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## Comparison of Harmonic Scalpel and Electrocautery During Breast Surgery: A Cohort Study

### Meme Cerrahisinde Harmonik Neşter ve Elektrokoterin Karşılaştırılması: Bir Kohort Çalışması

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#### ABSTRACT

**Objective:** As one of the most frequent procedures, breast surgery incurs high healthcare costs. The significance of surgical quality and complications before and after breast surgery entailed the use of methods with the highest outcomes and the least complications.

**Methods:** Throughout this research, postoperative complications and factors affecting the quality of surgery were evaluated in the Kowsar Hospital between 2019 and 2020 for patients requiring breast surgery. Patients undergoing breast surgery were randomly categorized into two groups: electrocautery (A) and harmonic scalpel (B).

**Results:** Of the 56 patients, 28 were in group A, and the remaining 28 were in group B. Intraoperative bleeding, drainage rate, period of drainage, and duration of hospitalization in group B were significantly lower ( $p<0.05$ ). Furthermore, the extent of pain in both groups was different ( $p<0.001$ ), so that there was less postoperative pain in women who experienced harmonic breast surgery. Patients throughout group A reported more complications than in group B, such that 7 (25%) patients underwent limb anesthesia and 3 (10.7%) patients experienced seroma, suggesting a higher risk of complications in group A; however, the difference between the two groups was not significant in terms of limb anesthesia ( $p=0.069$ ) and serum ( $p=0.075$ ).

**Conclusion:** Harmonic scalpel usage in breast surgery has fewer complications, better operation quality, and shorter hospital stay than other older methods; therefore, the use of harmonic scalpels may substitute for different surgical strategies.

**Keywords:** Breast mass, breast surgery, electrocautery, harmonic, complications

#### Öz

**Amaç:** En sık yapılan işlemlerden biri olan meme cerrahisi yüksek sağlık harcamalarına neden olur. Meme cerrahisi öncesi ve sonrası cerrahi kalitenin ve komplikasyonların önemi, sonuçları en yüksek ve komplikasyonları en az olan yöntemlerin kullanılmasını gerektiriyordu.

**Yöntemler:** Bu araştırma boyunca Kowsar Hastanesi'nde 2019-2020 yılları arasında meme ameliyatı gerektiren hastalarda ameliyat sonrası komplikasyonlar ve ameliyat kalitesini etkileyen faktörler değerlendirildi. Meme ameliyatı geçiren hastalar rastgele iki gruba ayrıldı: elektrokoter (A) ve harmonik neşter (B).

**Bulgular:** Elli altı hastanın 28'i A grubunda, geri kalan 28'i ise B grubundaydı. Grup B'de intraoperatif kanama, drenaj oranı, drenaj süresi ve hastanede kalış süresi anlamlı olarak daha düşüktü ( $p<0,05$ ). Ayrıca her iki grupta ağrı şiddeti farklıydı ( $p<0,001$ ), yani harmonik meme ameliyatı geçiren kadınlarda ameliyat sonrası ağrı daha azdı. Grup A'daki hastalar, grup B'ye göre daha fazla komplikasyon bildirdi; 7 (%25) hastaya ekstremitte anestezisi uygulandı ve 3 (%10,7) hastada seroma görüldü; bu, grup A'da komplikasyon riskinin daha yüksek olduğunu düşündürmektedir; ancak ekstremitte anestezisi ( $p=0,069$ ) ve serum ( $p=0,075$ ) açısından iki grup arasındaki fark anlamlı değildi.

**Sonuç:** Meme cerrahisinde harmonik neşter kullanımı diğer eski yöntemlere göre daha az komplikasyona, daha iyi operasyon kalitesine ve daha kısa hastanede kalış süresine sahiptir; bu nedenle harmonik neşterlerin kullanımı farklı cerrahi stratejilerin yerini alabilir.

**Anahtar Sözcükler:** Meme kitlesi, meme cerrahisi, elektrokoter, harmonik, komplikasyonlar

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## INTRODUCTION

Breast surgery is one of the most influential and popular procedures conducted today for several reasons, including remarkably benign and malignant masses and cosmetics. Breast masses are one of the most common and severe ailments in females. Breast cancer is less frequent than at the age of 30 years. In European and American nations, breast cancer is primarily found in women over the age of 50. According to research performed in Iran, the percentage of patients aged between 40 and 49 years is greater than that of other age categories. The rate of younger patients is still greater than that in Western nations (1). The standard of operation and problems that arose before and during breast surgery (bleeding, seroma, anesthesia, etc.) demanded the use of approaches for the optimum outcomes and the least complications (2). Because these patients have a lot of emotional strain, this doubles the sensitivity of work.

