International Surgery Journal
Gomaa E et al. Int Surg J. 2017 Oct;4(10):3228-3233
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20174200

Original Research Article

Cavity shave margins for breast conservative surgery

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Received: 28 August 2017
Accepted: 11 September 2017

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ABSTRACT

Background: 20-40% of patients have positive margins after partial mastectomy. Taking additional tissue circumferentially around the cavity left by partial mastectomy "cavity shave margins" may reduce the rate of positive margins. This review aims to evaluate the effect of routine excision of circumferential cavity shave margins after breast-conserving surgery.
Methods: This randomized controlled trial had been conducted in General Surgery Department, Sohag Faculty of Medicine from January 2015 to April 2017. 40 patients with early breast cancer were candidates for partial mastectomy and randomly assigned in a 1:1 ratio to have either additional circumferential cavity shave margins or not.
Results: The mean age of both groups were around 39 years (range 30-50 years). More than half of the cases fell in stage I, with a little more than 20% of them were in stage 0 and the rest in stage II at time of operation. Although cavity shave group had longer operative time, longer hospital stay, and higher amount of blood loss; all these showed non-significant difference between the two groups. The mean amount of resected volume was significantly higher among cavity shave group compared to non-cavity shave group. The percentage of positive margin reduced from 40% before shave to only 10% after shave margin.
Conclusions: Cavity shaving resulted in significant reduction of the rates of positive margins and re-operation among patients undergoing breast-conserving surgery.

Keywords: Breast conservative surgery, Cavity shave margin

INTRODUCTION

Breast conserving surgery (BCS) with radiation therapy is now considered as a standard therapy for low grade breast cancer, owing to its safety and cosmetic outcome. It is preferred in early breast cancers, as it provides similar rates of overall survival as traditional mastectomy.[1]

The International Consensus Conference about BCS defines BCS as "complete removal of the malignant breast tissue with a concentric margin of surrounding healthy tissue performed in a cosmetically acceptable manner (lumpectomy) usually followed by radiation therapy".[2-6]

It is important to achieve a good cosmetic result when using BCS but at the same time to minimize the width of excision and warrantee a low local reoccurrence rate. This important balance should be in mind for each breast surgeon planning for surgical treatment of early breast cancer.[1]

However, patients treated with BCS for cancer carry some higher risk of local reoccurrence later on in their lives. Local reoccurrence does not parallel the regional and/or visceral metastatic disease.[3]

Previous data revealed that up to 20-40% of patients have positive margins after partial mastectomy and need a second operation for margin clearance. Retrospective studies have shown that taking additional tissue circumferentially around the cavity left by partial mastectomy (a process called "cavity shave margins") may reduce the rate of positive margins. However, others claimed that it is sufficient to excise selective margins where the tumor appears to be close to the edge of the specimen on the basis of intraoperative imaging and gross assessment.[7-10]

The tumor edges differ from patient to patients and can be summarized in the following types:[11-13]

- Positive edges: tumor cells are present at the edge
- Focal presence of tumor cells: at least three low power fields of view shows tumor cells
- More than focal presence: tumor cells are present in more than three fields of low power field view
- Narrow edges: tumor cells are at approximately 0.5 mm from edges
- Negative edges: there are no tumor cells or the distance between edges and tumor cells is > 1 mm.

In all studies, the highest local reoccurrence rate corresponds to "more than focally positive margins" and lowest local recurrences rate to "negative margin tumors".[11-13]

The fact that the number of malignant cells at the periphery of the tumor decreases steadily as we go further away from the edges has raised the question of how much tissue should be removed in order to avoid local reoccurrence (LR)?[12]

Despite the fact that there is no agreed definition of optimal edges-tumor free margin, it is frequently stated that the sufficient edge width is 1 cm wide, with the hope that postoperative irradiation can destroy microscopic remains of disease beyond this distance.[12]

The objective of this study was to evaluate the effect of routine excision of circumferential cavity shave margins versus standard partial mastectomy on outcomes after breast-conserving surgery.

METHODS

This randomized controlled trial had been conducted in General Surgery Department, Sohag Faculty of Medicine. The study population consisted of patients with early breast cancer (stages 0-II) indicated for breast conservative surgery, during the period from January 2015 to April 2017. A total of 40 patients were studied, aged more than 30 years. All patients had been diagnosed by core-needle biopsy. Patients who had undergone neo-adjuvant chemotherapy and were candidates for partial mastectomy were eligible.

