Ultrasound-Guided Breast Biopsies
Basic and New Techniques

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Ultrasound-guided breast biopsies can be challenging to perform, especially when the target is adjacent to the nipple, skin, or implant or when the target is small and in very posterior, dense fibroglandular tissue. Oftentimes, a slightly modified approach can result in a diagnostic biopsy specimen with minimal complications. After a brief review of basic techniques for ultrasound-guided breast biopsies that includes a review of conventional breast biopsy devices, a presentation of procedural modifications and techniques to consider for more challenging cases is described. In particular, novel open-trough and tandem-needle techniques are detailed. Several cases using these techniques are then presented.

Key Words—breast biopsy; breast intervention; hydrodissection; tandem needle; ultrasound-guided

Ultrasound (US)-guided breast core biopsies (CBs) have been performed for many years, as they are preferred over a diagnostic surgical biopsy.1,2 Core biopsies have minimal risks and side effects3 and are relatively fast to perform, once the basic technique is mastered.4,5 Knowing the nuances and relative advantages and disadvantages of breast biopsy devices can improve biopsy accuracy and reduce sampling errors associated with CBs. Although many US-guided breast CBs are relatively straightforward, challenging cases do arise. These include small, subtle masses further obscured by lidocaine, masses adjacent to the nipple, skin, or implant, mobile masses, and masses in deep, dense breast tissue just anterior to the pectoralis muscle. Often, slightly modifying basic CB techniques can optimize diagnostic sampling while minimizing complications.

This article is divided into 3 parts. It is assumed that readers are familiar with conventional steps for US-guided breast CBs. Part 1 describes a brief review of basic techniques for breast biopsies that includes a review of conventional breast biopsy devices. Part 2 presents procedural modifications and techniques to consider for more challenging cases. In particular, the open-trough and tandem-needle techniques are detailed, neither of which has been described in the literature to our knowledge. Part 3 presents examples of challenging cases in which modifications described in part 2 are used. The purpose of this article is to leave the reader with affirmation of the very real challenges breast radiologists can face and ways to overcome them.

Part 1: Ultrasound-Guided Breast Biopsies and Biopsy Devices

Similar to non-breast-related US-guided interventions, US-guided breast procedures begin with obtaining consent and discussing the
risks, benefits, and alternatives to the procedures. Compared to breast interventional procedures performed with mammographic guidance, the breast is not in compression. Rather, the patient is positioned to optimize the tissue depth and tension on the skin to allow penetration of the needle into the breast tissue. The basic setup for the procedural tray will include instruments needed for local anesthesia, a scalpel for making skin nicks, gauze, and a spinal needle for reaching deeper tissues during local anesthesia. After the biopsy target is identified by US, the skin of the breast is prepared with an antiseptic cleaning solution, and the US transducer is disinfected, or a sterile transducer sleeve is used. Local anesthesia to both the dermis and the deeper breast tissue is obtained. Generally, the US biopsy device is selected before commencement of the procedure. The subsequent steps with respect to needle positioning relative to the target vary slightly depending on which device is selected. Regardless of which device is used, the basic principles to maintain visualization of a needle during freehand biopsy are used.

There are 2 basic types of devices commonly used in US-guided breast biopsies: spring-loaded core needle biopsy devices (SLDs) and vacuum-assisted breast biopsy (VABB) devices. Each device has its own set of advantages, which are presented below.

**Figure 1.** Spring-loaded core needle biopsy device using a 2-staged approach to confirm positioning of the sampling trough. A 77-year-old woman presented for US-guided CB of a palpable mass, which was performed with a 14-gauge SLD (Achieve; Cardinal Health, Dublin, OH). A. Prebiopsy image shows a hypoechoic mass (arrow) with angular margins and posterior acoustic shadowing. B. Prefire image shows the biopsy needle (arrowheads) directed toward the targeted mass and parallel to the chest wall. C. In this 2-staged approach, the postfire image of the first stage shows the mass (arrow) within the needle trough (arrowheads). D. During the second stage, the outer cutting cannula covers the trough (arrowheads), securing a tissue specimen in the trough.
Spring-Loaded Core Needle Biopsy Devices
Most SLDs for breast CBs use a spring-loaded mechanism and a rapid 2-step deploying or firing action. Each step is actuated by a finger-activated button on the device. The first step deploys the inner needle with a sampling trough into the targeted tissue. The second step deploys an outer hollow cutting cannula over the notched needle, shearing off the tissue. This procedure can be performed as a single-staged technique, meaning that the trough needle and the cutting cannula are deployed nearly simultaneously with the push of a button. Alternatively, the procedure can be performed in 2 stages in which each step is completed separately.