Consequently, if optimal outcomes are obtained throughout breast surgery, it will be better and more satisfying for our patients and will be effective in reducing patients' pain. Harmonic is a 55.5 kHz vibrating instrument that creates three synergistic results, comprising cavitation, coagulation, and cutting, to promote substantial homeostasis and tissue dissection at a defined stage, all of which minimize heat distribution to neighboring tissues (3). This instrument has been licensed by the US Food and Drug Administration for vessels with occlusion more significant than 5 mm in diameter (4-7). No systematic research and consensus were rendered on the advantages and disadvantages of breast surgery instruments. We also used a harmonic scalpel in breast surgery in this analysis and compared the effects of pre- and postoperative procedures employing electrocautery.

## MATERIALS AND METHODS

In Kowsar Hospital, Sanandaj (Iran), from 2019 to 2020, this prospective cohort analysis was conducted. Postoperative complications and variables influencing breast surgery quality were examined among patients.

The statistical population includes patients who underwent breast surgery at Kowsar Hospital. The exclusion criteria included patients with a background of radiotherapy and concurrent blood disorders (coagulation disturbances) or some other contraindication with breast surgery. In this analysis, patients were randomly classified into two categories, A (electrocautery) and B (harmonic), as standard surgical procedures. The patients' surgery was performed by one surgeon. Side effects and surgical performance were checked and followed up before and after surgery and after patients' discharge within 1 and 3 months (by telephone and examination at the clinic). The surgery length and volume of intraoperative bleeding were then compared based on the formulated checklist. Postoperative pain (VAS approach) dependent on ratings of 0 (no pain) to 10 (highest pain), duration of hospitalization, drainage, hematoma, infection, necrosis, seroma, and organ anesthesia were compared in both groups. The machines employed in this investigation were electrocautery (Avanteb smart-4, 2019, CF, I) and harmonic (Ethicon Endo-Surgery, 2019).

The approval of the Ethics Committee was obtained from the Kurdistan University of Medical Sciences for this study (approval number: IR.MUK.REC.1398.281, date: 04.02.2020).

## Statistical Analysis

Eventually, the collected data were evaluated using SPSS software version 22. An independent t-test was also used to compare the mean values, and Pearson's chi-squared test was used to compare the qualitative variables.

## RESULTS

A total of 56 patients were examined in this review, of which 28 were in the electrocautery group and 28 were in the harmonic group. The total patient age of 40.42 and 41.17 years was not statistically significant for both the electrocautery (A) and harmonics (B) groups. Breast size, method of procedures, position of the mass, and pathology were also matched. In group A, intraoperative bleeding was more, whereas in group B, the duration of surgery, extent of drainage during the initial 24 h, overall drainage, persistence of drainage, and period of hospitalization and pain were significantly lower than those in group A ( $p < 0.05$ ). The results of this study in the two groups of electrocautery and harmonic are shown in Table 1.

## DISCUSSION

Various studies have been conducted on oncology procedures and their complications with different surgical techniques (electrocautery and harmonics), but limited literature is accessible on breast surgery. Despite these variations, the advantages of employing harmonics are somewhat unclear. In the research of Hung et al. (3), the implementation of a harmonic scalpel during breast and axillary surgery was contrasted with the use of a harmonic scalpel combined with other surgical techniques such as electrocautery and scalpel in patients undergoing surgery. Following the current research, a study demonstrated that harmonic scalpel usage shortened the operation period and decreased the incidence of postoperative anesthesia throughout the axillary region (3). The use of harmonic scalpel and electrocautery procedures in radical mastectomy cases was studied in a clinical trial conducted by Ribeiro et al. (8). Throughout this analysis, seroma, hematoma, infection, tissue necrosis, surgery time, and intraoperative bleeding were evaluated between 7 and 14 days following surgery. In this examination, 46 patients underwent electrocautery, and 49 patients were exposed to harmonic surgery. According to this analysis, in the electrocautery group, the prevalence of postoperative complications was higher than that in the harmonic group, and there was no substantial change in postoperative seroma between the two groups (8). The complications of the electrocautery group were significantly higher in our research. Generally, in some studies, there is no significant difference between the use of electrocautery and harmonic, whereas in another number of studies, there are significant differences, especially during surgery and bleeding during and after surgery and the amount of pain in patients (2,8-16). A systematic review directed by Cheng et al. (11) investigated harmonic scalpel among patients undergoing oncosurgery. Breast, lung, head and neck, and colon cancers were studied in this analysis. The findings indicated that the length of the harmonic method had a shorter operating time of 25-29 min, which was less reported in breast cancers. The bleeding and drainage volumes in the harmonic community were smaller than those in other approaches in various experiments, varying from 42 to 141 and 42 to 292 mL. The hospitalization admission rate declined between 0.2 and 3.2 days in the harmonic group.