Pre-operative workup

- A written informed consent was obtained from every patient
- A proper sheet, for every patient, was recorded
- All patients had Preoperative diagnostic evaluation include:
  a) Complete history taking, physical examination.
  b) Laboratory investigations including complete blood picture, coagulation profile and other investigations for fitness were done routinely for all patients.
  c) Preoperative imaging and localization of tumor.

- Patients enrolled in the study were stratified into groups according to tumor stage (0, I, or II)
- In each stratum, patients were randomly assigned in a 1:1 ratio to having either additional circumferential cavity shave margins resected (shave group) or no further tissue removed (no-shave group). Each patient had a serial number based on date of attendance to outpatient breast surgery clinic in Sohag University Hospital. Cases having odd serial numbers were operated with cavity shave margin and cases with even serial numbers were operated without cavity shave.

Intraoperative workup

Two surgeons participated in the study

- First surgeon performs standard partial mastectomy according to his usual practice, including resection of margins where the tumor was believed to be close to the edge of the specimen on the basis of standard intraoperative their own gross evaluation.

  a) Neither the specimen obtained during partial mastectomy nor any additional margins were sent for intraoperative pathological evaluation by means of frozen-section examination.

- For patients in the shave group, a second surgeon resected additional tissue such that cavity shave margins encompassing the entire cavity were removed.

  a) Superior, inferior, medial, and lateral shave margins were mandated, along with anterior and posterior margins if the resection had not extended to the dermis and pectoralis fascia, respectively.
  b) The volume of the cavity shave margins could not be standardized given the varied tumour size and body habitus of the patients; however,

participating surgeons were instructed that cavity shave margins should encompass the entire cavity.

c) The specimen obtained during partial mastectomy was oriented with sutures to designate a minimum of two orthogonal faces (e.g., superior and lateral). All the additional tissue that was removed was marked with regard to its location and oriented to designate the true margin.

Postoperative workup

- Specimens obtained during partial mastectomy were sectioned into 0.40-cm slices for gross evaluation and sliced-specimen radiography
- Representative sections were submitted for histologic evaluation with a map of the specimen for the correlation of gross, imaging, and microscopic findings
- Specimens obtained during partial mastectomy that were smaller than 5 cm in the greatest dimension were submitted for histologic evaluation in their entirety
- A minimum of two sections perpendicular to each margin of the specimen obtained during partial mastectomy were evaluated
- Additional margins were serially sectioned perpendicular to the true margin and were evaluated grossly and by means of specimen radiography in the same way as the other specimens obtained during partial mastectomy
- Quantitative margin distances were recorded to the nearest millimeter.

Outcome measures

The primary outcome measures were rate of positive margins; operation time; intraoperative blood loss; length of hospital stay and rate of postoperative complications.

Statistical analysis

Statistical package for social sciences (IBM-SPSS), version 24 IBM-Chicago, USA (2016) was used for statistical data analysis. Student t and ANOVA tests were used to compare means of two or more groups. Pearson Chi square test was used to compare percentages for qualitative data. Pearson correlation test was used to compare two quantitative variables. P value is considered significant when <0.05, and highly significant when <0.001.

RESULTS

Demographic and clinical patients' data (Table)

The mean age of both groups were around 39 years (range 30-50 years), with non-significant difference between the two groups. More than half of the cases fell in stage I, with a little more than 20% of them were in stage 0 and the rest in stage II at time of operation. Tumor diameter ranged from 1 to 4 cm, with non-significant difference between the two groups. Although cavity shave group had longer operative time, longer hospital stays and higher amount of blood loss; all these showed non-significant difference between the two groups. On the other hand, the mean amount of resected volume was significantly higher among cavity shave group (120.85±14.7 cc3) compared to non-cavity shave group (67.6±6.14 cc3). The percentage of positive margin reduced from 40% before shave to only 10% after shave margin, which is highly significant.

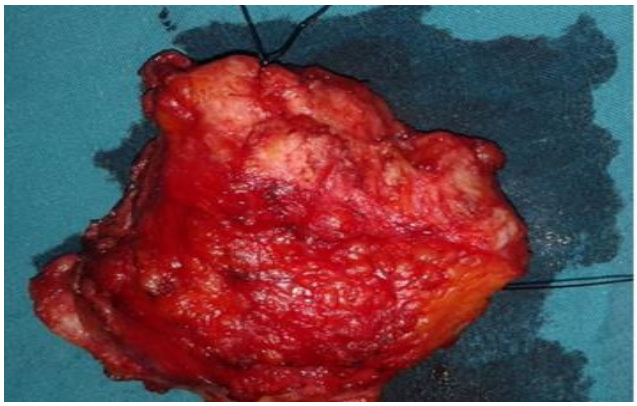

Figure 1: Excised breast lump.