The 2-staged approach can be used not only to confirm that the sampling trough is positioned within the target (Figure 1) but also to make fine adjustments in needle positioning between the 2 steps. For example, after the trough needle is deployed, a US image taken orthogonal to the needle at the target can better determine needle placement in the lesion (Figure 2). Because the outer cutting cannula has not been deployed, the trough needle can be readjusted to center it better in the target, if desired.

Sometimes, with a 2-staged approach, one can apply downward force to the handle of the device, creating torque along with a slight lifting force, which brings more target tissue into the trough before deploying the outer cutting cannula (Figure 3). This may be helpful when the trough is slightly more posterior to the target than desired. Another scenario when a 2-staged approach can be helpful is for very superficial targets.

In general, 14-gauge or larger spring-loaded needle systems provide adequate tissue samples for

Figure 2. Spring-loaded core needle biopsy device using a 2-staged approach to confirm optimal needle positioning in the orthogonal view. **A.** The needle is parallel and aligned with the footprint of the transducer. **B.** Corresponding transverse US image from **A** shows that the needle and open trough (arrowheads) are parallel to the chest wall, and the trough traverses the target (arrow). **C.** Rotation of the transducer 90° makes the transducer orthogonal to the needle and longitudinal with the lesion. **D.** Corresponding longitudinal or orthogonal US image shows the needle (arrowhead) nearly centered within the slightly echogenic target (arrow).
accurate diagnosis.\textsuperscript{11–14} Typically, 4 or 5 core samples from an SLD are sufficient for an accurate histologic diagnosis.\textsuperscript{15}

**Vacuum-Assisted Breast Biopsy Devices**

Vacuum-assisted breast biopsy devices are favored for smaller lesions when including as much of the target lesion as possible at the time of the biopsy is desired, when the target lesion is a complex solid and cystic mass, or when the biopsy target is suspected to be a papillary lesion, intraductal, or one that will be difficult to visualize after the administration of local anesthetics.\textsuperscript{16} When performing a VABB, the device aperture/trough is positioned just posterior to the target. When the device is correctly positioned, 2 echogenic lines corresponding to the 2 edges of the trough/aperture can be seen.
target lesion, so that it can be “pulled” or “vacuumed” into the device.6,17 Because the footprint of the US transducer generally used for breast biopsies is wide enough to capture both sides of the needle trough, one can determine that the device is in the appropriate position when 2 echogenic lines are visualized (Figure 4). One of the key benefits of a VABB is that this device allows the obtaining of multiple samples with only a single needle insertion.7 Vacuum-assisted breast biopsy devices are available with different trough lengths. For example, Suros (ATEC; Hologic, Bedford, MA) has a 9-gauge, 2.0-cm regular trough and a 9-gauge, 1.2-cm petite trough.18 One of the nuances of the VABB device is that the longer trough elicits greater vacuum suction, which is something to consider when using a VABB device just deep to the skin or nipple. Each biopsy “pass” is actuated by a switch that is often foot operated. Once the pass is initiated, it will complete the biopsy cycle to retain a specimen that is collected in a specimen basket.

Vacuum-assisted breast biopsy systems have varying features, and in general, the vacuum is not always on. After the biopsy is initiated by the biopsy switch, the vacuum is initiated and discontinued as the cutting cannula secures the tissue. When the biopsy switch is kept in the “on” position, the “vacuum—cut—secure specimen” biopsy cycle automatically repeats itself. Releasing the biopsy switch between cycles releases the vacuum, allowing tissue adjacent to the trough to move away from the trough. On occasion (eg, when the target is slightly farther away from the trough), it might be beneficial to keep the biopsy switch in the “on” position and take successive passes, capitalizing on the cumulative pull from the vacuum. This concept of inducing a cumulative pull is translatable to VABB devices that are used in stereotactic-guided breast biopsies.

