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ORIGINAL ARTICLE

SEROMA FORMATION AFTER MASTECTOMY FOR BREAST CANCER

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Abstract

Background: Seroma formation after modified radical mastectomy (MRM) is a frequent complication which predisposes to other complications. Different surgical strategies have been practiced looking for its prevention. We aimed with this study to analyze the different methods of dissection that participate in seroma formation after MRM and accordingly standardizing the best operative technique with the least incidence of seroma formation.

Patients and Methods: A prospective randomized study included females who had MRM for early breast cancer from April 2011 to August 2013, at Sohag University Hospital. Patients were classified into 3 groups according to breast dissection with electrocautery, conventional scalpel, and harmonic scalpel to analyze its effects in seroma formation. Also timing of drain removal, postoperative use of pressure garment, and timing of postoperative shoulder exercise were analyzed for the same purpose.

Results: The study included 50 females with 16% incidence of postmastectomy seroma. All were treated with aspiration, but drain replacement was necessary in one case (12.5%) with axillary seroma. The use of electrocautery, early removal of drains, and early active shoulder exercise, all were highly significant factors (P= 0.001) in development of postmastectomy seromas and proved to be independent factors. Neglection of the wear of pressure garment was nonsignificant (P= 0.25).

Conclusion: Prevention of seroma or decreasing its incidence after MRM can be achieved by the use of ordinary scalpel or far better harmonic scalpel in breast dissection, delayed removal of drains, use of pressure garment postoperative, and also delayed active shoulder exercise.

Keywords: Harmonic scalpel, Axillary dissection, Needle aspiration, Breast cancer

INTRODUCTION

Breast cancer, the second cause of cancer deaths among women, is treated with either modified radical mastectomy (MRM) or breast conservation depending on the disease stage.[1] This entails creation of large axillary dead space and much dissection in creation of skin flaps.

Seroma after mastectomy is a collection of serous fluid under the skin flaps or in the axilla after axillary dissection.[2] Being the commonest complication after mastectomy, it occurs in 2.5% to 51% of cases.[3] It begins on the seventh day post-surgery, reaching a peak on the eighth day and slows continuously until the sixteenth day when it generally resolves.[4] It is responsible for

patient discomfort, prolongation of hospital stay, multiple physician visits, delay of adjuvant therapy,[5] and sometimes, a fibrous encapsulated seroma forms which is resistant to aspiration and requires surgical excision.[6]

The factors contributing to seroma formation are poor adherence of flaps to chest wall, division of several larger lymph trunks, large dead space / large raw area in the axilla, pump action of upper limb increasing lymph flow, local inflammatory mediators, irregular shape of chest wall and axilla, and shear forces during respiration.[7] The most probable cause for seroma formation is disruption of lymphatic channels in the axilla.[8] Although, laboratory studies have shown conflicting evidence, some determined the fluid to be lymph-like in quality,[9] and others showed an inflammatory exudate.[10] Ligation of lymphatics before cutting during axillary clearance leads to reduction of incidence of seroma formation by reduction of axillary lymph drainage postoperative.[11] Also dissection of breast skin flaps during mastectomy using ordinary scalpel has low incidence of seroma formation than using electrocautery but blood loss is much more. Use of harmonic scalpel is reported to be associated with reduced blood loss and drainage volume.[12]

Several methods have been developed to overcome this problem but none of them could be used successfully in practice.[13] It is managed by repeated needle aspiration to seal the skin flaps against the chest wall.[14] However, the use of needle aspiration in an edematous breast can produce additional inflammation and edema.[15] So the best method of management of seroma formation should be focused in how to avoid its formation from the start.

Aim of the work: The aim of this study was to analyze the different methods of dissection that participate in seroma formation after MRM and accordingly standardizing the best operative technique with the least incidence of seroma formation.

MATERIAL AND METHODS

This study was done prospectively in the period between April 2011 to August 2013 on female patients with early breast cancer admitted to General Surgery department, Sohag University Hospital and managed with MRM by surgeons with an extensive experience in breast cancer surgery.

Fifty female patients were eligible for inclusion in this study and were randomized into 3 groups (using randomly ordered sealed opaque envelops, which were opened immediately before mastectomy).

