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Localization of nonpalpable breast lesions with sonographically visible clip: optimizing tailored resection and clear margins

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Clip;
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Resection volume

Abstract

BACKGROUND: Achieving clear margins with adequate resection volumes is one of the principal goals of breast-conserving surgery. The aim of our study was to compare preoperative localization using 2 different clips, radiopaque or sonographically visible, to reach this goal.

METHODS: We reviewed 209 consecutive nonpalpable breast cancers that were treated with lumpectomy: 59 with radiopaque and 150 with sonographically visible clip positioned during biopsy procedure. In the former case, preoperative localization was performed with mammography and in the latter by ultrasonography.

RESULTS: Clear margins were achieved in 80.4% of patients: 57.6% in the first and 89.3% in the second group ($P < .0001$; odds ratio, 7.6; 95% confidence interval, 3.4 to 17.2). By using sonographically visible clips, the re-excision rate has decreased from 42.4% to 10.7%, ($P < .0001$), and resections resulted smaller with average calculated resection ratio of 3.54 vs 5.08 ($P = .03$).

CONCLUSIONS: Preoperative localization using a sonographically visible clip allows a more tailored breast-conserving surgery and reduces the re-excision rate.

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With the introduction of extensive mammographic screening programs, improvements in imaging techniques, and increased patients awareness, an increasing number of nonpalpable breast lesions are diagnosed.[1–3] Achieving clear margins with an adequate volume of resection represents one of the principal goals of breast-conservative

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surgery. This requires a very precise preoperative localization of the lesion. Various techniques for breast lesion localization have been described, such as wire-guided excision, radio-guided occult lesion localization (ROLL), carbon-marking localization, and clip location after a vacuum-assisted breast biopsy (VABB). Clips are useful when an occult breast lesion, detected by imaging techniques, is removed during a breast biopsy procedure. In this situation, a clip marker is often inserted into the biopsy cavity, thus providing a definitive landmark for future radiologic localization, both for planning surgery or follow-up. Many types of clip markers have been described, and these could be divided in 2 main categories: metallic markers and clips with packing materials.[4] The former type includes radiopaque stainless steel clips and plain titanium clips visible both in mammograms and in magnetic resonance imaging. The latter type of clips, introduced in 2003, are metallic markers embedded with a bioresorbable material (collagen plug of bovine origin, polylactic acid, and polyglycolic acid). These clips are clearly visible both in mammograms and with ultrasonography, thanks to the radiopacity of its metallic core and the echogenicity of the bioresorbable plug, which appears as an echogenic tubular structure with posterior shadowing.[4] Some other well-known advantages of clips with packing materials are the decreased risk of migration resulting in improved accuracy and the hemostatic effect of the filling material.[5] Therefore, the lesion localization method used immediately before surgery depends on the type of clip used. We have compared a collagen-embedded titanium clip with a stainless steel metallic clip and assessed their efficacy in preoperative localization of nonpalpable lesions in terms of clear margins achievement and tumor resection volume adequacy.

Materials and Methods

Patient population

From November 2007 to September 2013, we have identified in our breast unit at "Luigi Sacco" University Hospital (Milan, Italy) 1,180 patients with a suspicious nonpalpable breast lesion on mammograms or ultrasonograms. A subsequent VABB was performed under stereotactic guidance using a Fischer Mammotome Plus S table (Biopsy System 85,201 6-1, Fischer Imaging Corporative, Denver, CO) in 1,063 patients (90.1%), or under sonographic guidance using a Hitachi H21 ultrasound (Hitachi, Tokyo, Japan; 7.5-MHz probe) in 117 cases (9.9%). In 1,158 patients (98.1%), an 11-ga needle was used, whereas in 22 patients (1.9%), the procedure was performed with an 8-ga needle. The choice of the needle size was based on breast tissue thickness and the location of the lesion. From November 2007 to December 2009, a stainless steel radiopaque clip (SSC; MicroMark, Ethicon Endosurgery, Cincinnati, OH) was positioned in 222 patients (18.8%), whereas from January 2010 to September 2013, a clip made of titanium embedded with collagen plug (TCC; MammoMark, Artemis, Hayward, CA) was placed in 706 patients (59.8%). No marker was placed in 252 cases (21.4%) because of residual visible lesion or multifocal disease. At the end of each procedure a mammography was performed to assess the correct marker positioning. All the procedures were performed by the same radiologist with the same stereotactic system (Fischer Mammotome Plus S table) and the same ultrasound (Hitachi H21, 7.5-MHz probe).

Case selection

The outcomes of the histopathologic examination from the VABBs were as follows: B1 in 19 cases (1.6%), and for these patients, a radiologic follow-up was recommended, and B2 in 559 lesions (47.4%), and these patients were referred for a radiologic follow-up or for an excision if the lesion size was greater than 30 mm. A B3 lesion was diagnosed in 147 patients (12.5%), and after a multidisciplinary consultation at the breast unit, 38 of them underwent a surgical biopsy because of the suspicious clinical and radiological findings. In 6 patients, a malignant lesion was diagnosed on final pathology, whereas the remaining 109 patients were followed up. No B4 lesions were encountered, whereas 295 (25%) and 160 (13.6%) lesions were classified as B5a and B5b, respectively. Of these, 138 and 106 patients, respectively, underwent breast surgery in our institution. All the histopathologic analyses were performed by the same pathologist. Therefore, of the total number of patients undergoing a VABB, 250 patients underwent a subsequent surgical intervention at our institution because of malignant lesions detected on histopathology. In 32 patients (12.8%), an extensive lesion (>5 cm) was demonstrated on mammography, whereas a multifocal disease was found in 9 cases (3.6%). Both these groups of patients underwent mastectomy with biopsy of the sentinel node and were excluded from our study. We have retrospectively reviewed the remaining 209 consecutive patients (83.6%) who underwent lumpectomy with biopsy of the sentinel node. SSC was used in 59 cases (28.2%), whereas TCC was positioned in the remaining 150 cases (71.8%; Fig. 1).

Localization techniques and surgery

Because the SSC does not offer clear visibility on ultrasonography,[4] the SSC group of patients underwent a monolateral mammogram in craniocaudal and lateral projections, with the patient being in the upright position. Then the radiologist performed a measurement directly on mammograms, thus obtaining the approximate clip location, and a cutaneous projection of the lesion was marked on the breast skin. In the TCC group of patients, the clip was sonographically localized before surgery with the patient in a supine position with the upper limb abducted,