**Spring-Loaded Versus VABB Devices: When to Use a Particular Device**

Several considerations go into which device is selected for a particular biopsy, and a brief description of what may make one device preferred over the other is provided. Compared to a VABB device in which the needle is inserted only once, the SLD needle when used without an introducer must be inserted multiple times, once for each tissue sample acquisition.6 Ultimately, the desire is to achieve the most representative biopsy specimen of the most worrisome finding with little sampling error and a minimal risk of complications. Comparative features of each

### Table 1. Comparative Features of SLDs and VABB Devices

| Feature                       | SLD     | VABB  |
|-------------------------------|---------|-------|
| Percutaneous needle insertions | Multiple | Single |
| Coaxial technique             | Yes     | No    |
| Orthogonal checking           | Yes     | Yes   |
| Hydrodissection               | Yes     | Yes   |
| Tandem-needle technique        | No      | Yes   |
| Open-trough technique         | Yes     | No    |

### Table 2. Target Characteristics That Might Affect Selection of the Biopsy Device

| Type of Target                     | SLD                                                                 | VABB                                                                 |
|------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| Small (<1 cm) masses               | Yes, but there is the possibility of loss of target conspicuity with each ensuing biopsy pass | Yes, particularly when entirely removing the mass during biopsy is desired |
| Complex solid and cystic masses    | Yes, but target conspicuity may decrease when the cystic portion is removed after initial passes | Yes, and may be preferred to include as much of the solid components of the mass |
| Suspected intraductal masses       | Yes, but since these masses are usually small, they also fall under the small-mass category | Yes, and may be preferred as removal or near-complete removal occasionally obviates the need for surgery (eg, papilloma) |
| Subdermal masses                   | Yes, and may be facilitated by hydrodissection                      | Yes, and may be facilitated by hydrodissection or the tandem-needle technique |
| Masses on an implant capsule       | Yes, and the open-trough technique may be preferred                 | Higher risk of implant rupture even with aggressive hydrodissection |
device that may be helpful for device selection are provided in Table 1, and characteristics of biopsy targets that might affect selection of biopsy device are provided in Table 2.

Part 2: Procedural Modifications and Techniques to Consider

Coaxial Technique: Conventional
With SLDs, a standard coaxial technique can be used with an introducer that is often included separately or as a detachable part of the needle system. Here, a coaxial introducer needle (blunt cannula with an inner stylet) is first advanced to the lesion. The inner stylet is then removed, and the cannula remains within the breast, functioning as a hollow needle into which the SLD is inserted. For systems in which the introducer is part of the biopsy needle, the entire system is advanced to the biopsy target. After sampling, the cannula is disengaged from the biopsy device, leaving the cannula behind in the breast ready for the next pass. For targets that are in extremely dense breast parenchyma, using an introducer needle can effectively create the initial path to the target, making it more comfortable for patients by reducing the pushing of the needle through the dense tissue for each separate pass. A coaxial technique with an introducer can also be useful when working with trainees, as they do not have to retarget the lesion and induce more tissue trauma for each pass. However, with an introducer, there is the potential of introducing air into the biopsy site, which can obscure the lesion, particularly when the lesion is small.6,7

Coaxial Technique: Open-Trough Technique
Another variation of the coaxial technique referred to here as an “open-trough technique” can be considered for some particularly challenging breast biopsies. This technique can be used when the target is located in a difficult location (eg, near the nipple, skin, or implant or adjacent to a large vessel), and there is not a safe...
zone for “firing” toward the target. This open-trough technique is detailed in Figures 5 and 6. When using this technique, it is important to make all biopsy needle exchanges with the coaxial technique beyond the lesion because each biopsy needle exchange introduces a small amount of air that could obscure the lesion.7 This technique can also be used with very small lesions where the introducer is placed posterior or deep to the lesion to minimize possible difficulty in lesion visualization after sampling. This can also be used with trainees when they are first introduced to breast biopsies.6

Hydrodissection: Before Biopsy Needle Placement

Hydrodissection is often used in interventional procedures such as hepatic thermal ablations and breast cryoablations.19,20 In thermal ablations, sterile saline or a lidocaine solution is used to displace a vital structure away from a thermal zone to avoid damaging those structures.19 For breast cryoablations, sterile saline is typically injected through a needle into the marginalized area to maintain a specific distance between the ice margin and the skin.20 Hydrodissection is also used in other therapeutic breast interventions such as percutaneous ablations to protect the nipple/areolar complex.21 This same technique can be translated into diagnostic breast procedures.22

Since the purpose of hydrodissection is to displace the targeted lesion to a more optimal location or to displace a structure away from the biopsy field, there are a few points that are notable in the breast.