**Table 1.** Consequences and side effects of groups A and B

	Electrocauter			Harmonic			p-value
	n	Mean	Standard deviation	n	Mean	Standard deviation	Significant in less than 0.05
Bleeding during surgery (mL)	28	131.10	75.56	28	88.92	61.25	0.026
Surgery time (min)	28	90.53	36.90	28	63.57	30.24	0.004
Drain discharge volume (mL)	28	52.14	16.06	28	33.39	11.94	0.000
Number of days of drainage	28	3.71	1.48	28	2.53	1.31	0.003
Total volume of drainage (mL)	28	170.35	95.78	28	115.35	7368	0.019
Pain (score 0 to 10)	28	6.28	1.41	28	4.10	1.22	0.000
Number of hospitalization days	28	1.50	0.57	28	1.14	0.35	0.007
		<b>Electrocauter</b>			<b>Harmonic</b>		
Limb anesthesia	Yes	7 (25%)		Yes	2 (7.1%)		0.069
	No	21 (75%)		No	26 (92.9%)		
Infection at the operation site	Yes	0		Yes	0		-
	No	28 (100%)		No	28 (100%)		
Seroma	Yes	3 (10.7%)		Yes	0		0.075
	No	25 (89.3%)		No	28 (100%)		
Surgical scar	Low	9 (32.1%)		Low	12 (42.9%)		-
	Medium	10 (35.8%)		Medium	9 (32.1%)		
	High	9 (32.1%)		High	7(25%)		

The use of harmonic scalpels has, in general, been shown to minimize complications and optimize patient outcomes (11). The advantages of using harmonics in different experiments were explored in a systematic review of harmonic scalpels conducted by McCarus and Parnell (14). This analysis indicates a relatively lower risk of postoperative pain, intra- and postoperative bleeding, seroma, and hospitalization and a higher return to function. It seems that the older studies have different results concerning the use of older devices than the newer studies in this field, so that in our study, which was using the latest harmonic device, had better results. Overall, our research indicates that intra- and postoperative bleeding, postoperative pain, surgical period, duration of drainage, and hospitalization are significantly different among groups A and B ( $p < 0.05$ ). In group B, both seroma and anesthesia were lower than in group A, which was compatible with and validated by recent research (2,8-11,13-20).

### Study Limitations

The high expense of the instruments and the use of the devices, and restrictions on the use of harmonic devices due to the high cost of maintenance and repair.

### CONCLUSION

Using the harmonic method in breast surgery seems secure, reduces intra- and postoperative complications for patients, and significantly reduces postoperative pain. Consequently, it is advised that the harmonic approach should be utilized in breast surgery rather than conventional methods. Additional research using a broader sample can validate this analysis.

### Ethics

**Ethics Committee Approval:** The approval of the Ethics Committee was obtained from the Kurdistan University of Medical Sciences for this study (approval number: IR.MUK.REC.1398.281, date: 04.02.2020).

**Informed Consent:** It wasn't obtained.

### Authorship Contributions

Concept: H.M., M.Y.F., Design: H.M., M.Y.F., Data Collection or Processing: H.M., M.Y.F., Analysis or Interpretation: H.M., M.Y.F., Literature Search: H.M., M.Y.F., Writing: H.M., M.Y.F.,

**Conflict of Interest:** No conflict of interest was declared by the authors.

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