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Original article

Margins in breast conserving surgery: The financial cost & potential savings associated with the new margin guidelines

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ABSTRACT

Introduction: In this study, we compare the indications for re-excision, the findings of additional tumor in the re-excision specimen as they relate to margin status, and costs associated with re-excision based on recent new consensus statements.
Materials and methods: A retrospective analysis was performed on 462 patients with invasive breast carcinoma who underwent at least one lumpectomy between January 2011 and December 2013. Post-operative data was analyzed based on where additional disease was found, as it relates to the margin status of the initial lumpectomy and the additional direct costs associated with additional procedures.
Results: Of the 462 patients sampled, 149 underwent a re-excision surgery (32.2%). Four patients underwent mastectomy as their second operation. In the 40 patients with additional disease found on re-excision, 36 (90.0%) of them had a positive margin on their initial lumpectomy. None of the four mastectomy patients had residual disease. The mean cost of the initial lumpectomy for all 462 patients was $2118.01 plus an additional $1801.92 for those who underwent re-excision.
Discussion: A positive margin was most predictive of finding residual tumor on re-excision as would be expected. Using old criteria only 0.07% (4/61) of patients who had undergone re-excision with a 'clear' margin, had additional tumor found, at a total cost of $106,354.11. Thus, the new consensus guidelines will lead to less overall cost, at no clinical risk to patients while reducing a patient's surgical risk and essentially eliminating delays in adjuvant care.

Introduction

The current standard treatment for an individual diagnosed with a resectable invasive carcinoma of the breast is to surgically remove the tumor (lumpectomy) followed by adjuvant radiation therapy to the breast. The findings of tumor cells at the margins of a lumpectomy specimen are associated with an increased risk of ipsilateral breast tumor recurrence. Therefore, in patients who elect to undergo a lumpectomy rather than a mastectomy, margin status is the primary determining factor in deciding whether or not to perform a re-excision or second surgery [1]. It has long been accepted that patients without clear margins following lumpectomy should undergo a second procedure to clear the margin in addition to postoperative radiation treatments [2]. Until recently, the definition of a 'clear' margin has been inconsistent. Recently, the Society of Surgical Oncology American Society for Radiation Oncology consensus guideline defined clear margins as no tumor on ink for invasive carcinomas [3]. Quickly this guideline has been adopted, with a resultant reduction in the rate additional surgery. This consensus has not only had a positive impact on patient care and addressed the anxiety associated with a second operation, but also seemingly will have a positive impact on the economics of breast cancer care. While the care of the breast cancer patient involves multidisciplinary discussion and decision making and most certainly involves discussion of the surgical margins, this new guideline will establish a consistency allowing a standard that can cross all aspects of patient care including research and clinical trials. In this retrospective study, we compared the indications for re-excision, the findings of additional tumor classified as invasive

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carcinoma in the re-excision specimen as they relate to margin status, and the costs associated with re-excision.

Materials and methods

The records of all individuals who were diagnosed with invasive carcinoma of the breast and were treated with a surgical approach at the Troy campus of Beaumont Health System in Southeast Michigan between January 2011 and December 2013 were reviewed. Patients who underwent an initial mastectomy were excluded. The remaining 462 patients were the subjects of this analysis. The biological characteristics of the cancer, including location and histology of cancer were obtained from the initial biopsy report. Invasive cancer was defined as any cancer other than pure Ductal Carcinoma In Situ (DCIS) or Lobular Carcinoma In Situ (LCIS), including invasive ductal carcinoma, invasive lobular carcinoma, mixed (lobular and ductal) carcinoma, and other carcinomas (tubular, mucinous, and metaplastic). In addition, the margin status of all margins was obtained for both the initial lumpectomy and any re-excision surgery that was performed. Because there was inconsistency as to what constituted a 'positive' margin, re-excisions were at times performed for a margin of up to 5 mm. Thus, pathology reports included data on the distance of the tumor cell from the inked margin as well as the linear extent of the any margin less than 5 mm. The margins and linear extent were measured in millimeters (mm) with margin measurements ranging from positive (ink on tumor) to 5 mm and linear extent having no such limit. Although there was inconsistency as to when a re-excision was indicated, or how to address 'close/positive' (old vernacular) margins, it was routine to not consider re-excision for any margin >5 mm. Thus, the linear extent of margins greater than 5 mm were not specifically identified. A positive margin was classified as any tumor that transected the inked specimen margin and were reported as 'positive' or 'abutted', and included a linear extent.

The decision to undergo re-excision was at the discretion of the surgeon and radiation oncologist. The majority of patients were discussed at a weekly Breast Multidisciplinary Tumor Board. For patients who underwent a re-excision procedure, the surgical margins of the new specimen were obtained from a separate pathology report, with the same classifications applied for measuring the tumor quality and quantity. Patients who underwent a re-excision were identified as being either positive or negative for additional tumor cells. Once again, since there was not a definitive criteria for what quantifies a clear margin in the re-excision specimens, margin status was classified in a similar fashion as the original lumpectomy.

The 149 patients who underwent a re-excision surgery were grouped based on whether or not they had residual carcinoma on re-excision as described previously. A multivariate analysis was conducted based on initial margin size and the presence of additional disease on re-excision. We did not examine the influence the linear extent of the close margin had on the decision to re-excise. Additional data was then collected on the financial cost associated with each patient included in the study. The mean cost of the initial surgeries, and, subsequent re-excision(s) were collected. Subsequent analysis was done to compare the average cost of surgery for those who were both positive and negative for residual disease on re-excision in order to determine the cost associated with finding residual disease. Those that chose mastectomy as their second procedure were not included in the financial analysis.

Results

Of the 462 patients included in the study, 149 underwent a re-excision (32.3%). A breakdown of the demographics and tumor types and tumor size (Fig. 1), are quite typical of a busy, community program [4]. Pathology reports included an assessment of all six margins, with a linear extent reported, if the margin is 5 mm or less. A separate margin status is reported if there is both an invasive and an intraductal component present, reflecting the six margins as it relates to each tumor type.

Of the 149 re-excisions performed for invasive cancer, 88 (59.1%) were performed for margins that had 'ink on tumor'. Thus, there were a total of 61 (40.9%) re-excisions performed for invasive cancer that would be considered 'negative' by the new guidelines (Fig. 2). The breakdown for the margin widths that were taken all patients undergoing a second operation is seen in Fig. 3. Of those patients who underwent re-excision, there was additional tumor found in 40 out of 149 (26.8%) patients. Four of the 153 patients underwent a mastectomy at the time of the second surgery, with

Average Age	65
Invasive Ductal Cancer	391
Invasive Lobular Cancer	37
Mixed Ductal and Lobular Features	10
Other (metaplastic, tubular, mucinous)	24
Tumor Staging based on Size	
TIa	35
TIb	76
TIc	178
T2	151
T3	8

T1a: Tumor >1 mm but ≤5 mm in greatest dimension
T1b: Tumor >5 mm but ≤10 mm in greatest dimension
T1c: Tumor >10 mm but ≤20 mm in greatest dimension
T2: Tumor >20 mm but ≤50 mm in greatest dimension
T3: Tumor >50 mm in greatest dimension

Fig. 1. Demographics and tumor characteristics of study population.