Figure 6. Open-trough technique. A, To perform an open-trough technique, an introducer is used and is placed deep to the target. B, Ultrasound image of the phantom and target shows the introducer (arrowheads) deep to and just past the target (arrow). C, The inner stylet is removed, and the biopsy device with the trough open (arrowheads) is inserted into the introducer. D, The biopsy device should be advanced until approximately 2 cm remain (arrow), at which point the “dead space” of the device will be visible on the US image. E, At this point, the introducer can be retracted (arrow) with one’s index finger. F, Corresponding US image will reveal a portion of the trough of the biopsy device (arrowhead). G–J, The introducer is fully retracted to reveal the trough of the SLD, which will be centered below the target. K, From this position, the target can be sampled.
First, reducing the downward pressure of the transducer on the target at the time of hydrodissection may facilitate displacement. For example, if the purpose of hydrodissection is to displace the target more anteriorly toward the skin, decreasing pressure on the transducer hand will reduce the opposing force of the “upward” displacement during hydrodissection (with the needle tip placed just posterior to the target lesion during hydrodissection). Second, sterile saline can be used when administration of an additional local anesthetic is not desired. Third, despite reducing transducer pressure, the bolus of the local anesthetic or sterile saline sometimes infiltrates rapidly into the adjacent tissues, providing very little displacement of the target. For example, hydrodissection sometimes only minimally anteriorly displaces a targeted mass away from the chest wall leaving little margin to place a VABB device posterior to the mass. In such instances, a tandem-needle technique can be considered.

**Hydrodissection: During Biopsy (Tandem-Needle Technique)**

In a tandem-needle technique, 2 needles are used simultaneously at the time of biopsy: 1 needle for biopsy and another needle for hydrodissection. This technique may be helpful when using a VABB device near the skin, nipple, implant, or chest wall. The tandem-needle technique requires a second set of hands to either hold the transducer or to handle either the biopsy needle or the hydrodissection needle.

For masses just deep to the skin, the VABB device is positioned posterior to the target like a normal biopsy. Next, a second needle connected to a syringe of either lidocaine or saline is inserted superficial to the mass but deep to the dermal surface. This hydrodissection needle can be placed orthogonal or semiparallel to the transducer footprint (Figures 7 and 8) and serves 2 purposes: (1) to act as a physical barrier to keep the dermis from being pulled into the VABB; and (2) to perform hydrodissection, actively injecting saline or lidocaine between the target and the dermis, which acts as a second barrier at the time of biopsy. When the VABB device is just about to begin vacuuming, lidocaine or sterile saline is injected through the hydrodissection needle.

**Figure 7.** Superficial lesion sampling with an SLD. A 75-year-old woman presented for biopsy of a palpable mass. A, Preprocedural image shows an irregularly shaped hypoechoic mass (arrow) with posterior shadowing just deep to the dermis. The procedure was performed with a 16-gauge Achieve needle. B, Subsequent image shows an introducer (arrowheads) placed below the target (arrow). C, The SLD with an open trough (arrowheads) is exposed by retracting the introducer cannula. D, Final image shows sampling of the lesion (arrow) with the cutting cannula (arrowheads) released.
When Lidocaine Obscures the Target
In both US-guided and mammography-guided procedures, administration of a local anesthetic can sometimes efface the biopsy target. Oftentimes, waiting about 5 to 10 minutes with or without some gentle massaging at the injection site will allow the local anesthetic to infiltrate and dilute in the adjacent tissues, bringing the target back into view. For smaller

Figure 8. Superficial lesion sampling after hydrodissection. A and B, Artist renderings of a breast biopsy shows lidocaine being instilled between the dermis and the target lesion (A) to create a safe zone between the dermis and the biopsy target (B) (Used with permission from the Mayo Foundation for Medical Education and Research; all rights reserved.)

