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Automated Breast Ultrasonography as a Supplementary Screening Method in High Risk Populations

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Mammography has been the main modality of breast cancer screening programs for many years and is still the only proved diagnostic method to decrease breast cancer related deaths.[1] However in some specific subpopulations like women with dense breasts, mammography could give the false negative result, in about 50% of cancerous cases.[2] About 43% of American women aged between 40-75 years and nearly half of younger women have heterogeneously or extremely dense breasts tissue[3,4,] which can highly decrease the accuracy of mammography.[5, 6] Moreover dense breast is an independent risk factor for developing cancer.[7,8]

Recent studies have suggested using new supplementary methods.[9] There are some techniques to improve radiologic detection of breast cancer in women with dense and heterogeneous breasts such as 3-Dimensional digital breast tomosynthesis (DBT), ultrasonography (US), contrast enhanced breast imaging and magnetic resonance imaging (MRI).[9,10]

Most studies have agreed that adding US as an excellent supplementary method could significantly improve detection of mammographically subtle breast cancers.[10] In fact, supplementary US helps to detect additional 6.8 cancer cases per 1000 screening exams in asymptomatic women[6] and about 4.2 per 1000 cases among women with elevated risk and/or dense breast tissue.[11] The latter incremental rate equals 55% improvement in cancer screening efficacy.[3, 10] The other remarkable point is that the majority of occult tumors identified by supplementary US were proved to be less than 1cm in size, more likely to be invasive (83-100%) and node negative (89-97%).[12]

There are two different available ultrasonography methods, conventional hand-held US (HHUS) and automated breast US (ABUS); ABUS can be done with a linear-array transducer which covers the entire breast and automates the ultrasound scanning process. It serves as a standardization technique and decreases the problems of operator dependency and variations. This screening technique improves not only the detection of breast cancer but also the efficiency of workflow.[3, 10] Additionally it allows the transverse images to be reconstructed into 3D images and be interpreted in coronal planes, which has been proved to improve readers' cancer detection.[3, 13] ABUS is approved by Food and Drug Administration (FDA) in 2012 for screening use in women who have dense breast tissue and negative mammography result.[3]

Although ABUS has many other advantages over HHUS like it requires less time to perform (approximately 10 minutes versus 20 minutes) and it is more reproducible. However, according to a study by Shin *et al*, in cases of suspicious findings, HHUS would be often necessary to confirm the lesion detected by ABUS as well as ultrasound-guided biopsy.[3] A comprehensive systematic review in 2016 discussing the evidence on comparison of these two methods, showed that despite the excellent negative predictive value (NPV=98%) of both techniques, they have more false positive results and consequently lower positive predictive value (PPV) than mammography alone (3.2-7.5% for HHUS and 4.1% for ABUS).[3, 14] Researchers found a sensitivity of 80-83% and specificity of 86-94% for HHUS and sensitivity and specificity of 67-85% and 74-91% for ABUS, respectively.[14,15]

In another recent study, radiologists' performance in breast cancer detection were compared using mammography alone and mammography combined with ABUS. The area under ROC curve (AUC) was

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0.72 for mammography and 0.82 for combination method; it means that ABUS yielded 14% relative increment. Overall specificity was 78.1% for mammography alone and 76.1% for combination method.[16]

In conclusion, we suggest combining mammography with ABUS, compared with mammography alone, provides significantly higher accuracy in detection of breast cancer especially in women with dense breasts. Also, this combination can be more helpful to distinguish benign from the malignant breast lesions. Although ABUS could be greatly helpful as the supplementary tool in the screening program of high-risk populations, further evaluation is needed to clarify whether these groups of population have a significantly better outcome or not. Moreover, making the decision between HHUS and ABUS with mammography as a screening method in high-risk patients with dense breast is still questionable.

Conflict of Interest

Authors declare no conflict of interests.

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