Figure 2: Cavity shaving.

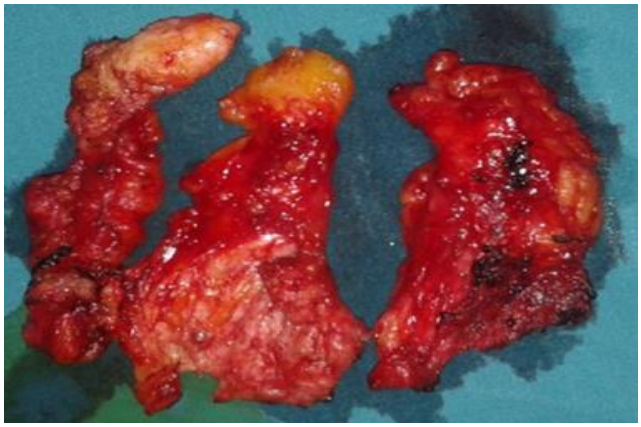

Figure 3: Shaved margins.

Figure 4: Before closure.

Figure 6: After healing

Table 1: Demographic and clinical data.

Item		Shave group	No shave group	P value
Age (years)	Mean±SD	39.75±4.99	38.70±5.66	0.537
	Median (range)	41 (32-48)	38 (30-50)	
Stage of the tumor	0	5 (25%)	4 (20%)	0.926
	I	11 (55%)	12 (60%)	
	II	4 (20%)	4 (20%)	
Tumor diameter (cm)	Mean±SD	2.19±0.86	2.27±0.79	0.761
	Median (rang)	1.9 (1-4)	2 (1-4)	
Type of tumor	Ductal	19 (95%)	18 (90%)	1.000
	Lobular	1 (5%)	2 (10%)	
Positive node	No (%)	13 (65%)	12 (60%)	0.744
Volume resected (cc)	Before shave	68.25±7.64	67.6±6.14	0.768
	After shave	120.85±14.7	67.6±6.14	<0.001
Operative time (minutes)	Mean±SD	75.25±16.1	65.00±20.33	0.085
	Median (rang)	75 (50-100)	60 (40-100)	
Hospital stay (hours)	Mean±SD	33.9±9.39	32.1±7.85	0.515
	Median (rang)	33 (24-48)	30 (24-48)	
Blood loss (cc)	Mean±SD	154.00±32.59	141.50±27.73	0.199
	Median (rang)	150 (100-200)	150 (100-200)	
Positive margin	Before shave	8 (40%)	7 (35%)	1.000
	After shave	2 (10%)		0.031

Figure 5: After healing

DISCUSSION

Breast cancer is the most common malignancy among women in the United States. Nearly 270,000 women were diagnosed with operable breast cancer in 2015, approximately two-thirds (180,000 women) of whom were suitable for breast-conserving surgery (BCS), namely partial mastectomy. For early cases, BCS can yield an equivalent survival compared with radical mastectomy. However, BCS has a higher lifelong local recurrence rate than total mastectomy, mandating adjuvant radiation therapy, and approximately 20-35% of patients who undergo BCS eventually require reoperation. Margin status is a pivotal predictor for local recurrence. The rate of positive margins after a partial

mastectomy is as high as 20-40%. Patients with breast cancer with positive margins have a two-fold increase in the risk of tumor recurrence compared with those who have negative margins.[12]

Cavity shaving (CS) was first introduced as a pathological biopsy technique to examine the residual tumor during or after partial mastectomy, and the incidence of residual tumor bed positivity reaches as high as 39.3%. Later, several studies demonstrated that CS could be an easy and effective procedure to decrease the positive margin rate and re-excision rate. However, some authors have argued that the excision of selective margins might be sufficient. The value of CS has been questioned because adjacent multifocal disease might outweigh margin status in causing BCS failure. Thus, we conducted this systematic review and meta-analysis with the aim to compare the efficacy and safety between CS plus lumpectomy and lumpectomy alone.[14]

Our study population consisted of patients with early breast cancer (stages 0-II) indicated for breast conservative surgery, during the period from January 2015 to April 2017. A total of 40 patients were studied, aged more than 30 years. All patients had been diagnosed by core-needle biopsy. Patients who had undergone neo-adjuvant chemotherapy and were candidates for partial mastectomy were eligible, our patients were classified to 2 groups, first group (non-shave group) performed standard partial mastectomy, second group (shave group) performed resection of additional tissue such that cavity shave margins encompassing the entire cavity were removed.

