

In early breast cancer: preoperative ultrasound skin marking reduces recurrence in Egyptian patients

Sherif M. Mokhtar^a, Karim G. Moustafa^b, Ebram A.Y. Abdelnor^c,
Ahmed M.H. Shazly^a

^aDepartment of General Surgery, Faculty of Medicine, Cairo University, ^bDepartment of General Surgery, Faculty of Medicine, Cairo University, ^cDepartment of Surgery, Ministry of Public Health & Population, Minia, Egypt

Correspondence to Karim G. Moustafa, MD, 44 Mohe Eddin Aboul-Ezz Street, Dokki, Giza, Cairo 12311, Egypt. Tel: +20 237 482 262; fax: +20 233 356 251; e-mail: karim_gsaied@hotmail.com

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Background

For patients with early-stage breast cancer, negative surgical margins at the first breast-conserving surgery minimize the need for reoperation and likely reduce postoperative anxiety. Preoperative skin mapping of the breast mass by ultrasonography (US) is one of the applied techniques to delineate optimal resection margins to insure safety without jeopardizing the cosmetic outcome. This study was conducted to evaluate the efficacy of preoperative skin mapping of the breast mass and margins using US to achieve free surgical margins.

Patients and methods

The study was conducted at the General Surgery Department of Kasr Al-Aini Cairo University Hospital from December 2017 through July 2018. It included 30 female patients who presented with stages 1 and 2 breast cancer and planned to be candidates for breast-conserving surgery. They were divided into two equal groups: groups I and II. Preoperative skin mapping of the tumor margin by US was done in group I, while group II patients were kept as a control without US mapping.

Results

Group I patients had negative margins in 93.3% compared with 80% in group II. Positive margins necessitated re-excision.

Conclusion

Preoperative US-guided skin mapping of breast tumor margins is an easy, noninvasive technique that is not time consuming, and gives a better chance to the surgeon to excise the tumor safely with free surgical margins.

Keywords:

breast-conservation surgery, frozen section examination, ultrasound skin mapping

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Introduction

Breast cancer is the most common cancer in women. Screening programs have resulted in detecting the disease in its early stages. In these early stages, patients can benefit from either breast-conservation surgery (BCS), followed by radiation therapy or by modified radical mastectomy. Long-term research indicates that survival and recurrence is the same in these two options, but BCS has the additional advantage of being less traumatic to the patients and gives a better cosmetic result. An important indicator of having a complete surgical excision of the mass is clear surgical margins microscopically [1,2]. Various factors that affect the results of BCS are age, stage of the tumor, multicentricity, multifocality, and surgical margin state [3–6]. Of these factors, surgical margin state has proved to be the strongest factor of recurrence [7–10]. Thus, the first goal of the surgeons is to get free negative margins. Safety margins in BCS have been a debatable subject for a long time, without a clear definition. But, in general, applying better surgical techniques decrease local recurrence rates achieving negative margins and in targeted therapy use. In

recent practice, margins handling and also the type and quality of regional and systemic treatment the patients receive are considered an important factor [11]. Many tumor localization and margin mapping methods have been described in the literature such as wire-guided excision, carbon marking localization, ultrasound (US) skin marking, etc., but no single technique proved to be better than the other [12]. The present work studies one of these methods, US skin marking, and assesses its efficiency in this respect.

Patients and methods

The study included 30 women with proven early breast carcinoma in one of their breasts treated at the Department of Surgery, Kasr Al-Aini University Hospitals by BCS. Approval of the study came from the local ethics committee and accomplished from

