CRITICAL APPRAISAL

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RESEARCH   **Open Access**

Automated breast ultrasound (ABUS) as a screening tool: initial experience

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- Title : Short and mentioned clearly

- Published in 2019 in Egyption Journal of Radiology and Nuclear Medicine

- Authors from relevant department : Radiology and Medical Imaging Department

OBJECTIVE

- To study the added value of ABUS in screening women with suspected breast mass compare to conventional mammography and hand-held ultrasound.

➢ Main objective was clearly stated.

➢ No specific objective.

Study design : Prospective study - clearly mentioned

Study duration : February 2017 – January 2018

Participants: 200 patients - Acceptable for given study duration

Study area : Not mentioned

Study researchers : had a combined 10 years experience in breast imaging. This is initial experience with ABUS.

Approved by institutional review board, written informed consent taken.

METHODS

- Inclusion criteria:
    1. Women in childbearing age complain of breast pain and lump.
    2. Women positive family history of Breast cancer.

- Exclusion criteria:
    1. Patient with known diagnosis of breast cancer under treatment.
    2. Patient with hx of mastectomy or previous intervention for breast lesion.

➤ No range of age specified. Based on result (Age range 19-61)

➤ Mean age : 35.44

MATERIALS

- Total 200 patient include in the study with all patient subject to full clinical examination, 80 patient had biopsy and histopathological analyzed base on imaging findings.

- Routine screening Mammography using Craniocaudal (CC)and mediolateral oblique (MLO) view perform in patient age above 30
  - ❖ Total 108 patient undergone mammogram study.

- Patient age below 30 were screen by ultrasound only.

- All patient had conventional breast ultrasound examination and ABUS for both breast

- ➢ Clearly mentioned which patient underwent mammogram, ultrasound, or both examinations.

TECHNIQUE

- Details on each machine was explained clearly including duration of each examination.

Descriptive statistic used (frequencies [no. of cases] and percentages).

Accuracy was represented using the terms sensitivity, specificity, positive and negative predictive value.

Analytic statistic using t-test and chi-square tests use to compare clinical and imaging findings.

Appropriate and clearly mentioned.

STATISTICAL ANALYSIS

RESULTS:

Age: 19-61 (mean 35.44; SD 10.83)

Most common complain was breast pain: 140 pts(70% of patient population)
32 patients with breast lump (16 %)

108 patients undergone mammography
Total 76 patient (70.8%) with dense breast ACR C (28 pt) and D (48 pt)

In 200 patients, 120 negative imaging and pathological findings.

80 patients with different breast pathology

48 benign (most common fibroadenoma in 36 patient)

32 malignant (most common invasive ductal Carcinoma in 22 patient

50 patient with single lesion; 30 with multiple lesion (20 show lesion in both breast).

Table 1 The comparison between ABUS and HHUS in lesion detection as regards the number of patients. t test was used to compare in between with p value < 0.05 considered significant

	ABUS	HHUS	p
Lesions detected	76/80	66/80	0.012
Accuracy	98.0%	93.0%	0.016
Sensitivity	95.0%	82.5	0.012
Specificity	100.0%	100.0%	–
PPV	100.0%	100.0%	–
NPV	96.8%	89.6	0.023

Table 2 The comparison between the numbers of patients with lesion detected by mammography alone and with the addition of ABUS. *t* test was used to compare in between with *p* value < 0.05 considered significant

	Mammography	Mammography + ABUS	*p*
Lesions detected	24/40	38/40	0.001
Accuracy	85.19%	98.15%	0.0005
Sensitivity	60%	95%	0.012
Specificity	100.0%	100.0%	–
PPV	100.0%	100.0%	–
NPV	80.95%	97.14%	0.023

Table 3 Comparison between ABUS and mammography in the detection of lesions in patients with dense breasts ACR C and ACR D. t test was used to compare between the results with p value < 0.05 considered significant

ACR breast density	Number of lesions detected	Lesions detected by mammography alone	Lesions detected by mammography + ABUS	p value
C (dense)	8	4	6	0.13
D (extremely dense)	28	16	28	0.0005
C and D	36	20	34	0.0001

LESION < 5MM

ABUS	Conventional US	p value
10 lesions detected	4 lesions detected	0.002

➢Results answer the main objective of this study

DISCUSSION

- ABUS – considered as recent addition in breast screening tools to overcome some of the limitations of conventional hand-held ultrasound scanning.

