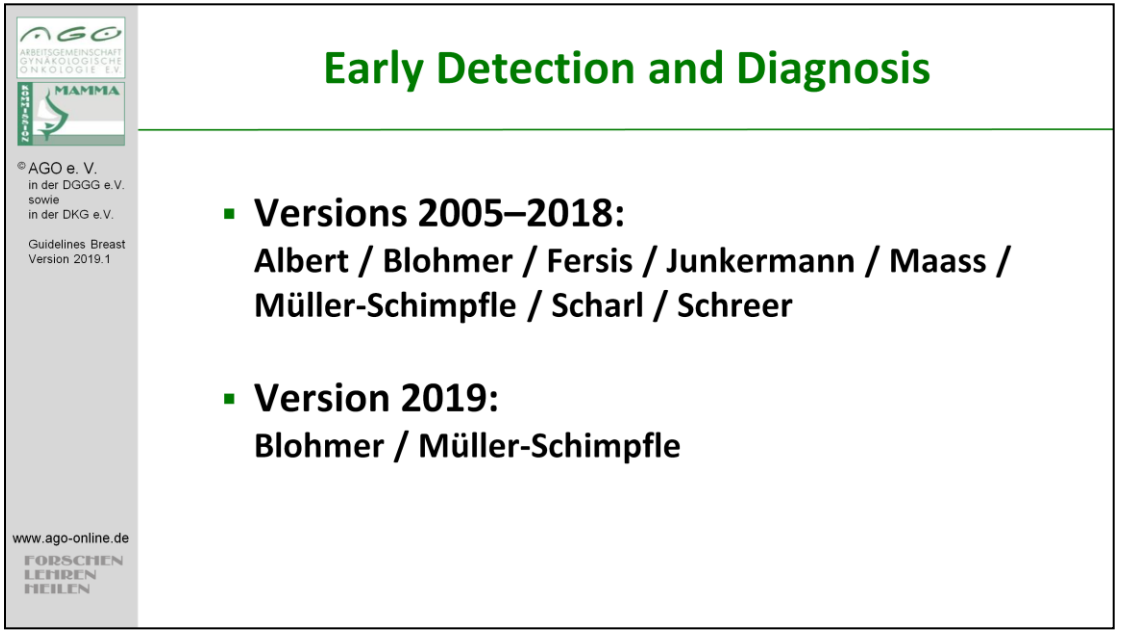
Diagnosis and Treatment of Patients with early and advanced Breast Cancer

Guidelines Breast
Version 2019.1

FORSCHEN
LEHREN
HEILEN

Early Detection and Diagnosis



Screened data bases

Pubmed	2013 - 2018
Medline	2013 - 2018
Cochrane	2013 - 2018

Guidelines

S3 Diagnostik, Therapie und Nachsorge des Mammakarzinoms:

Wöckel A, Festl J, Stüber T et al. Interdisciplinary Screening, Diagnosis, Therapy and Follow-up of Breast Cancer. Guideline of the DGGG and the DKG (S3-Level, AWMF Registry Number 032/045OL, December 2017) - Part 1 with Recommendations for the Screening, Diagnosis and Therapy of Breast Cancer. Geburtshilfe Frauenheilkd. 2018 Oct;78(10):927-948. doi: 10.1055/a-0646-4522. Epub 2018 Oct 19.

Wöckel A, Festl J, Stüber T et al.Interdisciplinary Screening, Diagnosis, Therapy and Follow-up of Breast Cancer. Guideline of the DGGG

and the DKG (S3-Level, AWMF Registry Number 032/045OL, December 2017) - Part 2 with Recommendations for the Therapy of Primary, Recurrent and Advanced Breast Cancer. Geburtshilfe Frauenheilkd. 2018 Nov;78(11):1056-1088. doi: 10.1055/a-0646-4630. Epub 2018 Nov 26.