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December 2017 through July 2018. A written consent was taken from each patient who was also informed about the nature of the procedure with its advantages, disadvantages, expected results, and possible re-excision operation. Exclusion criteria included a strong positive family history, pregnancy, previous local radiotherapy, diffuse microcalcifications, and inflammatory breast carcinoma type. The patients' data included their personal and family histories, any contraceptive use, and dates of hospital admission and operation. The objective was to evaluate the accuracy of using preoperative US in mapping breast mass margins. Patients were diagnosed using sonomammogram and US-guided/or MRI-guided needle core biopsy. Biopsies were evaluated for the presence of invasive duct carcinoma including its histological subtype. Impalpable tumors were localized by US-guided wire placement. Patients were then equally divided into two groups: groups I and II. For margin delineation, group I patients were candidates for preoperative marking of the tumor margins by US, with at least 1 cm gross clearance off the surrounding tissues. Group II patients were kept without marking as a control group. Assessment of the margins by frozen section intraoperatively was then made. Positive margin cases were submitted to re-excision, and if the re-excised margins were still positive, mastectomy was done. All excised tissues were then subjected to paraffin section examination, to collect a final pathology report. Comparison with the control group was done. Results were expressed as mean±SD or *n* (%). Association between variables was performed using χ^2 test or Fisher's exact test, whenever appropriate.

Results

Thirty patients were divided into two equal groups: I and II (age, 48.73±9.57 and 44.07±10.25, years) respectively. Group I patients underwent preoperative US skin marking, while group II patients were kept as a control. They were all examined for the presence of associated diseases like

Table 1 Clinical and pathological data for both groups

Items	Group I (N=15) [n (%)]	Group 2 (N=15) [n (%)]
Age (years)	48.73±9.57	44.07 ±10.25
Associated comorbidity		
No comorbidity	3 (20.0)	0
Chronic heart disease	1 (6.7)	1 (6.7)
DM	4 (26.7)	4 (26.7)
HTN	5 (33.3)	6 (40.0)
DM and HTN	0	3 (20.0)
Hepatitis C virus	2 (13.3)	1 (6.7)

DM, diabetes mellitus; HTN, hypertension.

chronic heart disease, diabetes mellitus, chronic hepatitis C, hypertension, etc. (Table 1). When the masses were excised, the margins were subjected to intraoperative frozen section examination in group I members, and if positive re-excision was done. In group II members, the specimens were sent for paraffin section examination. In group I patients 93.3% of the carcinomata were intraductal group II while 6.7% were intraductal group III. In group II, 93.3% was intraductal group II, while 6.7% were lobular carcinoma. Immunohistochemistry of all the specimens was determined for all patients to assess the hormonal receptor status (ER, PR, Her 2 *Neu*, and Ki 67) (Table 2). We assessed the margins of the excised masses by frozen section and then by paraffin section for confirmation. Free margins were present in the specimens of 14 patients in group I (93.3%), while the remaining patient necessitated re-excision. In group II, in 12 (70%) specimens the margins were negative by frozen section and in the remaining three, re-excision was required (Table 3).

Discussion

During mass excision in the course of conservative surgery for breast cancer, the precise link between compromised surgical margins and subsequent local recurrence is still debatable. This is partly due to the absence of a uniform definition of an involved or clear margins, and partly due to the fact that most of the available data in the literature in this respect are retrospective and nonhomogeneous study groups were used [13–15]. US-guided lumpectomy was found to influence the adequacy of resection margins and hence lowers the frequency of local recurrence. Keskek

Table 2 Pathological features of both groups

	Group I (N=15) [n (%)]	Group II (N=15) [n (%)]
Pathology		
ILC	0	1 (6.7)
IDC group II	14 (93.3)	14 (93.3)
IDC group III	1 (6.7)	0
ER		
Negative	1 (6.7)	3 (20.0)
Positive	14 (93.3)	12 (80.0)
PR		
Negative	1 (6.7)	3 (20.0)
Positive	14 (93.3)	12 (80.0)
HER2 neu		
Equivocal	0	1 (6.7)
Negative	14 (93.3)	11 (73.3)
Positive	1 (6.7)	3 (20.0)
Ki 67		
Negative (<10)	2 (13.3)	2 (13.3)
Positive (≥10)	13 (86.7)	13 (86.7)

IDC, invasive duct carcinoma; ILC, invasive lobular carcinoma.

