Update on Preoperative Breast Localization

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KEYWORDS

• Malignant neoplasm • Breast • Wire localization (WL, WNL)
• Radioactive seed localization I125 (RSL) • SCOUT RADAR • MAGSEED • Wire-free localization
• Targeted axillary dissection (TAD) • Radiofrequency identification (RFID)

KEY POINTS

- Preoperative same-day wire localization (WL) using mammography, ultrasound, MR imaging, and computed tomographic (CT) guidance aids surgical excision of nonpalpable breast lesions.
- Non–wire localization devices (I125 RSL, SCOUT RADAR, MAGSEED, and RFID) may provide an alternative means to mark and aids surgical excision of nonpalpable breast lesions and axillary lymph nodes up to 5 to 30 days preoperatively under mammography, ultrasound, and CT guidance.
- Non–wire deployment systems via MR guidance are not yet available; non–wire nonradioactive devices are MR conditional.
- Non–wire devices have potential for longer-term preoperative localization in patients who undergo neoadjuvant breast cancer treatment.

Video content accompanies this article at http://www.radiologic.theclinics.com.

Breast-conserving surgery is a safe and effective method to treat early breast cancer (Video 1).[1–7] A successful breast-conserving treatment program requires multidisciplinary communication and planning between the surgeon, radiologist, and other specialists. The goal is to safely remove the target tissue with adequate surgical margins (SM), avoid unnecessary resection of healthy breast tissue, and provide a good cosmetic outcome without compromising survival. This article reviews image-guided tools for preoperative breast/axillary node localization, and the radiologist's role in the multidisciplinary breast care team.

CURRENT PROCEDURES

Conservative breast surgical treatment programs rely on image guidance devices and skills of the radiologist and surgeon. **Table 1** summarizes various localization methods reviewed by Corsi and colleagues.[8] They reported that because no single localization tool or technique proved better for achieving adequate SM, when advantages and disadvantages of each were taken into account, each multidisciplinary surgical team should adopt the most effective localization and margin assessment technique based on the skills and technologies available. Since then, additional non–wire preoperative localization devices were US Food and Drug Administration (FDA) cleared. These non–wire devices have noninferior breast cancer surgical outcomes compared with wires.[9–13] In the United States, preoperative wire needle localization (WL) and non–wire localization are accepted standard methods to guide intraoperative surgical excision of nonpalpable breast lesions.

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Table 1
Summary of various localization methods

Localization Technique	Clear Margin Rate	Disadvantages
WL	71%–87%	Wire dislodgment, vasovagal episodes, pneumothorax
Carbon marking	81%	Foreign-body reactions that may mimic malignancy
Radio-guided occult lesion localization	75%–94%	Expense, need for nuclear medicine laboratory, intraoperative tools for surgeons, intraductal injection of 99 Technetium disperses radiotracer
Clip marker localization	90%–92%	Clip migration and need for surgeon training
Hematoma ultrasound guided localization (HUG)	89%–97%	Need for surgeon training, DCIS rarely seen unless visible by clip marker or hematoma
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Cavity shave	91%–94%	Longer operative times; margin assessment tools needed
RSL	Noninferior to WL	Stringent nuclear regulatory rules on access, monitoring, storage, transportation, and disposal of I125 seeds

Concurrent developments in 2014 to 2016 in techniques with breast radiology non–wire localization tools for nonpalpable breast and axillary lymph nodes, as well as the updated definitions of adequate breast surgery margins from the American Society of Breast Surgeons, each offer improved ways to optimize re-excision rates, mastectomy rates, and cosmetic outcomes for patients with breast cancer.[12–15] The 10 tools reported by the American Society of Breast Surgeons multidisciplinary consensus panel to minimize adverse surgical outcomes of increased mastectomy rates and poor cosmetic outcomes are listed in **Box 1**.

Preoperative Image-Guided Localization Procedure

Regardless of the imaging guidance method or specific needle wire/non–wire device used, all localization procedures share specific preprocedure and postprocedure steps.

Preprocedure review

Preprocedure review of the imaging and pathology reports and any clip placed during the diagnostic biopsy should be completed. Placement of a biopsy tissue marker clip (CLIP) is routine for image-guided breast biopsies and is mandated when a lesion is mammographically occult, when a lesion is difficult to visualize on post–biopsy imaging, and when it is necessary to confirm that the proper lesion has been sampled. Clip placement is useful when neoadjuvant chemotherapy is contemplated and to correlate findings with other imaging modalities.[16,17]

The reviewer should assess the original extent of disease compared with the visible residual disease and the accuracy of biopsy clip placement at the target lesion. The preoperative localization target may be residual breast disease, biopsy clip, or post–biopsy hematoma. The radiologist should determine the best image-guidance method, the localization device, and coordinate any additional relevant schedules such as the operating room (OR) start time and lymphoscintigraphy injection.

Postprocedure, preoperative communication

Postprocedure, preoperative communication between the radiologist and the surgeon optimizes care. Common communication involves annotation of the images. A supplementary telephone call may be needed based on the surgeon's preference and patient details that may influence their approach. When feasible, marking the skin directly over the nonpalpable breast lesion and noting the skin-to-lesion depth with the patient in the supine operative position, can aid the surgeon.

Postprocedure, intraoperative communication

Postprocedure, intraoperative communication of the specimen radiograph findings should be expedited. Noncompression, 2-view specimen radiograph confirms the removal of the target lesion and can provide some information regarding the surgical excision and margins.[16] Tumor