IMAGE GUIDED BREAST INTERVENTIONS

Laura Dean, MD
Breast Imaging, Cleveland Clinic
DISCLOSURE OF RELEVANT FINANCIAL RELATIONSHIP(S) WITH INDUSTRY

• Nothing to disclose

REFERENCES TO OFF-LABEL USAGE(S) OF PHARMACEUTICALS OR INSTRUMENTS

• Nothing to disclose
LEARNING OBJECTIVES

- Introduce common image guided procedures of the breast
- Review primary techniques for preoperative localization of breast lesions
- Brief review of pathologic conditions that necessitate surgical excision
“For every 1,000 women screened, 100 are recalled. Of the 100, 81 are either called negative and rescreened in a year or have another imaging study in six months. Nineteen undergo a minimally invasive needle biopsy, and five of them are diagnosed with breast cancer”.

Society of Breast Imaging
www.sbi-online.org
INTRODUCTION

• Common for patients to have recommendation for an image guided biopsy (1.6 million/year world-wide)

• Important to be familiar with the various procedures such that we can counsel patients on what to expect
IMAGE GUIDED PROCEDURES:

• Ultrasound guided
• Stereotactic
• MRI guided
• Preoperative localization
IMAGE GUIDED PROCEDURES

• Minimally invasive core needle biopsy (CNB) is gold standard for tissue diagnosis for breast lesions

• In most cases, CNB is reliable alternative to surgical excisional biopsy for histopathologic correlation of imaging findings
ULTRASOUND GUIDED CORE NEEDLE BIOPSY
ULTRASOUND GUIDED BIOPSY

• Preferred method to biopsy breast
• Most commonly performed interventional breast procedure
ULTRASOUND GUIDED BIOPSY

• Advantages over other procedures:
  • more comfortable for the patient
  • less invasive than surgical biopsy
  • more accessible (i.e. patients with physical limitations)
ULTRASOUND GUIDED BIOPSY

- Avoids need for ionizing radiation
- Faster and less expensive
- Accessibility to challenging locations such as chest wall, subareolar, axilla, or along an implant
ULTRASOUND GUIDED BIOPSY

- Low false negative rate, accuracy similar to surgical breast biopsy
- Streamlines diagnosis in a minimally invasive way; benign vs high risk vs malignant
- Allows for more precise surgical planning (i.e. single surgery in cases of cancer)
TECHNIQUE

• Performed by specially trained operator (i.e. radiologist)
• Patient positioned supine, often on an angle to optimize biopsy approach
• After cleaning the patient, local anesthetic is administered in the skin and deeper tissues
• Core needle device is then advanced to the lesion and several samples acquired
(needle, pre-fire position)

(needle, post-fire position)

Illustration used with permission from Mayo Foundation for Medical Education and Research.
BIOPSY DEVICE EXAMPLES

Commonly used device is a 12g or 14g spring activated core biopsy needle

Vacuum assisted devices also available

Multiple different styles/manufacturers

Several samples taken (avg 3-6)

Bard Marquee™ biopsy device

Bard Monopy™
TECHNIQUE

- Biopsy clip is placed at the site of biopsy—standard of care
- Direct pressure (5-10 mins) held over biopsy site to ensure hemostasis
- Post-biopsy mammogram images to verify clip placement and post-biopsy findings
BIOPSY CLIP EXAMPLES


https://voices.uchicago.edu/grosspathology/breast/mastectomy/
Mass #1 – Q clip

Mass #2 – coil clip
Ability to biopsy mass adjacent to implant
Companion case – mass adjacent to saline breast implant
ULTRASOUND BIOPSY - RISKS

• Bleeding/hematoma formation

• Post-biopsy discomfort - readily controlled by non-prescription pain medication and application of ice

• Very small risk of infection (less than one in 1,000)

• (Extremely rare chance of pneumothorax)
ULTRASOUND BIOPSY - RISKS

• Specific cases:
  • Presence of a breast implant
    • Very rare possibility of implant rupture
  • Breastfeeding patient
    • Potential milk fistula
POST-BIOPSY HEMATOMA
ULTRASOUND BIOPSY LIMITATIONS

• Lesion must be visible by ultrasound
• Calcifications, subtle architectural distortion, tiny masses, low density asymmetries are findings not well seen by ultrasound
• Occasional non-diagnostic or discordant results
STEREOTACTIC BREAST BIOPSY
STEREOTACTIC BIOPSY

• Technique utilizing mammogram images to facilitate biopsy targeting

• Historically performed for sampling of calcifications, increasingly utilized to evaluate asymmetries/architectural distortion

• Advances in equipment now allow use of tomosynthesis guidance during the biopsy
STEREOTACTIC BIOPSY

• Most common procedure is performed prone:
  • Breast passes through a hole in the table and is compressed in a mammogram unit installed beneath the table
  • Depending on target, can use either 2D or tomosynthesis imaging to identify the finding
Prone stereotactic biopsy table
STEREOTACTIC BIOPSY