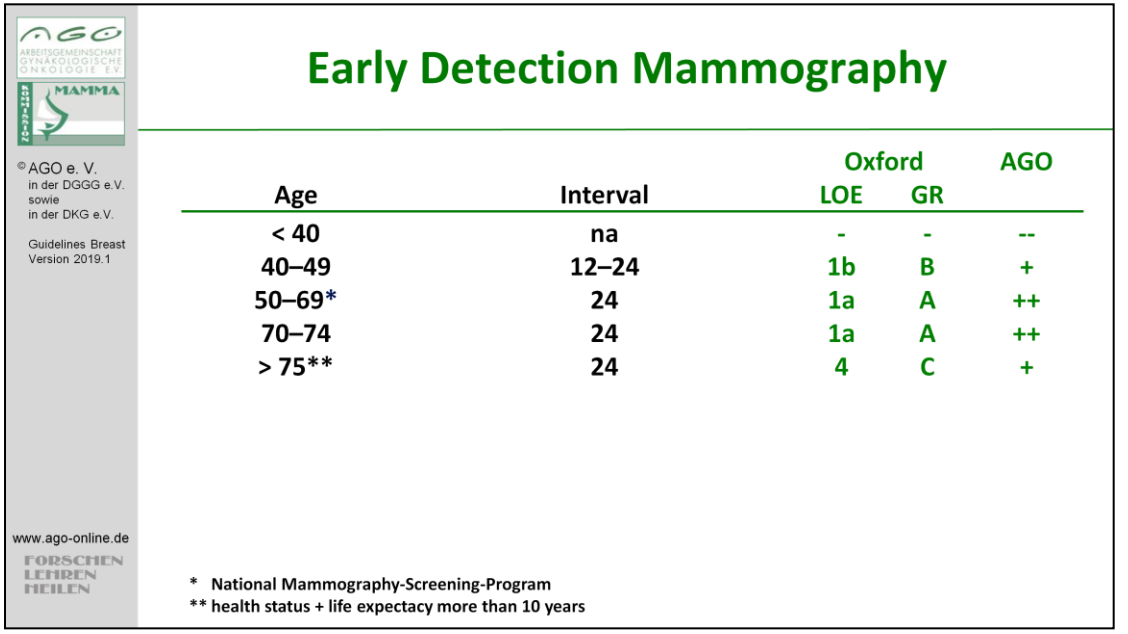
2015 ACS Update Breast Cancer Screening for women at average risk

IARC Handbook 2016

European Commission 2016

(http://ecibc.jrc.ec.europa.eu/recommendations/list/3;Update 24.11.2016, Abruf 20122016)

Screened: Metaanalyses/ Systematic reviews / RCT / Cohort studies



1. Beckmann KR, Lynch JW, Hiller JE, et al. A novel case-control design to estimate the extent of overdiagnosis of breast cancer due to organized population-based mammography screening. Int J Cancer2014, DOI: 10.1002/ijc.29124
2. Bleyer A, Welch H. Effect of three decades of screening mammography on breast-cancer incidence. N Engl J Med 2012; 367:1998-2005
3. Broeders M, Moss S, Nyström L et al. The impact of mammography screening on breast cancer mortality in Europe: a review of observational studies. J Med Screen 2012; 19(Suppl 1):14-25
4. Canadian Task Force on Preventive Health Care. Recommendations on screening for breast cancer in average-risk women aged 40-74 years. CMAJ 2011; 183:1991-2001
5. Chiu SYH, Duffy S, Yen AMF, et al. Effect of baseline breast density on breast cancer incidence, stage, mortality and screening parameters: 25-year follow-up of a Swedish mammographic screening. Cancer Epidemiol Biomarkers Prev 2010;19(5):1219-1228
6. Duffy SW, Dibden A, Michalopoulos D, et al Screen detection of ductal carcinoma in situ and subsequent incidence of invasive interval breast cancers: a retrospective population-based study. Lancet Oncol 2016;17:109-114
7. Euroscreen Working Group. Summary of the evidence of breast cancer service screening outcomes in Europe and first estimate of the benefit and harm balance sheet. J Med Screen 2012; 19(Suppl 1):5-13

