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One-Stop Contrast-Enhanced Mammography-Guided Breast Biopsy: A Practical Workflow from a Tertiary Referral Center

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Dear Editor,

Contrast-enhanced mammography (CEM) improves the visualization of tumor neovascularity through intravenous administration of iodinated contrast medium. Using a dual-energy digital mammography technique, CEM produces low-energy images alongside iodine-specific recombined images that clearly delineate contrast-enhancing lesions within the breast parenchyma (1).

Established clinical indications for CEM include clarification of suspicious screening findings, locoregional staging of breast cancer, and assessment of treatment response, with recent evidence further supporting its role as a supplemental screening tool in women with dense breasts (1, 2). CEM is particularly valuable in the management of enhancing mass and/or non-mass lesions detected on magnetic resonance imaging (MRI) or CEM that lack a sonographic correlate. In such cases, CEM-guided biopsy offers a critical diagnostic pathway for lesions occult on ultrasound (US) (3-5).

Our breast clinic is a tertiary referral center serving a large regional population. Diagnostic and interventional breast procedures are therefore routinely performed within a one-stop clinic model, often on the same day, with the aim of minimizing diagnostic delays, reducing repeated hospital visits, and alleviating overall

patient burden. The majority of patients referred for CEM-guided biopsy present with suspicious lesions detected exclusively on breast MRI. At many institutions, diagnostic CEM and biopsy are performed on separate days; alternatively, some centers repeat iodinated contrast several hours later to enable same-day biopsy (3). Both approaches may result in repeated contrast exposure and a less efficient workflow.

Proposed Workflow

All patients referred to our center with MRI-only enhancing lesions first undergo a targeted US examination performed by a dedicated breast radiologist. In the absence of a sonographic correlate, CEM is scheduled to localize the occult lesion. As lesion localization has already been established on prior MRI, patients are counseled regarding the possibility of same-day biopsy before imaging begins.

Intravenous administration of non-ionic iodinated contrast medium (1.5 mL/kg) is initiated. Approximately 2 minutes after the start of contrast injection, the breast is positioned on the biopsy table with appropriate compression. Subsequently, a contrast-enhanced full-field diagnostic acquisition is performed in the craniocaudal projection. Once adequate lesion conspicuity is confirmed, the stereotactic biopsy unit is mounted immediately, and CEM-guided biopsy is performed without

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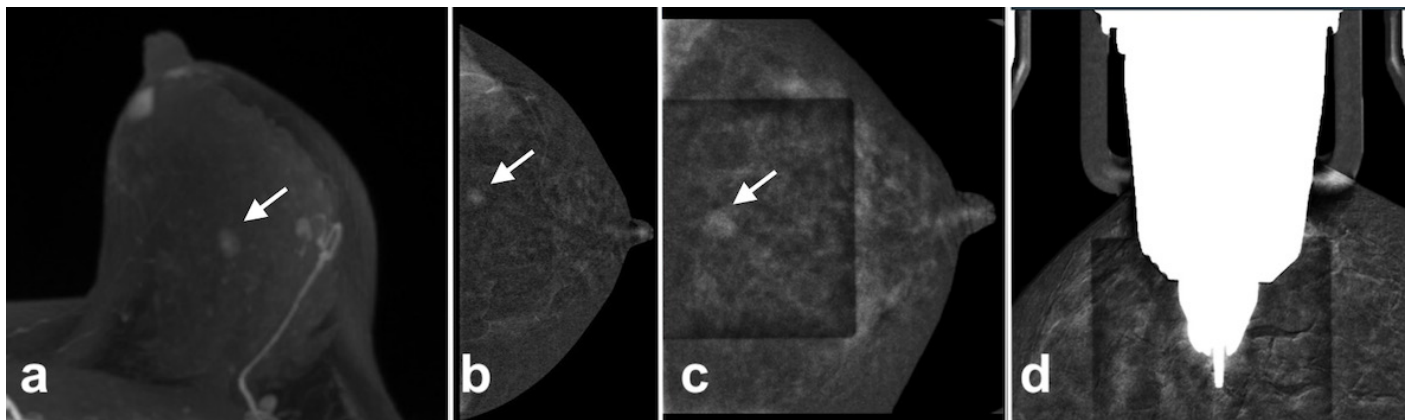