- Results supported by other similar articles/journals.

LIMITATIONS

- Small number of patients

- Relative bias in case selection (researchers were still along learning phase of this new technique & ABUS is recently introduced in Egypt with limited no. of machines).

- Two machines were installed at time this study was conducted.

- Further studies incorporating this modality with national screening program would definitely provide more information reg efficacy of technique and cost-benefit of its use on routine basis.

CONCLUSION:

- ABUS is technological advancement in breast imaging and screening with the benefits of:
    1. Standardization of the scan
    2. Better detection of small lesion especially in patient with dense breast
    3. Improve scan time

- Major drawback : relative high cost of machine compare to convention machine.

OVERALL

GOOD ARTICLE. FINDINGS SUPPORTED BY OTHER SIMILAR ARTICLES/JOURNALS.

Automated Three-dimensional Breast US for Screening: Technique, Artifacts, and Lesion Characterization[1]

Jan C. M. van Zelst, MD, MSc
Ritse M. Mann, MD, PhD

Automated breast (AB) ultrasonography (US) scanners have recently been brought to market for breast imaging. AB US devices use mechanically driven wide linear-array transducers that can image whole-breast US volumes in three dimensions. AB US is proposed for screening as a supplemental modality to mammography in women with dense breasts and overcomes important limitations of whole-breast US using handheld devices, such as operator dependence and limited reproducibility. A literature review of supplemental whole-breast US for screening was performed, which showed that both AB US and handheld US allow detection of mammographically negative early-stage invasive breast cancers but also increase the false-positive recall rate. Technicians with limited training can perform AB US; nevertheless, there is a learning curve for acquiring optimal images. Proper acquisition technique may allow avoidance of common artifacts that could impair interpretation of AB US results. Regardless, interpretation of AB US results can be challenging. This article reviews the US appearance of common benign and malignant lesions and presents examples of false-positive and false-negative AB US results. In situ breast cancers are rarely detected with supplemental whole-breast US. The most discriminating feature that separates AB US from handheld US is the retraction phenomenon on coronal reformatted images. The retraction phenomenon is rarely seen with benign findings but accompanies almost all breast cancers. In conclusion, women with dense breasts may benefit from supplemental AB US examinations. Understanding the pitfalls in acquisition technique and lesion interpretation, both of which can lead to false-positive recalls, might reduce the potential harm of performing supplemental AB US.
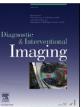
Online supplemental material is available for this article.

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SA-CME LEARNING OBJECTIVES

ELSEVIER

SOLICITED REVIEW / *Breast imaging*

Three-dimensional automated breast ultrasound: Technical aspects and first results

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Table 1   Comparison of breast lesion detection between 3D ABUS and HHUS.

Study	Number of patients	Number of lesions	3D ABUS detection rate (%)	HHUS detection rate (%)
Kim et al. [49]	38	66	84.8 to 86.3 (across three radiologists)	93.9
Lin et al. [48]	81	95	100	100
Wang et al. [45]	213	239	99.6	98.7
Wang et al. [47]	155	165	97.6	95.8
Xiao et al. [46]	300	417	100	78.2
Zhang et al. [50]	81	99	89.9 to 100 (across two examiners)	60.6 to 85.9 (across two examiners)

3D ABUS: three-dimensional automated breast ultrasound system; HHUS: handheld ultrasound.

- Thank you