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Primary Category: Breast Imaging
Secondary Category: Quantitative Imaging and CAD

Quantitative CAD for mammograms: Reducing false positive biopsies

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PURPOSE

Almost 2% of screening mammograms result in biopsy, and approximately 70% of these biopsies are benign (Allison, Cancer, 2015). Decreasing the number of unnecessary biopsies would be cost effective and decrease patient anxiety about breast cancer screening. We evaluated a novel algorithm that differentiates benign and malignant calcifications and compared these results to those of experienced radiologists in selecting cases for biopsy. The algorithm is based on a quantitative learning algorithm that takes into account morphology and clustering formation of benign and malignant calcifications as well as stability over time.

METHOD AND MATERIALS

In this IRB approved study, we performed a comparative analysis on 391 patients' screening and diagnostic mammograms where tissue was sent to biopsy based on suspicious calcifications detected by MQSA certified, fellowship-trained breast imaging radiologists. Cases from 2 different centers were reviewed.

These images were evaluated with the qCAD and compared to the expert radiologists' reads. The outcome of the algorithm is an analytical function determined by the training datasets that mathematically define both malignant and benign calcifications. The algorithm is self-learning, improving over time as it encounters more patient cases.

RESULTS

Out of the 391 cases sent to biopsy, 302 cases were benign and 89 malignant (including DCIS). In a preliminary study using 44 cases (30 cases benign and 14 malignant), the algorithm detected 100% of confirmed cancer cases and had 11 cases with false positives, substantially fewer than the 30 false positives by the radiologists. If biopsy recommendations were based on the algorithm up to 63% of biopsies could have been avoided. The PPV of 32% could have been increased to 56% with the benefit of the qCAD.

CONCLUSION

This novel algorithm demonstrates that it can reduce the number of false negative biopsies based on suspicious calcifications by up to 63%. Also, the algorithm can be used to evaluate both screening and diagnostic mammograms.

CLINICAL RELEVANCE/APPLICATION
The use of this quantitative CAD for mammography may be useful in reducing false positive breast biopsies and significantly increasing the positive predictive value (PPV) of biopsy. This may lead to health savings costs as well as eliminate pain and distress for many patients.