Figure 9. Superficial lesion sampling with an SLD. A 75-year-old woman with a history of breast cancer presented for biopsy of a palpable lesion, which was performed with a 16-gauge Achieve needle. A, Prebiopsy image shows a hypoechoic oval mass (arrow) with irregular margins superficially located with extension to the dermis. B, Initial procedural image shows the tip of the introducer (arrowheads) at the edge of the target (arrow). C, Subsequent image with lesion with in the open trough (arrowheads). D, Final image shows sampling of the lesion (arrow) with the cutting cannula released (arrowheads).
targeted findings where injection of a local anesthetic can completely obscure the target, one can also keep the US transducer fixated on a particular finding in that region (e.g., a fatty lobule or a pattern of intersecting Cooper ligaments) while waiting for the local anesthetic to infiltrate. Doing so can improve confidence of the subsequent search for the targeted site, since the transducer never left the site of local anesthetic injection.

Part 3: Applying Techniques to Challenging Biopsy Scenarios

Biopsying Superficial Masses

Biopsying a superficial breast mass depends on the biopsy device selected. When using an SLD, an option would be to use an open-trough technique and sample the deeper aspect of the targeted mass (Figures 7 and 9). Additionally, hydrodissection could be performed to displace the mass posteriorly from the subcutaneous-dermal interface (Figure 8) or away from the nipple.

For complex solid and cystic masses, the device of choice is often a VABB device to minimize undersampling the mass.16,23 This device can be difficult to use for superficial masses, as there is always the potential risk of pulling the dermis into the trough. To solve this challenge, a tandem-needle technique (Figures 10 and 11) can be considered.

Biopsying Deep Masses

When targets are deep and lie directly on the pectoralis muscle, the usual strategy is to approach the biopsy from slightly farther away, allowing enough room to bring the device parallel to the chest wall.4,7,22 Using hydrodissection, the mass may be

Figure 10. Sampling with the tandem-needle technique. Artist rendering shows a cross-sectional image of a VABB device with a mass being pulled (arrow) into the aperture. In this illustration, the hydrodissection needle is placed orthogonal to the biopsy needle and is located above the mass. (Used with permission from the Mayo Foundation for Medical Education and Research; all rights reserved.)
displaced anteriorly by bolusing a local anesthetic or saline and creating a “safe zone” for biopsy. After elevating the biopsy target, the biopsy device of choice can be used (Figure 12). If one is using a VABB device, there is now room for the device to be placed

Figure 11. Superficial lesion sampling with a tandem-needle technique. An 88-year-old woman with a new screen-detected mass presented for US-guided CB. A, Preprocedural image shows a complex solid and cystic mass (arrow) in the subareolar breast. A 9-gauge petite Suros VABB device was selected for the procedure with a tandem-needle approach. B, The superficial needle (arrow) is located above the targeted lesion, and the VABB device (arrowheads) is located below the target. The superficial tandem-needle acts as a barrier and allows for the infusion of saline or lidocaine, which acts as a second shield for the dermis. C, During the procedure, saline or lidocaine is actively instilled above the target (arrow) as the VABB device (arrowheads) continues to take samples.

Figure 12. Deep lesion sampling with hydrodissection. A, Preprocedural image shows a hypoechoic oval mass (arrow) with slightly irregular margins immediately above the pectoralis muscle. B, A 25-gauge spinal needle (arrowheads) is used to instill lidocaine (arrow) posterior to the lesion to lift the target off the pectoral muscle. Once the lesion has been elevated, either an SLD or a VABB device can be used to sample the mass. The histologic diagnosis was focal atypical ductal hyperplasia in a background of a fibroadenomatoid nodule.

Figure 13. A 43-year-old woman after mastectomy with implant reconstruction presented for biopsy of a right breast mass. A, Preprocedural image shows a hypoechoic circumscribed mass immediately adjacent to the implant (arrow) and within a few millimeters of the skin. B, A CB could not be performed, but fine-needle aspiration was performed with 25-gauge needles (arrowheads). Histologic findings were most consistent with benign scar tissue. The fine-needle aspiration cytologic examination showed no evidence of malignancy.
posterior to the target, and if one is using an SLD, one has more clearance to safely biopsy without injuring the pectoralis muscle.

