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Critically Appraised Topic / Évaluation critique

Variable Appearances of Ductal Carcinoma In Situ Calcifications on Digital Mammography, Synthesized Mammography, and Tomosynthesis: A Pictorial Essay

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Abstract

This pictorial essay demonstrates the variable appearances of ductal carcinoma in situ on full-field digital mammography, synthesized mammography, and digital breast tomosynthesis. The spectrum of intercase and intracase variability suggests further refinement of reconstruction algorithms for synthesized mammography may be necessary to maximize early detection of ductal carcinoma in situ.

Résumé

Cet essai illustré présente les divers aspects d'un carcinome canalaire in situ observés à la mammographie numérique plein champ, à la mammographie synthétisée et à la tomosynthèse numérique du sein. Compte tenu de la grande variabilité entre les divers cas et à l'échelle d'un même cas, il convient peut-être de peaufiner davantage les algorithmes de reconstruction de la mammographie synthétisée pour optimiser la détection précoce des carcinomes canaux in situ.

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Key Words: Ductal carcinoma in situ; Digital breast tomosynthesis; Synthesized mammography; 2D mammography; 3D mammography; Full-field digital mammography; Calcifications

Breast cancer detection has improved with digital breast tomosynthesis (DBT), which has been demonstrated to increase overall breast cancer sensitivity either compared or in combination with full-field digital mammography (FFDM) [1]. An issue that has emerged from the combination exam of FFDM plus DBT is the dual radiation dose compared with a single exposure from FFDM alone [2]. The efficacy of FFDM compared with that of synthesized mammography (SM), a 2-dimensional (2D) reconstruction from the DBT dataset, has been demonstrated to be comparable [3]. If adopted as an alternative to FFDM, SM addresses the concern of dual radiation.

This pictorial essay demonstrates the varied appearances of calcifications of ductal carcinoma in situ (DCIS), the most common noninvasive breast cancer subtype. DCIS represents over 20% of all breast cancers detected by mammography [4].

Most DCIS cases (80%-85%) are discovered by mammography whereas the remainder may present as a palpable mass. Approximately 96% of mammographically diagnosed DCIS cases are detected by biopsy of calcifications [5].

Materials and Methods

At mammographic assessment, standard 2-view 2D mammography of both breasts and 2-view DBT were obtained as a single procedure with the same breast compression (Selenia Dimensions; Hologic, Bedford, MA). Synthetic 2D images were generated from the DBT dataset for each case using C-View 2013 image processing software version 1.7.2 (Hologic). Images were viewed on SecurView DW workstations (Hologic) for both 2D and DBT images.

Of 27 biopsy-proven DCIS cases from our institution from January to December 2014, 6 DCIS-only cases with FFDM and SM images from our facilities were chosen to highlight the varied appearances of calcifications on these 2D acquisitions (Table 1). Three readers from our institution

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Table 1
Comparative appearances of 6 cases of DCIS calcifications on FFDM and DBT

Case	View	Greatest number of calcifications	Greatest contrast of calcifications
1	CC	FFDM	SM
	MLO	FFDM	SM
2	CC	FFDM	FFDM
	MLO	FFDM	FFDM
3	CC	FFDM	Equal
	MLO	FFDM	SM
4	CC	SM	SM
	MLO	FFDM	SM
5	CC	FFDM	SM
	MLO	SM	SM
6	CC	SM	SM
	MLO	SM	SM

CC = craniocaudal; DBT = digital breast tomosynthesis; DCIS = ductal carcinoma in situ; FFDM = full-field digital mammography; MLO = mediolateral oblique; SM = synthesized mammography.

retrospectively reviewed these cases and determined reader preference for FFDM versus SM for calcification conspicuity.

Results

Mammographic and correlating pathologic images of 6 biopsy-proven DCIS-only cases from our institution are provided with direct comparison of the appearances of calcifications on FFDM and SM (Table 1).

