

# A Comparative Study of Modified Radical Mastectomy Using Harmonic Scalpel and Electrocautery

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## ABSTRACT

**Aim:** The harmonic scalpel is recently emerging as an alternative surgical tool for dissection and haemostasis and has been extensively used in the field of minimally invasive surgery. We studied the utility and advantages of this instrument over electrocautery for performing modified radical mastectomy.

**Methods:** The operative and morbidity details of twenty-three breast cancer patients who underwent modified radical mastectomy using the harmonic scalpel were compared with 23 matched controls operated with electrocautery by the same surgical team.

**Results:** There was no significant difference in the operating time between the harmonic scalpel and electrocautery group (104 and 100 mins,  $p > 0.05$ ). The blood loss ( $60 \pm 35$  ml and  $294 \pm 155$ ,  $p < 0.001$ ) and drainage volume ( $590 \pm 430$  ml and  $1,085 \pm 690$  ml,  $p < 0.001$ ) were significantly lower in the harmonic scalpel group. There was a significant reduction of drain days in harmonic scalpel group (mean five and nine days,  $p < 0.05$ ). There was no significant difference in the seroma rate between two groups (16% and 22%).

**Conclusion:** Modified radical mastectomy using harmonic scalpel is feasible and learning curve is short. Harmonic scalpel significantly reduces the blood loss and duration of drainage as compared to electrocautery.

**Keywords:** Modified radical mastectomy (MRM), harmonic scalpel

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## INTRODUCTION

Despite the emergence of breast conservation surgery, modified radical mastectomy (MRM) remains the most commonly performed operative procedure for breast cancer today<sup>(1)</sup>. Conventional MRM using electrocautery or scalpel is associated

with a moderate degree of operative morbidity in 35 - 50% of patients<sup>(2,3)</sup>. Much of this morbidity has been attributed to the large post mastectomy raw area, cut lymphatics and use of electrocautery<sup>(4,5)</sup>. Ultrasonic dissection using the harmonic scalpel has recently emerged as a safe alternative to electrocautery. This has been used extensively in laparoscopic surgery for surgical dissection<sup>(6)</sup>, and initial experience in "open" surgery suggests that it could significantly diminish the blood loss and the operation time<sup>(7)</sup>. With this background we have operation initiated the work on harmonic scalpel MRM in our unit and standardised the operative technique<sup>(8)</sup>. In this study we compared the operative details and morbidity of 23 harmonic scalpel MRMs with 23 matched controls undergoing MRM with electrocautery.

## METHODS

Twenty-three operable breast cancer patients planned for surgery between December 1998 and August 1999 underwent MRM with a harmonic scalpel (Ultracision, Ethicon endosurgery Inc., USA) after obtaining an informed consent. The control group consisted of 23 breast cancer patients matched for age, body surface area (BSA) and stage of disease, operated by the same surgical team using electrocautery during the same period. Blood loss was estimated by weighing the dry sponges pre-operatively and subtracting the weight from the weight of the used sponges<sup>(9)</sup>. A record of operating time, blood loss, 24-hours drain volume and drain days was kept. Drains were removed when the drainage volume was less than 30 ml/24 hours. All the patients were evaluated for the development of haematoma, flap necrosis, wound infection and seroma during follow-up. A matched pair analysis was performed between two groups using a computerised statistical package (Statistix Version 4.0, Analytical software Co Ltd). The Wilcoxon sign rank test and Mc nemar's test were used as appropriate and "p" < 0.05 were taken as significant.

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## OPERATIVE TECHNIQUE – HARMONIC SCALPEL MRM

Flaps were raised using the coagulating shears (CS) attachment of harmonic scalpel. The blunt edge of the open CS blade was used for flap dissection and coaptive coagulation mode was used to occlude and transect the blood vessels more than 3 mm diameter. Axillary dissection was performed using the flat surface of the CS blade. During the axillary dissection coaptive coagulation mode with a power setting of three was used to achieve a better sealing of lymphatics and blood vessels. A standard level III clearance was performed. No suture material or electrocautery was used for haemostasis<sup>(8)</sup>.

## ELECTROCAUTERY MRM

MRM was performed in a standard fashion using electrocautery (Olympus – UES 10, Kyoritsu Electric Co, Japan). Haemostasis was secured using electrocautery or silk ties as appropriate.