Most SLDs have a dead space, which is the most distal portion of the biopsy needle that is not part of the trough. Unlike the trough, the dead space, which can be between 0.5 and 0.8 cm in length, is not directly involved with securing a tissue specimen but needs to be accounted for, particularly when the biopsy target is small. For example, if the target is less than 1.0 cm in size and immediately adjacent to the chest wall, one needs to account for the length of the dead space to ensure that the pectoralis muscle is not injured. If hydrodissection is unable to displace the target off the pectoralis muscle, a tandem-needle technique can be considered. Another consideration is to use a biopsy device without a dead space, such as a BioPince (Argon Medical Devices, Frisco, TX). Unlike an SLD with a trough, the BioPince has no dead space and obtains a cylindric core specimen.

**Figure 14.** Open-trough technique for a lesion on an implant. A 52-year-old woman with a history of right nipple-sparing mastectomy and implant reconstruction presented for biopsy of a painful mass right breast mass. A, Preprocedural image shows an oval mass with irregular margins (arrowhead) located between the dermis and the implant. An open-trough technique with a coaxial needle was performed. B, Subsequent image shows placement of the introducer (arrowheads) below the target (arrow). C, The outer introducer is retracted, revealing the SLD with the trough (arrowheads) positioned below the target (arrow). D, Final image shows the outer cutting cannula deployed (arrowheads) sampling through the lesion (arrow). The histologic diagnosis was invasive ductal carcinoma.

**Figure 15.** Mass adherent to an implant capsule in a 44-year-old woman with an area of palpable concern in the left breast. A, The mass (arrowhead) is immediately adjacent to the anterior surface of the patient’s implant in the region of the valve (arrow) of the saline implant. The procedure was performed with a 16-gauge Temno needle (Merit Medical, Jordan, UT). B, The needle is advanced through the superficial (arrowheads) aspect of the target (arrow). C, The outer cutting cannula (arrowheads) is deployed, sampling the superficial aspect of the mass. The histologic diagnosis was grade I invasive ductal carcinoma.
discussed earlier, using an introducer may be helpful, particularly when the target is within dense tissue.

**Biopsying Near an Implant or the Fibrous Capsule**

Sampling a peri-implant lesion can be challenging, especially when the target is located on or involves the fibrous capsule. Sometimes, fine-needle aspiration of the lesion may be sufficient to determine whether malignancy is present (Figure 13). At our institution, these lesions often undergo CB.

Not only can the open-trough technique be used (Figures 14 and 15), but hydrodissection can also be extremely helpful and even allow for consideration of using a VABB device. Similar to deep lesions, hydrodissection can be used to displace the targeted mass off the implant capsule, creating a safe zone to perform a biopsy using the usual techniques (Figure 16). If a biopsy device without a dead space, such as a BioPince, is available, that can also be considered.

If the capsule needs to be sampled to rule out breast implant–associated anaplastic large cell lymphoma, sterile saline or lidocaine can be used to dissect the fibrous capsule somewhat away from the implant envelope. In a patient with skin-sparing mastectomy and implant reconstruction, hydrodissection both superficial and deep to the target may be

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**Figure 16.** Implant and hydrodissection. **A**, Artist rendering shows how hydrodissection can be used to lift a lesion off an implant. **B**, Then lidocaine can be instilled superficially to the mass to create a safe zone between the lesion and the skin surface. **C**, These steps created room for the biopsy device. (Used with permission from the Mayo Foundation for Medical Education and Research; all rights reserved.)

**Figure 17.** Mastectomy and hydrodissection. **A**, Artist rendering shows how hydrodissection can be used to lift a lesion off the pectoral muscle. **B**, Then lidocaine can be instilled superficially to the mass to create a safe zone between the lesion and the skin surface. **C**, Having lidocaine above and below the lesion creates enough space for the use of a biopsy device. (Used with permission from the Mayo Foundation for Medical Education and Research; all rights reserved.)
able to create a saline/lidocaine “pool” surrounding the lesion. This not only creates room for the biopsy device near the implant but also protects the superficial skin (Figure 17).

**Biopsying Targets Seen Better in Only a Single US Plane**

For those rare occasions when a biopsy target is better seen in only a single plane, the trajectory of the biopsy usually coincides with the plane of best visualization. For example, if the target is best seen in the transverse plane, then the needle trajectory will be in the transverse plane. However, when a finding is only well seen in the longitudinal plane at the 12-o’clock position, biopsying in the longitudinal plane can be tricky. On the one hand, the nipple precludes a caudal-cranial approach, and on the other hand, the patient’s chin or face hinders a cranial-caudal approach.