Patients were excluded if they were ASA (American Society of Anesthesiologists) classes > 2, those undergoing bilateral mastectomy or immediate reconstruction, those who had undergone more than 1 previous surgical procedure related to the presenting pathology, those with voluminous breasts, and those who were known to have bleeding diatheses, or were on anticoagulant medication.

Ethical approval was obtained from the local ethics committee and an informed consent was obtained from each participant. Patients were subjected to complete preoperative evaluation through history and examination to assess breast lump and axillary lymph nodes and also to exclude the presence of advanced breast cancer. Preoperative laboratory investigations included coagulation profile, complete blood count, blood sugar level, liver function tests, renal function tests, total proteins, serum albumin, and serum electrolytes. Preoperative radiological assessment included bilateral breast mammography, ultrasound in addition to chest plain x-ray and abdominal ultrasound to exclude metastases. Invasive diagnostic techniques included Tru-cut needle biopsy followed by histopathology.

After preoperative assessment MRM was done. The breast dissection was done by three different tools; electrocautery (Valley Lab., USA®), conventional scalpel and harmonic scalpel (Johnson & Johnson, Ethicon_Endo®). After operation drains were removed either within 3-5 days postoperative, whatever their daily output, or after 5 days; when their daily output was less than 30 cc.

Due to the unavailability of pressure garments, they were replaced by multiple large sized crepe bandages which surrounded the chest wall and the axilla over the wound dressing as early as possible after the operation (before the anesthesia recovery). Also soft objects were put over the axillary region and under the crepe bandage (e.g. multiple dressings and towels).

Active shoulder exercise from the first postoperative day was done with some patients and was postponed till 5-10 days postoperative in some of them (chosen randomly) and only the simple daily activities of the upper limb were allowed in that period.

Follow up for 1-2 months of all patients in this study was done postoperatively every week to assess the wound and to detect the cases of seroma formation and other complications. A seroma was defined as a postoperative fluid collection requiring one or more aspirations or subsequent drain placement.[16]

Statistical Analysis: Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS 16.0 for Windows, SPSS INC., Chicago, USA).

The association of different clinical and operative factors and risk of occurrence of seroma formation was evaluated by Binary Logistic regression analysis. The cut-off for significance of all used statistical analyses was

rated as P ≤ 0.05, P value = 0.001 was rated as highly significant, and P value > 0.05 was rated as not significant.

Categorical variables were expressed as number of cases and percentages, mean with standard deviation (SD) and median and range, as appropriate. The 95% confidence interval was calculated for the main outcome measure.

RESULTS

At this study, there were 50 female patients of early breast cancer. The age of the included patients ranged from 28 to 70 years with a mean age = 47.26 ±1.3 and the median was 43 years.

Breast dissection was done by conventional scalpel in 20 patients, electrocautery in 20 patients, and harmonic scalpel in the remaining 10 patients.

There were 8 cases (16%) of postmastectomy seroma detected 9-16 days postoperative, 7 cases of them were detected in outpatient follow up and the last case was detected during hospital stay at the 9th postoperative day. There were associated complications e.g. wound infection and flap necrosis in 3 cases of postmastectomy seroma. Five seromas were in the axilla and the other 2 cases had combined location both in the axilla and in the breast wound site. All seromas were treated with aspiration initially, with a mean of 2.7 aspirations (range 2 to 7 aspirations). But drain replacement was necessary in one case (12.5%) with axillary seroma.

Breast dissection was done by electrocautery in 20 cases (40%), of them 7 cases developed postoperative seroma (35%), which was a highly significant factor in the development of postmastectomy seroma (P= 0.01) (Table 1& 2).

Breast dissection was done by conventional scalpel in 20 cases (40%), and there was only one case developed postoperative seroma with percentage = 5%. The usage of conventional scalpel in the breast dissection is an important factor in the prevention of postmastectomy seroma, but was not a significant factor (P= 0.12) (Table 1& 2).

Harmonic scalpel was used in breast dissection in 10 cases (20%) without seroma formation in any; this means a percentage of 0% postoperative seroma formation. Although it is inferred from the previous results that the use of harmonic scalpel is an important factor in prevention of postmastectomy seroma, but P value could not be calculated as there were no cases of postmatectomy seroma detected (Tables 1, 2).

