

## Possibilities of Automated Breast Ultrasound (Literature Review)

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### Abstract

Worldwide the studying of possibilities of automated breast ultrasonography (ABUS) in women with dense breasts is gaining popularity due to its standardization and high reproducibility. A new generation of automated ultrasound scanners demonstrates results comparable to a hand held traditional breast ultrasound. There are advantages of ABUS compared to hand held ultrasound such as high reproducibility, less operator dependence, less required radiologist time for image evaluation, the ability to record volume data on electronic devices for further dynamics assessment. Moreover, ABUS provides a unique coronal view and a relatively large field of view. ABUS can be used in addition to mammography as a basic screening ultrasound in women with dense breast tissue before the hand held specifying ultrasound.

**Key words:** Breast Ultrasound, Automated Breast Ultrasound, Dense Breast, Breast Cancer, Breast Cancer Screening.

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### References

1. *Vasil'ev A. Yu., Pavlova T. V., Manuylova O. O., Kasatkina L. I., Rotin D. L. Eremeeva E. A.* Digital breast tomosynthesis in breast cancer diagnosis of the patient with extremely breast density (the clinical example). *Radiologiya – praktika*. 2017. No. 5. P. 38–44 (in Russian).
2. *Gazhonova V. E., Efremova M. P., Khlustina E. M., Shatilova E. V., Kuleshova T. N., Lozovator A. L.* Automated breast volume sonography – new technology in breast cancer diagnosis. *Med. vizualizaciya*. 2015. V. 2. P. 67–77. (in Russian).
3. *Kaprin A. D., Starinskiy V. V., Petrova G. V.* The state of cancer care in Russia in 2018. Pod red. A. D. Kaprina, V. V. Starinskogo, G. V. Petrovoy. M., 2019. 236 p. (in Russian).
4. *Solodky V. A., Meskih E. V., Ershtein M. A., Kolesnik A. Ju., Oksanchuk E. A., Nudnov N. V.* The role and possibilities of automated breast ultrasound in breast cancer screening in women with high density breast tissue. *Med. vizualizaciya*. 2018. V. 22. No. 5. P. 21–30 (in Russian).
5. *Yakobs O. E., Kaprin A. D., Rozhkova N. I., Mazo M. L., Mikushin S. Y.* Virtual breast sonography. Results of clinical application. *Med. vizualizaciya*. 2014. No. 2. P. 22–31 (in Russian).
6. *Berg W. A., Bandos A. I., Mendelson E. B. M., Lehrer D., Jong R. A., Pisano E. D.* Ultrasound as the primary screening test for breast cancer: analysis from ACRIN 6666. *J. Natl. Cancer. Inst.* 2016. V. 108. No. 4. P. 1–8.
7. *Brem R. F., Tabár L., Duffy S. W., Inciardi M. F., Guingrich J. A., Hashimoto B. E., Lander M. R., Lapidus R. L., Peterson M. K., Rapelyea J. A., Roux S., Schilling K. J., Shah B. A., Torrente J., Wynn R. T., Miller D. P.* Assessing improvement in detection of breast cancer with three-dimensional automated breast US in women with dense breast tissue: the SomoInsight Study. *Radiology*. 2015. V. 274. No. 3. P. 663–673.

8. *Chang J. M., Cha J. H., Park J. S., Kim S. J., Moon W. K.* Automated breast ultrasound system (ABUS): reproducibility of mass localization, size measurement, and characterization on serial examinations. *Acta Radiol.* 2015. V. 56. No. 10. P. 1163–1170.
9. *Choi E. J., Choi H., Park E. H., Song J. S., Youk J. H.* Evaluation of an automated breast volume scanner according to the fifth edition of BI-RADS for breast ultrasound compared with hand held ultrasound. *Eur. J. Radiol.* 2018. V. 99. P. 138–145.
10. *Farrokh A., Erdönmez H., Schäfer F., Maass N.* SOFIA: A novel automated breast ultrasound system used on patients in the prone position: a pilot study on lesion detection in comparison to hand held grayscale ultrasound. *Geburtshilfe Frauenheilkd.* 2018. V. 78. No. 5. P. 499–505.
11. *Hellgren R., Dickman P., Leifland K., Saracco A., Hall P., Celebioglu F.* Comparison of hand-held ultrasound and automated breast ultrasound in women recalled after mammography screening. *Acta Radiol.* 2017. V. 58. No. 5. P. 515–520.
12. *Larson E. D., Lee W., Roubidoux M. A., Goodsitt M. M., Lashbrook C., Davis C. E., Kripfgans O. D., Carson P. L.* Preliminary clinical experience with a combined automated breast ultrasound and digital breast tomosynthesis system. *Ultrasound Med. Biol.* 2018. V. 44. No. 3. P. 734–742.
13. *Lee J. M., Partridge S. C., Liao G. J., Hippe D. S., Kim A. E., Lee C. I., Rahbar H., Scheel J. R., Lehman C. D.* Double reading of automated breast ultrasound with digital mammography or digital breast tomosynthesis for breast cancer screening. *Clin. Imaging.* 2019. V. 55. P. 119–125.
14. *Niu L., Bao L., Zhu L., Tan Yu., Xu X., Shan Yu., Liu J., Zhu Q., Jiang C., Shen Yu.* Diagnostic performance of automated breast ultrasound in differentiating benign and malignant breast masses in asymptomatic women: a comparison study with handheld ultrasound. *J. Ultrasound Med.* 2019. Epub. URL: <https://doi.org/10.1002/jum.14991>.
15. *Shin H. J., Kim H. H., Cha J. H.* Current status of automated breast ultrasonography. *Ultrasonography.* 2015. V. 34. No. 3. P. 165–172.
16. *Skaane P., Gullien R., Eben E. B.* Interpretation of automated breast ultrasound (ABUS) with and without knowledge of mammography: a reader performance study. *Acta Radiol.* 2015. V. 56. No. 4. P. 404–412.
17. *Van Zelst J. C. M., Tan T., Clauser P., Domingo A., Dorrius M. D., Drieling D., Golatta M., Gras F., de Jong M., Pijnappel R., Rutten M. J. C. M., Karssemeijer N., Mann R. M.* Dedicated computer-aided detection software for automated 3D breast ultrasound; an efficient tool for the radiologist in supplemental screening of women with dense breasts. *Eur. Radiol.* 2018. V. 28. No. 7. P. 2996–3006.
18. *Vourtsis A., Kachulis A.* The performance of 3D ABUS versus HHUS in the visualisation and BI-RADS characterisation of breast lesions in a large cohort of 1,886 women. *Eur. Radiol.* 2018. V. 28. No. 2. P. 592–601.
19. *Wang H. Yu., Jiang Yu. X., Zhu Q. L.* Differentiation of benign and malignant breast lesions: a comparison between automatically generated breast volume scans and handheld ultrasound examinations. *Eur. J. Radiol.* 2012. V. 81. No. 11. P. 3190–3200.
20. *Wilczek B., Wilczek H. E., Rasouliyan L., Leifland K.* Adding 3D automated breast ultrasound to mammography screening in women with heterogeneously and extremely dense breasts: Report from a hospital-based, high-volume, single-center breast cancer screening program. *Eur. J. Radiol.* 2016. V. 85. No. 9. P. 1554–1563.

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