Table 3 Margin assessment in the two groups by frozen section examination and possible subsequent re-excision

Group I with US marking	Negative (N=14) [n (%)]	Positive (N=1) [n (%)]	P value
Mass			
T1	7 (50.0)	0	0.333
T2	7 (50.0)	1 (100.0)	
Re-excision		1 (6.7)	
Group II without US marking	Negative (N=12) [n (%)]	Positive (N=3) [n (%)]	
Mass			
T1	4 (33.3)	1 (33.3)	1.000
T2	8 (66.7)	2 (66.7)	
Re-excision		3 (20)	

US, ultrasonography. P value for re-excision 0.283.

et al. [16] had a rate of 24.1% positive margins for tumor in patients who had undergone BCS. They discovered that the tumor size and type are the major factors predicting the positivity of surgical margins. They stated that re-excision of positive surgical margins is the procedure of choice to achieve negative and clear surgical margins. It has also been demonstrated that re-excision surgery is a realistic choice as a second procedure to achieve clear margins in those with close or involved margins. Mastectomy was the procedure to be done if the re-excision of the involved margins failed to achieve negative surgical margins. They also stated that re-excision may be a valid option before mastectomy is planned.

Breast US was used in diagnosis and for US-guided biopsies [17]. Interventional procedures have been in increased use recently, and US is the first choice for guided breast biopsy if needed. Most of the palpable breast masses detected by US, MRI, and mammography can be biopsied using US guidance. Suspicious intraductal microcalcifications may be detected and sampled [18]. Recently, US-guided lumpectomy has been used to assess the presence of malignancy and the adequacy of safety margins following mass excision. Presence of malignant cells at the resection margins is considered a positive surgical margin [16–20]. Many authors consider a negative margin as a ‘not positive’ margin, while other authors have put a definition of greater than 1–5 mm, more than one high power field [15,16,19–24]. Preoperative detection and localization of the breast mass with US is a promising technique to obtain a free surgical margin, putting in mind the fact that most of the palpable breast masses can be detected by US, which makes it a great tool for intraoperative detection of the mass [25]. Most studies show that the intraoperative use of the US is superior to the palpation guided tumor excision, or even superior to excision guided with wire localization

[26], even it can be a good alternative to detection and excision of the nonpalpable breasts masses [27]. Better results were obtained when US localization and wire localization of the breast mass were used simultaneously [28,29]. Although, it has been found that the use of preoperative US alone to detect the size of the tumor is a strong predictive factor for reoperation. Tumor size underestimation is associated with elevated risk for follow up excision [30]. To get a better cosmetic results, an important factor to put in mind when offering an oncoplastic technique, is severe volume loss after excising a large breast tumor [31].

In the present work, we used preoperative skin marking of tumor margins using US and frozen section in one group of the sample study (group I) to decrease margin width with safety. The primary endpoint was to assess margin status by frozen and paraffin sections examination to assess the validity of the use of intraoperative US in a trial to achieve better cosmetic results. We obtained 100% free margins in the final paraffin pathology report, with negative margins reported in 97% of the studied patients. One case needed re-excision (6.7%), 14 (93.3%) cases did not need re-excision. This was in contradistinction to the control group II, where three (20%) cases needed re-excision, and 12 (80%) did not need re-excision. The paraffin results were 100% free margins in both groups.

In patients subjected to mass re-excision operation owing to compromised margins, we observed that the larger the size the higher is the risk of local recurrence. This matches with similar results reported by Moore *et al.* [32]. For confirmation, tumor bed re-excision has been tested in several centers to study tumor margin status, and was found to lessen local recurrence even in patients with negative margins [33]. This was potentiated using adjuvant radio, chemo, and endocrine therapies [34–36].

Conclusion

Mass mapping by preoperative US in early breast cancer reduces positive margins by frozen section examination and reduces recurrence. It is easy, simple, and noninvasive and does not take much time.

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Conflicts of interest

There are no conflicts of interest.

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