Wound drains were removed 3-5 days postoperative in 12 cases with development of postmastectomy seroma in 7 cases (58%), while in the other 38 cases the drains were removed later and there was only one case of seroma within those (2.6%). So, early drain removal 3-5 days postoperative was a highly significant factor in the development of postmastectomy seroma (P= 0.001) (Tables 1, 2).

Pressure garment was used in 22 patients (chosen randomly) postoperatively, of whom 2 cases developed postmastectomy seroma (9%), while in cases pressure garment was not used there were 6 cases of postmastectomy seroma (22%). So its use was associated with less incidence of postmastectomy seroma, but was insignificant (P= 0.25) (Tables 1, 2).

Active shoulder exercise was delayed 5-10 days postoperative in 38 patients chosen randomly, in whom there was development of postmastectomy seroma in only one case (2.6%). In those patients who had early active shoulder exercise (12 cases), there were 7 cases of postmastectomy seroma (58.3%). From these results it is inferred that early active shoulder exercise is a highly significant factor in the development of postmastectomy seroma (P= 0.001) (Tables 1, 2).

As regard Univariate logistic regression analysis of factors affecting occurrence of seroma we found the following results:

Univariate analysis

Usage of electrocautery was associated with high incidence of development of postmastectomy seroma with an incidence of (35%), an Odds ratio= (15.62) which means that the incidence of seroma in cases utilized electrocautery in dissection was higher 15.62 times than cases done without the use of electrocautery and P= 0.01. Also early drain removal had higher incidence of development of postmastectomy seroma than late removal with an incidence of (58.3%), an Odds ratio= 51.8 and P= 0.001. And in the same study early shoulder exercise had higher incidence of development of postmastectomy seroma with an incidence of (58.3%), an Odds ratio= 51.8 and P= 0.001 (Table 2).

Multivariate analysis

According to Multivariate logistic regression of factors affecting occurrence of seroma, including significant factors identified in Univariate analyses, we got the following results; seroma was significantly associated with the usage of electrocautery (P value = 0.02, hazard ratio= 28.40, with 95% confidence interval 1.55- 520.44). Add to this removal of wound drains 3-5 days postoperative was a significant factor in seroma formation (P value= 0.03, hazard ratio= 24.5, with 95% confidence interval 1.43– 498.87). Also Active shoulder exercise 5-10 days appeared to be a significant factor in seroma formation (P value= 0.03, hazard ratio= 24.5, with 95% confidence interval 1.43 – 498.87). All these factors appeared to be independent factors (Table 3).

Table 1. Comparison between factors that participate either in the prevention or formation of postmastectomy seroma

	Total number	Seroma Number 8 (16)	No seroma Number 42 (84)
Ordinary scalpel	20	1 (5)	19 (95)
Electrocautery	20	7 (35)	13 (65)
Harmonic Scalpel	10	0.0 (0)	10 (100)
Drains removed 3-5 days postoperative	12	7 (58.3)	5 (41.7)
Pressure garment	22	2 (9)	20 (91)
Delayed active shoulder exercise 5-10 days	38	1(2.6)	37 (97.4)

Table 2. Univariate logistic regression of factors affecting occurrence of seroma

Factors affecting seroma	Odds ratio	(95% confidence interval)	P value
Age ≥45y vs. age<45	0.56	(0.12 – 2.55)	0.45
Cautery vs. no Cautery	15.62	(1.34 -140.21)	0.01
Ordinary vs. no ordinary scalpel	0.17	(0.02 – 1.53)	0.12
Harmonic scalpel vs. no	Can't calculated as all seroma occurs in those with no harmonic scalpel		
Drain removed 3-5 days postoperative versus drain removed later	51.8	(5.22 – 513.56)	0.001
Pressure garment vs. no pressure garment	0.37	(0.07 – 2.03)	0.25
Active shoulder exercise vs. Delayed shoulder exercise 5-10 days vs.	51.8	(5.22 – 513.56)	0.001

- Factors with bold letters were significant.