8. Gotsche PC, Olsen O. Is screening for breast cancer with mammography justifiable? Database Syst Rev 2011 Jan 19(1): CD001877. Review
9. Helvie MA, Chang JT, Hendrick RE, et al. Reduction in late stage breast cancer incidence in the mammography era. Cancer 2014;17
10. Lauby-Secretan B, Scoccianti C, Loomis D, et al. for the International Agency for Research on Cancer Handbook Working Group. N Engl J Med June 4, 2015
11. Miglioretti DL, Zhu W, Kerlikowske K, et al. for the Breast Surveillance Consortium. Breast tumor prognostic characteristics and biennial vs annual mammography, age and menopausal status. JAMA Oncol 2015;1(8):1069-1077
12. Melnikow J, Fenton JJ, Whitlock EP, Miglioretti DL, Weyrich MS, Thompson JH, Shah K Supplemantal screening for breast cancer in women with dense breasts: a systematic review for the U.S. Preventive Services Task Force. Ann Intern Med 2016;164 doi 10.7326/M15-1789
13. Myers ER, Moorman P, Gierisch JM, et al. Benefits and harms of breast cancer screening: a systematic review. JAMA 2015;314(15)1615-1634
14. Morris E, Feig SA, Drexler M, et al. Implications of overdiagnosis: Impact on screening mammography practices. Population Health Management 2015;18:Suppl 1
15. Nickson C, Mason KE, Kavanagh AM. Breast cancer screening of women aged 70-74 years: results from a national experiment across Australia. Breast Cancer Res Treat 2014;143:367-372
16. Oeffinger KC, Fontham ETH, Etzioni R, et al. Breast Cancer Screening for women at average risk. 2015 Guideline Update from the American Cancer Society. JAMA 2015; 314:1599-1614
17. Paap E, Verbeek ALM, Botterweck AAM, et al. Breast cancer screening halves the risk of breast cancer death: A case referent study. The Breast 2014;23:439-444
18. Perry N, Broeders M, De Wolf C, et al. (eds.) European Guidelines for Quality Assurance in Mammography Screening and Diagnosis, 4th ed. Office for Official Publications of the European Communities, Luxembourg 2006
19. Puliti D, Duffy S, Miccinesi G et al. Overdiagnosis in mammography screening for breast cancer in Europe: a literature review. J Med Screen 2012; 19(Suppl 1):42-56
20. Siegel RL, Miller KD, Jemal A Cancer Statistics, 2015. CA Cancer J Clin 2015;65:5-29

21. Siu AL, on behalf of the US Preventive Services Task Force Screening for breast cancer: U.S. Preventive Services Task Force Recommendation Statement. Ann Intern Med 2016 doi:10.7326/M15-2886
22. Tabar L, Vitak B, Chen THH, et al. Swedish Two-County Trial: Impact of mammography screening on breast cancer mortality during 3 decades. Radiology 2011;260:658-663
23. Tabar L, Yen AM, Wu VVY, et al. Insights from breast cancer screening trials: how screening affects the natural history of breast cancer and implications for evaluating service screening programs. Breast J 2015;21(1)13-20
24. Walter LC, Schonberg MA Screening mammography in older women: a review. JAMA 2014;311(13):1336-1347
25. Yaffee MJ, Mainprize JG Risk of radiation-induced breast cancer from mammographic screening. Radiology 2011; 258(1):98-105
26. European Commission Guideline Recommendation Breast Cancer; Update 24.11.2016; Ecibc.jrc.ec.europe.eu/recommendation/download/inline/NdBkYvN7u2:Abruf 20.12.2016
27. Hodgson et al 2016 Hodgson R, Heywang-Köbrunner SH, Harvey SC, et al. Systematic review of 3D mammography for breast cancer screening.Breast. 2016 Jun;27:52-61. doi: 10.1016/j.breast.2016.01.002. Review.)
28. ACS 2015: Systematic Review of Cancer Screening Literature for Updating American Cancer Society Breast Cancer Screening Guidelines. Duke Evidence Synthesis Group. http://www.cancer.org/acs/groups/content/documents/document/acspc-046315.pdf. Zugriff am 11.August 2016
29. USPSTF 2016: US Preventive Services Task Force Final Recommendation Statement for mammographyScreening12.01.2016.http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/breast-cancer-screening Zugriff 04112016
30. Nelson HD, et al. (2016a). Effectiveness of Breast Cancer Screening: Systematic Review and Meta-analysis to Update the 2009 U.S. Preventive Services Task Force Recommendation. Ann Intern Med. 2016 Feb 16;164(4):244-55
31. Nelson HD, et al. (2016b). Harms of Breast Cancer Screening: Systematic Review to Update the 2009 U.S. Preventive Services Task Force Recommendation. Ann Intern Med. 2016 Feb 16;164(4):256-67.