The mean age of our study group was 39.8 years in shave group and 38.7 years in non-shave group, however the mean age in studies of Chagpar et al and Jones et al, ranged from 50-60 years.[12,14]

Regarding the diameter of tumor, it was 2.2 cm in shave group and 2.3 cm in non-shave group. Tumour was ductal in 90-95% and lobular in 5-10% of both groups, with non-significant difference. Positive node was in 65% of shave group and 60% of non-shave group. Regarding mean of volume resected in shave group, it was 68 cm3 before shave and 120 cm3 after shave, but in non-shave group it was 67 cm3 before and after shave. In a retrospective study involving 171 patients, Huston et al, found that cavity shaving was associated with larger total specimen volumes than was partial mastectomy, with or without intraoperative selective margin resection (129.2 cm^3 versus 46.0 cm3 and 37.4 cm3, respectively).[15] However, Mook et al, in a retrospective study, found that cavity shaving was associated with a smaller volume of excised tissue than was standard partial mastectomy (80.7 cm3 versus 165.1 cm3), which raises the possibility that surgeons who perform cavity shaving routinely excise less tissue initially and excise excess tissue during shaving.[13]

Positive margin in our study before shave was in 40% but after shaving it was in only 10% of shave group, however in non-shave group it was in 35% of patients. Several retrospective studies have shown similar findings. In a study involving 138 patients, Kobbermann et al, found that routine cavity shaving was associated with a lower rate of reoperation for margin clearance than was standard partial mastectomy (22% versus 42%, P = 0.01) and was a significant predictor of negative margins on multivariate analysis.[16] Unzeitig et al, found that routine cavity shaving resulted in nearly half the re-excision rate associated with standard partial mastectomy (24% versus 47%, P<0.001).[17] Similarly, Marudanayagamet al, found that before the introduction of cavity shaving, 49 of 392 patients (12%) underwent reoperation for margin clearance, whereas afterward, only 22 of 394 patients (6%) who underwent cavity shaving required further surgery. Cao et al, found that 59% of103 patients who had positive margins on their initial specimen had negative margins after cavity shaving.[18,19] Tengher-Barna et al Similarly, found that 42% of 47 patients who had positive marginson their initial specimen had negative margins with cavity shaving. Jacobson et al.[20,21] found that routine cavity shaving eliminated the need for a second surgery for margin clearance in 49% of 125 patients.

Findings of Guyatt et al, suggested that additional CS had a lower positive margin rate than BCS alone (16.4% versus 31.9%).[22] CS was associated with a 59% OR reduction in the tumor-involved margin. The precision of this association was reinforced by the narrow 95% CI of 0.32-0.53.

Chen et al, showed that the cavity margin status was significantly associated with loco-regional recurrence in NAC-treated patients but not in non-NAC-treated patients.[23] In addition, tumor, tumor grade, vascular invasion, and lymph node metastasis have been suggested to be correlated with the cavity-shave margin status. These factors should be carefully considered when planning the extent of the cavity shave margin.[24]

CONCLUSION

Study found that cavity shaving resulted in significant reduction of the rates of positive margins and reoperation among patients undergoing breast-conserving surgery for breast cancer of stage 0 to II.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Gentilini O, Botteri E, Leonardi MC, Rotmensz N, Vila J, Peradze N, et al. Ipsilateral axillary recurrence after breast conservative surgery: The