Figure 1. CEM-guided biopsy of an MRI-only enhancing lesion using a single contrast administration. (a) Follow-up breast MRI demonstrates a newly detected 6.5-mm lobulated mass with circumscribed margins and a heterogeneous enhancement pattern in the upper central quadrant of the left breast (arrow). (b) A unilateral craniocaudal CEM recombined image confirms lesion conspicuity (arrow). (c) Planning image acquired following stereotactic unit mounting demonstrates persistent lesion enhancement (arrow). (d) Pre-fire image obtained using a vertical approach confirms accurate needle targeting. Histopathological analysis of the 14-gauge core needle biopsy specimen reported columnar cell changes with apical snouts

CEM: Contrast-enhanced mammography; MRI: Magnetic resonance imaging

additional contrast administration (Figure 1), in accordance with previously described technical principles (3-5). If lesion localization remains uncertain, the examination is limited to diagnostic imaging alone, the mediolateral oblique view is completed, and biopsy is deferred to a subsequent session.

Practical Advantages

This workflow offers several clinically meaningful advantages:

- Avoidance of repeated iodinated contrast administration, either within the same day or across separate visits.
- Completion of diagnostic confirmation and biopsy within a single visit, in accordance with one-stop clinic principles.
- Improved patient satisfaction by consolidating diagnostic and interventional procedures during a single session.

Prior studies have demonstrated that radiation doses associated with CEM-guided biopsy remain within accepted safety thresholds and are comparable to those of conventional stereotactic biopsy techniques, supporting the routine integration of CEM guidance into interventional breast practice (6).

Timing Considerations, Limitations and Future Perspective

In our institutional experience, lesions identified on diagnostic CEM generally remain conspicuous beyond the initial 10-minute post-contrast window, with persistent enhancement providing sufficient time to safely complete the biopsy procedure (3). Conspicuity-related issues due to increased background

parenchymal enhancement and a theoretical risk of diminished enhancement over time remain potential pitfalls that should be acknowledged when adopting this technique (3).

Current evidence supports the use of single-contrast protocols and targeted diagnostic confirmations to optimize interventional CEM workflows (3-5). In our workflow, skin surface measurements and markings are applied prior to CEM acquisition as a supportive step for procedural planning (4). These markings serve as a practical guide to determine the most appropriate patient positioning (either upright or lateral decubitus) on the biopsy table. We additionally perform an initial full-field diagnostic CEM acquisition before mounting the stereotactic unit, which provides an essential baseline for confirming lesion conspicuity and facilitates a more confident procedural start, particularly during the early stages of adopting this technique when clinical experience may be limited.

Should a loss of conspicuity occur following lesion localization, alternative strategies remain available, including rescheduling the procedure for a separate day or repeating contrast administration several hours later. In cases where the lesion cannot be visualized under CEM guidance, MRI-guided biopsy remains a viable and established alternative.

A single-contrast, one-stop CEM-guided biopsy protocol appears to be a practical, time-efficient, and patient-centered approach for the management of MRI-only enhancing breast lesions, particularly in high-volume tertiary referral centers. This strategy has the potential to reduce cumulative contrast exposure

while streamlining the diagnostic and interventional pathway, without compromising procedural feasibility or diagnostic yield. Multicenter prospective studies are warranted to test the feasibility of this approach and to establish standardized protocols for broader clinical implementation.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.Ö., U.A.P.; Concept: H.Ö., H.Ö.A.; Design: H.Ö., H.Ö.A.; Analysis and/or Interpretation: H.Ö., H.Ö.A.; Literature Search: H.Ö., U.A.P.; Writing: H.Ö., U.A.P., H.Ö.A.

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