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Localization of Image-Detected Breast Abnormalities: Radioactive Seed Localization—An Alternative to Wire Localization CE

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A B S T R A C T

Since most breast cancers are nonpalpable and detected by imaging, radiologic localization is necessary for surgeons to identify their targets. Wire localization has been the standard procedure for decades and has disadvantages including the need for patients to have wire localization on the same day as surgery and the potential for displacement of the wire. Radioactive seed localization (RSL) is a safe and effective alternative procedure and considered the new standard in some institutions. Advantages include more efficient workflow (due to the uncoupling of the dates of localization and surgery), improved surgeon and patient satisfaction, greater options for surgical entry site (not limited by the path of a wire), and decreased risk of displacement. We describe the two localization methods, advantages and disadvantages, the RSL program, radiation safety, and challenges. Sufficient knowledge of the RSL program and radiation safety is critical for all staff providing patient education and advocacy.

Introduction

Breast imaging detects the large majority of breast cancers in the United States (Breen, Yabroff, & Meissner, 2007). Image-detected cancers are associated with better outcomes (Webb et al., 2014) and are more likely to be amenable to breast conserving surgery (Coldman, Phillips, & Speers, 2007; Lawrence, 2011). Breast abnormalities detected with mammography, ultrasound, or MRI may undergo image-guided biopsy. These abnormalities include suspicious calcifications, architectural distortion, or a mass (Figure 1A-E). A tissue marker is placed at the site of biopsy (Figure 1F), facilitating localization if surgery is planned for malignant, high risk, or discordant results.

Since most breast cancers are nonpalpable, image-guided localization is necessary for surgeons to identify their targets. Localization has traditionally been performed with a wire on the day of surgery. An alternative procedure for localizing nonpalpable lesions, radioactive seed localization (RSL), is becoming increasingly popular (Pouw et al., 2015) and is considered the new standard in some institutions. Rather than following a wire that protrudes from the skin, RSL instead allows the surgeon to follow percutaneous signals from an implanted radioactive seed.

This article will review the two localization methods and discuss advantages and disadvantages. We will also describe the RSL program and the challenges involved in instituting a new RSL program. While there are many advantages to the RSL procedure, it requires interdisciplinary organization involving various departments and staff members as well as significant regulatory compliance. Knowledge of the RSL program and radiation safety is critical for all staff providing patient education and advocacy.

Wire localization

Localization wires placed percutaneously have guided surgeons to nonpalpable abnormalities for decades. Some of the

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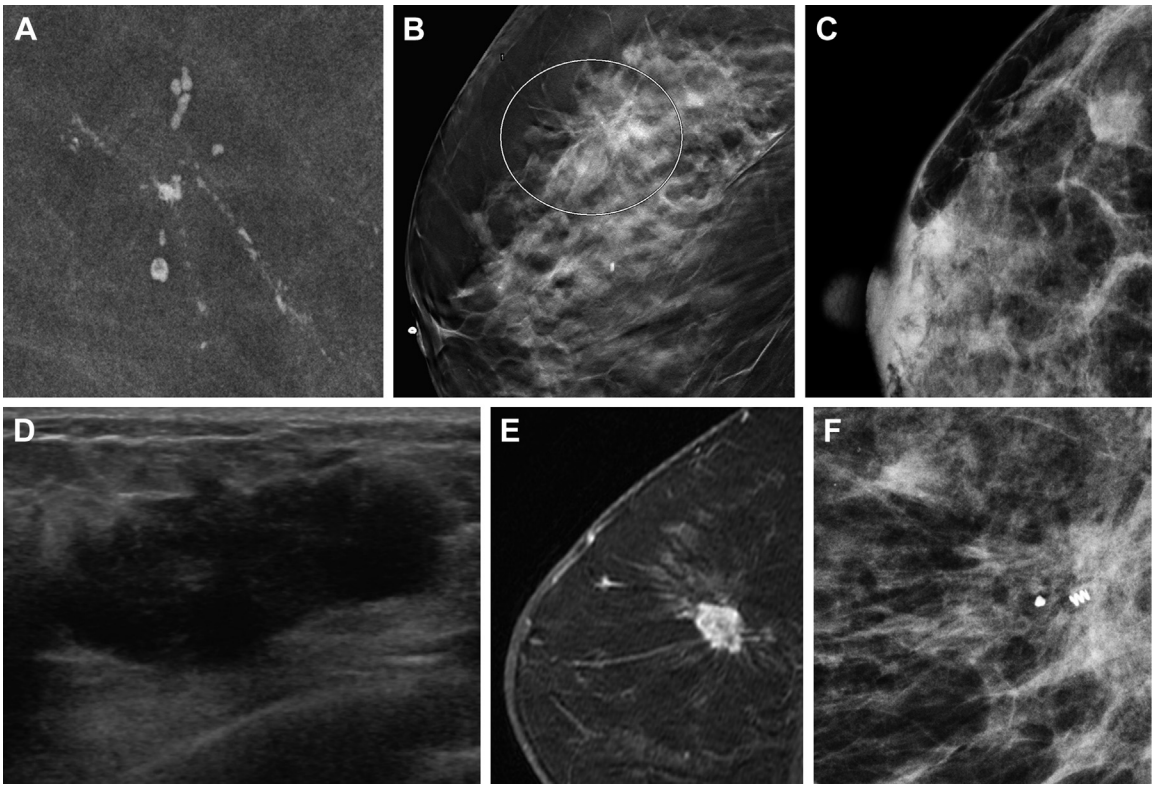