protective effect of whole breast radiotherapy. Radiother Oncol. 2017;122(1):37-44.
2. Thurlimann B, Senn HJ. Consensus Meeting of the 9th International Conference on Primary Therapy of Early Breast Cancer (St. Gall, January 26-29, 2005). Gynakol Geburtshilfliche Rundsch. 2005;45(3):143-6.
3. Bhatti AB, Khan A, Muzaffar N, Siddiqui N, Syed A, Shah M, et al. Safe negative margin width in breast conservative therapy: results from a population with a high percentage of negative prognostic factors. World J Surg. 2014;38(11):2863-70.
4. Nadrljanski MM, Milosevic ZC, Plesinac-Karapandzic V, Maksimovic R. MRI in the evaluation of breast cancer patient response to neoadjuvant chemotherapy: predictive factors for breast conservative surgery. Diagn Interv Radiol. 2013;19(6):463-70.
5. Non-clinical factors as determinants of the use of breast conservative surgery in Italy. Tumori. 2003;89(2):168-72.
6. Barbuscia MA, Cingari EA, Torchia U, Querci A, Lemma G, Ilacqua A, et al. Indications for and limits of conservative surgery in breast cancer. G Chir. 2013;34(3):90-4.
7. Urban C, Amoroso V, Spautz C. Cavity shave margins in breast cancer. N Engl J Med. 2015;373(22):2187.
8. Bartelink H, Rutgers E, Wesseling J. Cavity Shave Margins in Breast Cancer. N Engl J Med. 2015;373(22):2186-7.
9. Jiang L, Jiang S, Long H. Cavity shave margins in breast cancer. N Engl J Med. 2015;373(22):2186.
10. Chagpar AB, Trial I. Cavity shave margins in breast cancer. N Engl J Med. 2015;373(22):2187-8.
11. Coble J, Reid V. Achieving clear margins. Directed shaving using Margin Probe, as compared to a full cavity shave approach. Am J Surg. 2017;213(4):627-30.
12. Chagpar AB, Killelea BK, Tsangaris TN, Butler M, Stavris K, Li F, et al. A Randomized, controlled trial of cavity shave margins in breast cancer. N Engl J Med. 2015;373(6):503-10.
13. Mook J, Klein R, Kobbermann A, Unzeitig A, Euhus D, Peng Y, et al. Volume of excision and cosmesis with routine cavity shave margins technique. Ann Surg Oncol. 2012;19(3):886-91.
14. Jones V, Linebarger J, Perez S, Gabram S, Okoli J, Bumpers H, et al. Excising additional margins at initial breast-conserving surgery (BCS) reduces the need for re-excision in a predominantly african american population: a report of a randomized prospective study in a public hospital. Ann Surg Oncol. 2016;23(2):456-64.
15. Huston TL, Pigalarga R, Osborne MP, Tousimis E. The influence of additional surgical margins on the total specimen volume excised and the re-operative rate after breast-conserving surgery. Am J Surg. 2006;192(4):509-12.
16. Kobbermann A, Unzeitig A, Xie XJ, Yan J, Euhus D, Peng Y, et al. Impact of routine cavity shave margins on breast cancer re-excision rates. Ann Surg Oncol. 2011;18(5):1349-55.
17. Unzeitig A, Kobbermann A, Xie XJ, Yan J, Euhus D, Peng Y, et al. Influence of surgical technique on mastectomy and re-excision rates in breast-conserving therapy for cancer. Int J Surg Oncol. 2012;2012:725121.
18. Marudanayagam R, Singhal R, Tanchel B, O'Connor B, Balasubramanian B, Paterson I. Effect of cavity shaving on reoperation rate following breast-conserving surgery. Breast J. 2008;14(6):570-3.
19. Cao D, Lin C, Woo SH, Vang R, Tsangaris TN, Argani P. Separate cavity margin sampling at the time of initial breast lumpectomy significantly reduces the need for reexcisions. Am J Surg Pathol. 2005;29(12):1625-32.
20. Tengher-Barna I, Hequet D, Reboul-Marty J, Frassati-Biaggi A, Seince N, Rodrigues-Faure A, et al. Prevalence and predictive factors for the detection of carcinoma in cavity margin performed at the time of breast lumpectomy. Mod Pathol. 2009;22(2):299-305.
21. Jacobson HI, Lemanski N, Narendran A, Agarwal A, Bennett JA, Andersen TT. Hormones of pregnancy, alpha-feto protein, and reduction of breast cancer risk. Adv Exp Med Biol. 2008;617:477-84.
22. Guyatt GH, Oxman AD, Kunz R, Brozek J, Alonso-Coello P, Rind D, et al. GRADE guidelines 6. Rating the quality of evidence-imprecision. J Clin Epidemiol. 2011;64(12):1283-93.
23. Chen K, Jia W, Li S, He J, Zeng Y, Yang H, et al. Cavity margin status is an independent risk factor for local-regional recurrence in breast cancer patients treated with neoadjuvant chemotherapy before breast-conserving surgery. Am Surg. 2011;77(12):1700-6.
24. Lovrics PJ, Cornacchi SD, Farrokhyar F, Garnett A, Chen V, Franic S, et al. The relationship between surgical factors and margin status after breast-conservation surgery for early stage breast cancer. Am J Surg. 2009;197(6):740-6.

Cite this article as: Gomaa E, Khalil M, Hamed AR. Cavity shave margins for breast conservative surgery. Int Surg J 2017;4:3228-33.