- Local anesthetic administered
- Vacuum assisted needle advanced to the calculated target (9g or 12g)
- Multiple samples taken (6-12)
- Biopsy clip placed
- Post-procedure imaging is obtained
STEREOTACTIC BIOPSY

• “Upright” units available - same technique however patient is seated in a chair

• Allows access for patients with physical limitations/mobility challenges

• Slight increase in vasovagal reactions, decreased accessibility of certain lesions
STEREOTACTIC BIOPSY

• Compared to ultrasound biopsy:
  • takes longer to perform
  • harder for patient (breast in compression, holding still)
  • ionizing radiation during procedure
Biopsy of calcifications using stereotactic technique (15 degree off angle targeting images acquired)
Biopsy of calcifications using tomosynthesis to target.
Upright tomosynthesis biopsy of small area of distortion – DCIS
BRCA positive patient with new left breast focal asymmetry; no ultrasound correlate; stereotactic biopsy therefore performed = IDC
COMPANION CASE
Left CC
Left MLO
No ultrasound correlate – tomo guided
Pathology = IDC
MRI GUIDED BREAST BIOPSY
MRI GUIDED BIOPSY

• Used for tissue sampling of a suspicious enhancing finding seen on breast MRI

• Every attempt is made to biopsy via ultrasound or stereotactic guidance

• Reserved for findings only seen by breast MRI
Example: High risk patient due to CHEK2 mutation; baseline screening breast MRI
- Enhancing finding in each breast for which further workup is recommended

Ultrasound correlate found for the right breast mass → ultrasound biopsy

No correlate for the left breast mass → MRI guided biopsy
MRI GUIDED BIOPSY

• Initial images are obtained with the patient in biopsy position (prone, breast in compression)

• IV contrast injected; computer software utilized to calculate appropriate target

• Local anesthesia is administered. Trocar placed adjacent to the lesion, several samples taken (9-gauge, avg. 6 samples)

• Clip placed
MRI GUIDED BIOPSY

• Most challenging breast biopsy for the patient
  • prone positioning
  • must be very still
  • breast in compression
  • longer than US or stereotactic

• No ionizing radiation however does require IV gadolinium contrast
MRI BIOPSY - DISADVANTAGES

- Longer exam time
- More limited biopsy approach (only medial or lateral)
- Claustrophobia
- Limitations with body size/habitus
- Bruising is common
- Patients with MRI contraindication (cardiac device, tissue expander, aneurysm clips, contrast allergy)
FOR ALL BREAST BIOPSIES…

• Biopsy result possibilities:
  • Benign, no further follow up needed
  • Benign, high risk (ALH, ADH, LCIS, radial scar, papilloma, MLL, pre-malignant) → surgical consultation for consideration of excision
  • Malignant → oncology/excision
CONCORDANT VS DISCORDANT

• Radiologist reconciles biopsy pathology with the imaging assessment
• Concordant = pathology fits with the imaging finding
• Discordant = pathology does NOT fit with what is expected given the imaging finding
• Discordant pathology typically warrants surgical consultation
IMAGE GUIDED LOCALIZATION OF BREAST LESIONS REQUIRING EXCISION
PREOPERATIVE LOCALIZATION

- Performed in order to facilitate surgical excision of non-palpable breast lesions
- Wire and non-wire methods are available
MODIFIED KOPANS HOOK-WIRE APPARATUS
Trend over time to develop less invasive localization techniques

PREOPERATIVE LOCALIZATION

• Lesion is localized by radiologist via imaging guidance (ultrasound or mammographic)

• Localizing device (either wire or one of the non-wire alternatives) placed in appropriate position next to target

• Patient proceeds to the OR, excision performed, specimen radiograph typically obtained to confirm adequate sample
Ultrasound guided wire localization of malignant breast mass
NON-WIRE LOCALIZATION DEVICES

• Advantages:
  • Uncouples the loc procedure from the day of surgery (i.e. improved flexibility)
  • Increased patient comfort and satisfaction
  • Decrease amount of non-target tissue removed
  • Useful in cases of neoadjuvant chemotherapy, targeted axillary dissection
NON-WIRE LOCALIZATION DEVICES

SaviScout™
MagSeed™
Radioactive seed
Stereotactic technique for placement of SaviScout™
Specimen radiograph obtained to confirm removal of the location device and biopsy.
IN CONCLUSION…

• Reviewed image guided breast biopsy techniques
• Discussed advantages/disadvantages of various methods
• Introduced preoperative localization techniques including wire and non-wire methods
REFERENCES


QUESTIONS & DISCUSSION
THANK YOU FOR JOINING US IN THIS COURSE

Rochester, Minnesota

Phoenix, Arizona

Jacksonville, Florida