The Feasibility Of A New Built-in Specimen Radiography Solution For The Optimization Of Stereotactic Breast Biopsy Workflow

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Keywords

Specimen radiography, stereotactic breast biopsy, mammography

Abbreviations

SMR: Specimen magnification radiography

SBB: Stereotactic breast biopsy

Purpose

Specimen magnification radiography (SMR) is integral to stereotactic breast biopsy (SBB) workflow and is critical for the evaluation of retrieved tissue specimens. SMR is especially important for visualization of targeted mammographic microcalcifications within a specimen. The quality, efficiency, and speed of acquiring SMR are crucial, because its results affect the decision-making process and may alter the course of the procedure. The duration of SMR directly affects total procedure time, which influences the patient experience. Moreover, patient motion may occur while SMR is being acquired, since the breast remains in compression.

SMR is often a rate-limiting and workflow-disrupting step of SBB. Some facilities perform SMR on dedicated mobile units housed within procedure rooms. This necessitates investment in capital equipment and requires additional space, unit handling time, and digital storage and transfer solutions. Other facilities use separate stationary mammography systems, which impedes workflow, as an extra suite must be kept available for SMR, limiting patient throughput in the facility. A built-in SMR function on a biopsy-enabled 2D/3D mammography system may mitigate this issue.

Methods

We are describing our experience implementing a new, FDA-cleared, built-in Sample Imaging feature on Pristina Serena™ biopsy option for Senographe Pristina™ (GE Healthcare, Buc, France), which enables SMR on the same detector plate as the patient's breast, while the patient is still under compression (Fig. 1).

The SMR option consists of a combination of add-on software and hardware. The hardware is a manually operated collimator plate, designed to focus the x-ray beam to a small window in one corner of the detector plate to one side of the breast, limiting the exposure of the breast to scattered radiation only. SMR results from a single 2D radiographic acquisition performed with +15º or -15º angulation, depending on the position of the biopsy attachment and the needle, without changing the biopsy setup. At present, the SMR feature is most feasible for the horizontal position of the detector plate; however, custom solutions for a vertical plate position are being developed.

We performed stereotactic breast biopsies utilizing the built-in specimen radiography option with a portable radiography unit available in the room for back-up in case microcalcifications were inadequately visualized and back-up imaging was needed. The radiologist performing a biopsy visually inspected the image from the built-in option and evaluated it as adequate and sufficient, or inadequate with the need for further imaging on a back-up unit.

Fig. 1- *A photograph of a pre-procedure set-up of a mammography unit demonstrating a biopsy attachment with a fenestrated compression paddle (Serena Bright™, GE Healthcare, Buc, France), as well as a round plastic specimen container within a rectangle of light for specimen radiography in the right upper corner of the mammography plate (arrow). Specimen radiography can be done on either side of the compression paddle depending on the breast and needle position.*

Fig. 2- *Intra-procedure photograph taken during a stereotactic biopsy with a superior "parallel" needle approach and the patient in a decubitus position. The photograph demonstrates the patient's breast under compression, as well as a retrieved biopsy specimen being imaged on a non-adherent dressing pad placed on the same detector. A manually-adjusted collimator shields the breast from direct radiation and produces a focused beam in the corner of the detector, which is visible on the photograph as a lit rectangular window. The biopsy needle is outside of the field of view.*

Results

We used the built-in specimen imaging for 7 patients undergoing a stereotactic biopsy on the Senographe Pristina mammography unit. Specimens were either placed into a plastic container (Fig. 1), or imaged on a non-stick pad (Fig. 2).

For all patients, the built-in SMR option was able to adequately answer the clinical question about the presence or absence of targeted microcalcifications within the specimen without the need for additional specimen imaging (Fig. 3).

The built-in SMR feature is advantageous in our workflow, because this procedure room is located on a different floor than the main breast center, which, in the absence of a built-in specimen radiography option, would require either bringing a portable specimen radiography machine or transporting the specimen to the main breast center for radiography on a stationary mammography unit.

The built-in SMR option can be effectively utilized within the SBB workflow. The learning curve for using this method by radiologists is steep, and the image quality produced by the built-in solution is at least noninferior to that produced by conventional methods and is adequate for evaluating a biopsy specimen.

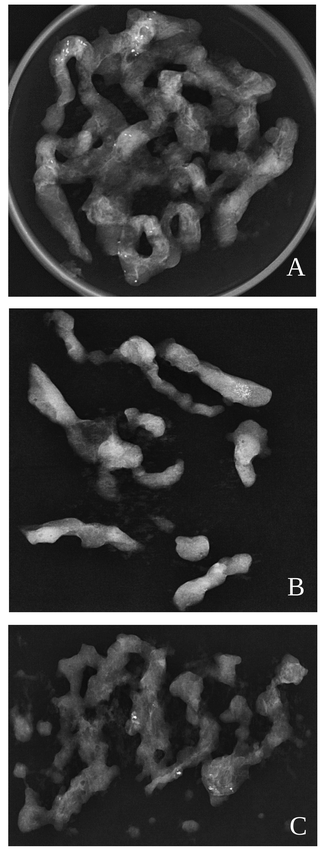

Fig. 3 (A-C)- *Specimen radiographs from different patients taken with the built-in SMR*. They demonstrate *microcalcifications within the retrieved stereotactic biopsy specimens, imaged with adequate resolution.*

Conclusion

The new built-in Sample Imaging feature is feasible and advantageous for the SBB workflow. The evaluated SMR option may eliminate the need for additional equipment and save valuable procedure time during SBB.

References

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Acknowledgements

This work would not have been possible without the expertise and enthusiasm of our team: Joanna Esquivel, Yamile Melgar, Sarah Renner, Iris Hernandez Flores, Denita Shahid, Callie Sullivan and Debora Dawson. We thank Antionett Newhuis for her help with poster preparation.

Funding

This work was made possible by the NIH/NCI Cancer Center Support Grant P30 CA016672 and the MD Anderson/ GE Healthcare in-kind grant. Additional disclosures: O. Weaver: Brown Foundation, Little Green Book Foundation, Center for Global Cancer Early Detection at MD Anderson; Elsa Arribas: Advisory Board Member and shareholder of Volumetric Inc.; Beatriz Adrada: No disclosures; Tanya W. Moseley: Consultant, Hologic Inc.; Consultant, Merit Medical Inc.; M. E. Scoggins: No disclosures.

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