240-52.
- Stewart B, Wild C. *World Cancer Report 2014*. International Agency for Research on Cancer; 2014. Back to cited text. 2015(3).
- Cheng H, Clymer JW, Sadeghirad B, Ferko NC, Cameron CG, Amaral JF. Performance of Harmonic devices in surgical oncology: an umbrella review of the evidence. *World journal of surgical oncology*. 2018;16(1):1-16.