For 12-o’clock targets seen in only the longitudinal plane, one can first document what the target looks like in an oblique position and biopsy in this trajectory, confirming at some point that the needle traverses the target when viewed in the longitudinal direction. Alternatively, a 2-staged, open-trough technique can be used initially, advancing in the transverse plane. Once in this view, the US transducer is slowly rotated into the orthogonal (longitudinal) view where the target is best depicted. In this plane, the needle device is then adjusted to be within the target. Then the second stage can be completed (Figure 18).

**Biopsying When the Needle Enters the Same Tract**

Occasionally, after the first few biopsy samples, the subsequent cores are friable, or the trough is “empty” with blood products despite being within the center of the target. When this occurs, retargeting can be attempted to create a new tract and get more solid samples. Despite attempting this maneuver, however, it may seem that the needle continues to follow the path of least resistance and enter the earlier biopsy tract. At this time, consider switching to a 2-staged technique; if the needle follows the old needle tract, then you can

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**Figure 18.** Lesion seen in a single plane in a 61-year-old woman with asymmetry in the left breast and a vague hypoechoic suspicious left breast lesion identified on an outside US examination. **A** and **B**, Preprocedural grayscale images show a vague area of shadowing (arrows) at the 12-o’clock position, with an adjacent cyst (arrowhead) seen in the longitudinal plane (A). Biopsy was performed with a 14-gauge Achieve device; samples were taken in 2 stages. **C**, The first stage shows the open trough (arrowheads) in the region of the target (arrow). **D**, Orthogonal image shows the needle (arrow) at the edge of the vague lesion; the cyst (arrowhead) was used as a landmark. **E**, In this plane, the needle can be moved to the desired location (asterisk). The histologic diagnosis was ductal carcinoma in situ, cribriform and solid types, intermediate nuclear grade.
Figure 19. Biopsy entering the same tract. A 54-year-old woman with a new screen-detected mass presented for US-guided biopsy performed with a 14-gauge Achieve needle. **A**, Preprocedural image shows an indistinct hypoechoic mass with posterior acoustic shadowing (arrow). **B**, Initial sampling shows the needle (arrowheads) traversing the mass (arrow). **C**, Orthogonal image shows the needle (arrowhead) centered within the mass. Subsequent sampling results in small cores because the biopsy device continues to enter the same tract. **D**, After the first stage of sampling, rotate the device 90° (open pie shape) in the tract to sample a different part of the lesion. **E**, Continue to rotate the device (open pie shape) for subsequent samples. The histologic diagnosis was pseudoangiomatous stromal hyperplasia.

Figure 20. Mobile lesion. A 95-year-old woman unable to raise her arm above her head presented with a palpable right breast mass. **A**, Preprocedural image shows a hypoechoic mass (arrow) with internal cystic components. The mass and breast tissue were highly mobile, and the patient was unable to raise her arm above her head for proper positioning. **B**, An introducer (arrowheads) was used to immobilize the lesion, passing through the lesion, which was fairly soft. **C**, The biopsy was then performed with an open trough (arrow), and the introducer (arrowheads) was slowly retracted. **D**, With the introducer retracted, the trough of the SLD (arrowhead) can be easily visualized. The histologic diagnosis was invasive ductal carcinoma with mucinous features, Nottingham grade I (of III).
simply rotate the device 90°, apply some torquing force, and now sample a different part of the lesion (Figure 19). Note that rotating the device is not beneficial in a single-staged approach, as the outer cutting cannula has already been deployed. This can be repeated as you sample “around the clock.”

Biopsying Mobile Lesions
Mobile lesions, whether large or small, can be challenging because despite accurate targeting, the lesion can be “pushed away” rather than being sampled by the device. For these scenarios, using an introducer to anchor the lesion and then performing the biopsy may improve sample yield. If the lesion is relatively soft, often the introducer can be inserted to the distal aspect of the mass, and an open-trough technique can be used (Figure 20). Additionally, the transducer hand can be used to help anchor the target in place by rocking and compressing the transducer.25

Conclusions
Core biopsies of suspicious breast findings are preferred over surgical biopsies. Understanding the mechanisms of action for common US-guided biopsy devices can help a radiologist perform more difficult procedures. Maneuvers such as hydrodissection before sampling and modifications to conventional techniques such as an open-trough technique or tandem-needle technique may help mitigate the challenges of a daunting US-guided CB.

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