Figure 1. (A-F) Image-detected breast abnormalities. (A) Magnification view mammogram demonstrating linear, branching calcifications. (B) Right mediolateral-oblique (RMLO) mammogram on digital breast tomosynthesis demonstrating architectural distortion. (C) RCC mammogram with round, spiculated lateral mass. (D) Right breast ultrasound with oval, heterogeneous, microlobulated mass. (E) Breast MRI with enhancing, spiculated mass. (F) RMLO mammogram with a coil-shaped tissue marker inferiorly.

most commonly used devices are the Kopans spring-hook wire (Kopans & Meyer, 1982), the Hawkins II wire (Walker & Ross, 1992), and the Homer J-wire (Homer, 1988). Wire localizations are performed on the day of surgery under mammographic (Figure 2), ultrasound (Figure 3), or MRI guidance. The needle is positioned adjacent to or through the area to be excised. With the Kopans device, a guide wire is placed so that the reinforced segment of the wire is adjacent to the tissue marker or through the imaging abnormality (Figure 2). With the Hawkins II needle and wire combination, the wire is positioned at the abnormality and the needle remains in place. Using the Homer device, a J-shaped flexible wire is deployed from the tip of the needle and the needle remains in the breast (Figure 4). The Homer needle can be repositioned. A specimen radiograph confirms excision of the target.

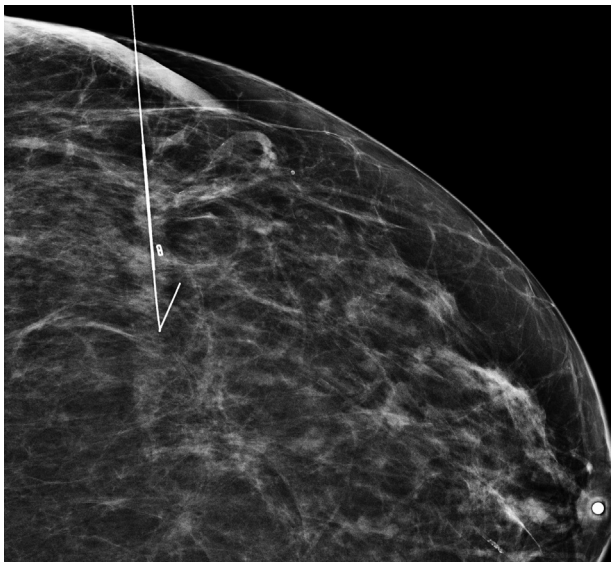

Figure 2. Mammographic localization using Kopans device. Needle is inserted and adjusted, so that it is precisely at the target or just proximal. A guide wire is placed so that the reinforced segment of the wire is adjacent to the tissue marker or through the imaging abnormality.

Advantages and disadvantages of wire localization

Advantages

In addition to low cost and ease of mastery, advantages of wire localization include the ability to reposition or even remove a wire if there is suboptimal wire or needle position. Other benefits include the ability to use MRI guidance, lack of regulatory requirements, and a single trip to the health care facility for patients.

Disadvantages

Disadvantages of wire localization involve the logistics of scheduling on the same day as surgery, which include costs of delays when patients arrive late to the operating suite. Other disadvantages include the potential of wire migration at postlocalization mammography or transport, and the risk of wire transection. Finally, for some surgeons, the wire dictates the surgical entry site. This limits options for alternative approaches that may be more optimal when planning the site of incision.