Table 3. Multivariate logistic regression of factors affecting occurrence of seroma (including significant factors in univariate analysis)

Factors affecting seroma	Odds ratio	(95% confidence interval)	P value
Cautery vs. no Cautery	28.40	(1.55 -520.44)	0.02
Drain removed 3-5days postoperative vs. later removal	24.5	(1.43 – 498.87)	0.03
Active shoulder exercise vs. delayed shoulder exercise 5-10 days	24.5	(1.43 – 498.87)	0.03

DISCUSSION

Postmastectomy seroma development is a common event with rates ranging from 3% to 85% after breast or axillary surgery,[17] its treatment usually necessitates repeated aspiration,18 but often seroma needs replacement of a drain or even surgical intervention.6 Several factors have been investigated as the cause of seroma formation. These include age, obesity, duration of wound drainage, use of pressure garment, post-operative arm activity, preoperative chemotherapy, and use of electrocautery.[14,17]

We had a collectively seroma incidence rate as 16% because electrocautery was used in 40% of cases for dissection with an incidence of postmastectomy seroma formation as 35% which was a significant factor affecting development of seroma (P= 0.01). This may be due to increased thrombosis of subdermal vessels which lead to relative ischemia of the flaps and lymph spillage from inadequately sealed lymphatics might predispose the wound to seroma. Also the thermal effect of electrocautery on subcutaneous fat leads to lipolysis which is another underlying cause of seroma formation.[19]

The current study revealed that the use of conventional scalpel in MRM was associated with less incidence of seroma formation postoperatively (5%) than with electrocautery use, which may be due to the avoidance of the unwanted effects of electrocautery which lead to higher incidence of seroma formation.[19] This study matches with other studies.[19,20]

Harmonic scalpel causes breakdown of hydrogen bonds and forms a protein coagulum to occlude the vascular and lymphatic channels. So we can get a least incidence of seroma formation. It is important to cut all tissue only with the harmonic scalpel because it ensures the perfect sealing of lymphatic and blood vessels and causes lesser thermal injury and inflammatory reaction, in addition there is no use of sutures.[21,22] This study revealed that the use of harmonic scalpel in MRM was an important factor in prevention of postoperative seroma formation as there was no cases of seroma developed after its use, so it is better than electrocautery as regard seroma formation and also the use of harmonic scalpel is far better than conventional scalpel or in other word the use harmonic scalpel during MRM is the best for prevention of postoperative seroma formation which comes in accordance with other studies.[22,23]

Our study proved that early drains removal 3-5 days postoperative (independent on the daily output) was a highly significant factor (P= 0.001) in the occurrence of postmastectomy seroma, this is in accordance with other study.[24] As during axillary dissection and axillary lymph node dissection there is cut of the axillary vessels with continuous extracellular fluid leak from upstream tissues through afferent lymphatic vessels and some weeks are necessary for draining lymphatic network reconstitution.[25] Meanwhile 8-day drainage after MRM has less incidence of seroma formation than 5-day drainage.[26] The hazards of delayed drains removal can be avoided by early discharge of the patients from hospital with wound drains and good frequent follow up for them in output clinics with good care of drains (to avoid occlusion or infection) till their removal when daily output is acceptable (less than 30- 50 cc).

Our study showed that the use of pressure garment after MRM decrease the incidence of breast seroma formation (9%), but this was not a significant factor in preventing postmastectomy seroma formation (P= 0.25). This decrease in incidence of breast seroma formation, accordingly decrease other wound complications. This can be explained by early obliteration of the dead space by pressure garment (the dead space between the chest wall muscles and the skin flaps developed after the operation) that may decrease the amount and period of drainage. So, it decreases incidence of wound complications especially breast seroma formation.[27]

This study proved that the delayed active shoulder exercise (5-10 days postoperative) could decrease the incidence of breast seroma (2.6%) and this was a highly significant factor in prevention of postmastectomy seroma development (P= 0.001). This matches other studies which can be explained by enhancement of adherence of skin flaps after dissection and obliteration of dead space that occurs as a result of delay of active shoulder exercise.[28]

It was concluded from this study that the prevention of breast seroma formation after MRM can be achieved by the following strategies; the use of ordinary scalpel or far better harmonic scalpel in breast dissection, delayed removal of the wound drains, the use of pressure garment early postoperative, and also delayed active shoulder exercise at the side of operation 5-10 days postoperative with only daily activities of upper limb in this period. All these can help in prevention of seroma formation or even decrease its postoperative incidence.

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