The 6 figures portray a spectrum of conspicuity of calcifications in 6 DCIS cases. Conspicuity is described in terms of quantity and contrast of calcifications. A greater quantity of calcifications is demonstrated on FFDM in Figures 1, 2, and 3. In Figures 4 and 5, a greater quantity of calcifications is demonstrated on FFDM in one view and on SM in the other view, demonstrating even intracase

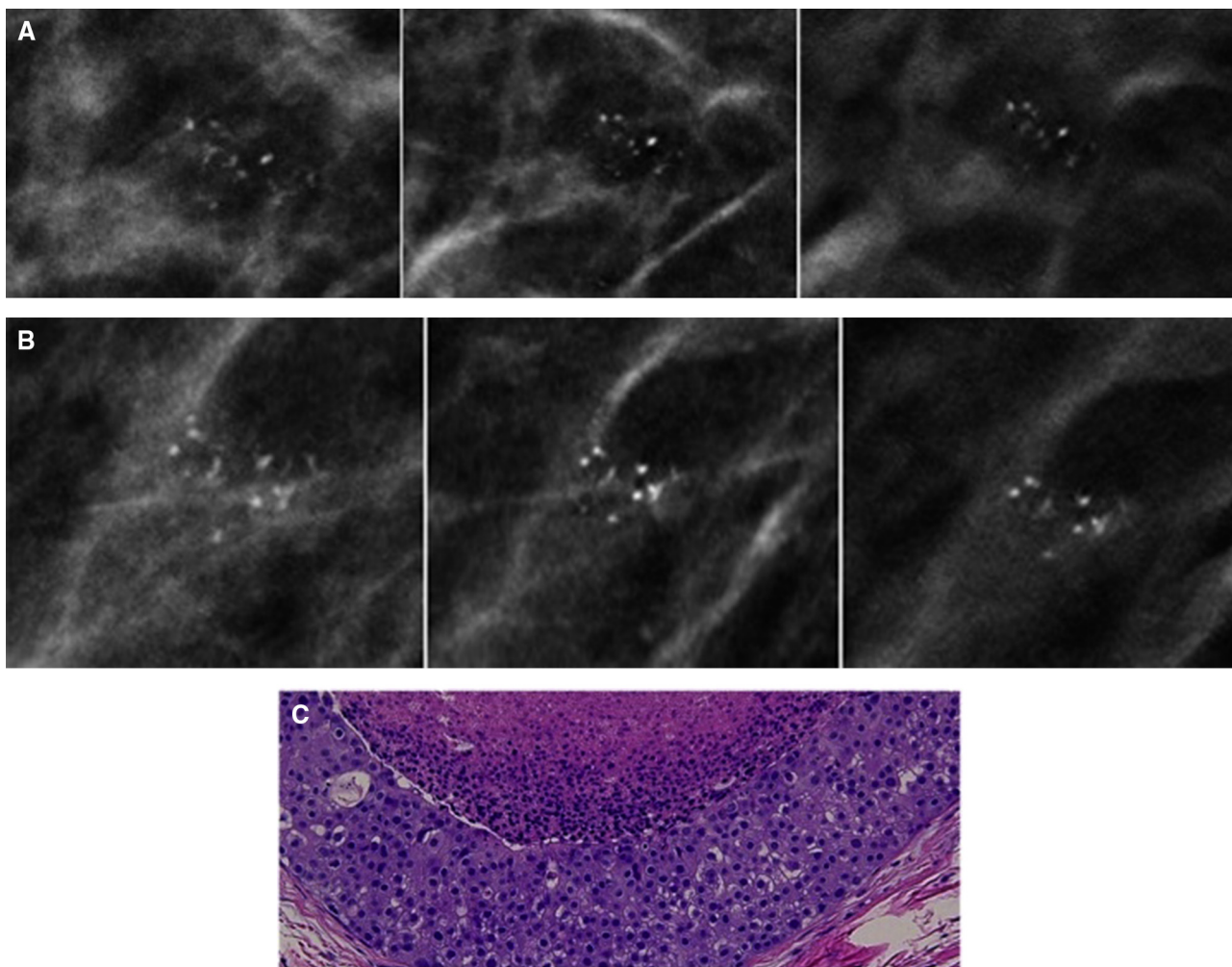


Figure 1. A 44-year-old woman presented for screening with no personal or family history of breast cancer. A diagnostic exam was performed for additional images. Two groups of microcalcifications were identified in the right breast, 1 of which was fine pleomorphic calcifications in the right upper quadrant, 8.5 cm from the nipple. Synthesized mammography (SM) demonstrates fewer but sharper calcifications compared with full-field digital mammography (FFDM). (A) Right craniocaudal views of FFDM, SM, and digital breast tomosynthesis (left to right). (B) Right mediolateral oblique views of FFDM, SM, and digital breast tomosynthesis. (C) Stereotactic core biopsy yielded intermediate to high-grade ductal carcinoma in situ with comedonecrosis.

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