## RESULTS

The age, body surface area and stage of the two groups were comparable (Table I). There was no significant difference in the operating time between the harmonic scalpel and electrocautery group (104 and 100 mins,  $p>0.05$ ). The blood loss was significantly lower in the harmonic scalpel group as compared to electrocautery group ( $60 \pm 35$  ml and  $294 \pm 155$ ,  $p<0.001$ ). The total volume of drainage in the harmonic scalpel group was significantly lower than the electrocautery group ( $590 \pm 430$  ml and  $1,085 \pm 690$  ml,  $p<0.05$ ) and the average number of drain days was also significantly less in the harmonic scalpel group (five and nine days,  $p<0.001$ ) as shown in Table II. None of the patients in both the groups developed wound infection, flap necrosis or post operative haematoma. Four patients in the harmonic scalpel group developed seromas compared to five patients in the electrocautery group (Table II). This was not statistically significant ( $p>0.05$ ).

## DISCUSSION

MRM performed using electrocautery is associated with a moderate degree of morbidity<sup>(2,3)</sup> in the form of blood loss, haematoma, flap necrosis, seroma and prolonged axillary drainage. Tejler et al<sup>(2)</sup> reported a post mastectomy morbidity rate of 35% in a series of 385 breast cancer patients and found that 17% of the total hospital stay was due to post mastectomy morbidity. Recent studies<sup>(4,5)</sup> have shown that cautery associated thermal tissue injury causes damage of subdermal vascular plexus and incomplete occlusion of vascular and lymphatic channels, leading to increased morbidity. Recently harmonic scalpel is emerging

Table I. Patient and operative details.

	Harmonic scalpel MRM	Electrocautery MRM	"p" value
Number of patients	23	23	
Age (years)	$51 \pm 11$	$50 \pm 10$	0.8605 (NS)
BSA (sq mts)	$1.50 \pm 0.15$	$1.54 \pm 0.1$	0.0726 (NS)
Stage I & II	9	10	
Stage III	14	13	
Operating time (min)	$104 \pm 26$	$100 \pm 24$	0.0837 (NS)
Blood loss (ml)	$60 \pm 35$	$294 \pm 155$	0.0001 (S)

(BSA = Body surface area, MRM = Modified Radical Mastectomy,  $\pm$  = standard deviation, NS = Not Significant, S = Significant)

Table II. Drainage and morbidity details.

	Harmonic scalpel MRM	Electrocautery MRM	"p" value
Total Drain Volume	$590 \pm 430$	$1,085 \pm 690$	0.0194 (S)
Mean Drain Days	$5 \pm 3$	$9 \pm 7$	<0.001 (S)
Seroma Rate	4/23 (17%)	5/23 (22%)	0.7389 (NS)

(MRM = Modified Radical Mastectomy,  $\pm$  = standard deviation, NS = Not Significant, S = Significant)

as an alternative surgical tool for dissection and haemostasis especially in the field of minimally invasive surgery. Ultrasonic waves at a frequency of 55,000/second are generated by the harmonic scalpel for tissue dissection and haemostasis. Although it has been extensively used in laparoscopic surgery<sup>(6)</sup>, experience with the harmonic scalpel in "open" surgery is limited. The harmonic scalpel has recently been used in thyroid surgery and found to be associated with lower operating time and blood loss<sup>(7)</sup>. Initially the harmonic scalpel procedure took a longer time than conventional mastectomy; however the operating time decreased with experience and the mean operating time was comparable with electrocautery. The blood loss and drain days were significantly lower in the harmonic scalpel group. Ultrasonic energy generated by the harmonic scalpel causes a breakage of hydrogen bonds and the formation of denatured protein coagulum. This coagulum seals off the vessels and lymphatics in decreased blood loss and lymphatic drainage. Lateral thermal injury has been shown to be halved with the harmonic scalpel as compared to electrocautery in animal models<sup>(10)</sup>, which can potentially decrease the flap necrosis rate. We did not encounter flap necrosis in either group. Historical data from the authors' unit show a flap necrosis rate of 4% using electrocautery. The small number of patients could explain this apparent difference in outcome.

Apart from being a better haemostatic tool than electrocautery, the harmonic scalpel has an added advantage of multifunctionality, avoiding frequent instrument changes and use of sutures. Haemostasis was achieved in all patients of the harmonic scalpel group without ligature, clamp or cautery.

### CONCLUSION

Modified radical mastectomy can be safely performed with a harmonic scalpel with a significant reduction in the blood loss and duration of drainage in comparison to electrocautery.

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