<u>Tomosynthese</u>

1. Ciatto S, Houssami N, Bernardi D, et al.: Integration of 3D digital mammography with tomosynthesis for population breast-cancer

screening (STORM): a prospective comparison study. Lancet Oncol 2017; 14 (7): 583-9, 2013

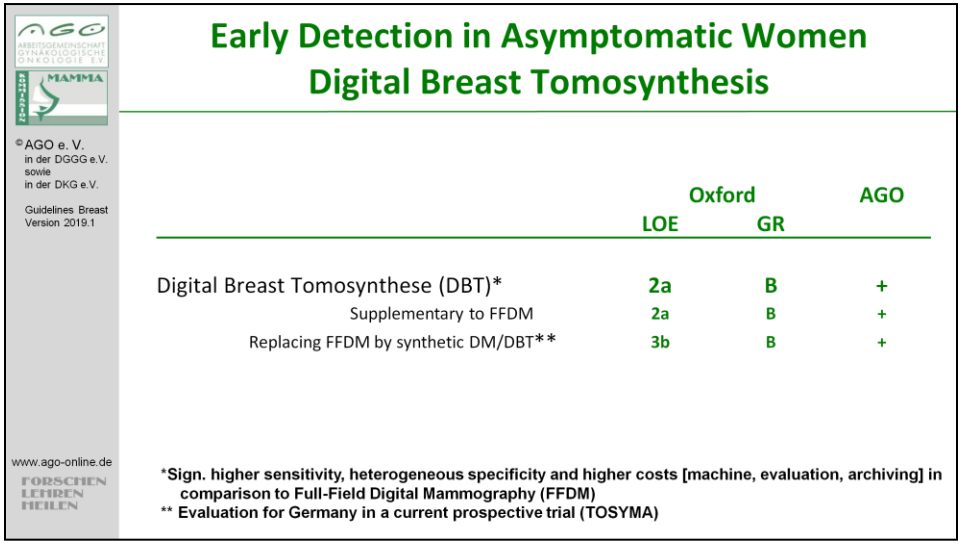
2. Houssami N, Bernardi D, Pellegrini M, et al. Breast cancer detection using single-reading of breast tomosynthesis (3D-mammography) compared to double-reading of 2D-mammography: Evidence from a population-based trial.(Storm-2) Cancer Epidemiol. 2017 Apr;47:94-99. doi: 10.1016/j.canep.2017.01.008.
3. Aujero MP, Gavenonis SC, Benjamin R, et al. Clinical Performance of Synthesized Two-dimensional Mammography Combined with Tomosynthesis in a Large Screening Population. Radiology. 2017 Apr;283(1):70-76. doi: 10.1148/radiol.2017162674.
4. Raghu M, Durand MA, Andrejeva L, et al.Tomosynthesis in the Diagnostic Setting: Changing Rates of BI-RADS Final Assessment over Time. Radiology. 2016 Oct;281(1):54-61.
5. Zackrisson S1, Lång K2, Rosso A2, Johnson K2, Dustler M3, Förnvik D4, Förnvik H4, Sartor H2, Timberg P4, Tingberg A4, Andersson I2.One-view breast tomosynthesis versus two-view mammography in the Malmö Breast Tomosynthesis Screening Trial (MBTST): a prospective, population-based, diagnostic accuracy study. Lancet Oncol. 2018 Nov;19(11):1493-1503. doi: 10.1016/S1470-2045(18)30521-7. Epub 2018 Oct 12.
6. Hofvind S1, Hovda T1, Holen ÅS1, Lee CI1, Albertsen J1, Bjørndal H1, Brandal SHB1, Gullien R1, Lømo J1, Park D1, Romundstad L1, Suhrke P1, Vigeland E1, Skaane P1. Digital Breast Tomosynthesis and Synthetic 2D Mammography versus Digital Mammography: Evaluation in a Population-based Screening Program. Radiology. 2018 Jun;287(3):787-794. doi: 10.1148/radiol.2018171361. Epub 2018 Mar 1.
7. Albert US, Schreer I; Arbeitsgruppe der Stufe-3-Leitlinie Mammarkarzinom.[S3 guideline breast cancer: update on early detection, and mammography screening]. Radiologe. 2019 Jan;59(1):13-18. doi: 10.1007/s00117-018-0473-6. Review. German.
8. Marinovich ML, Hunter KE, Macaskill P, Houssami N. Breast Cancer Screening Using Tomosynthesis or Mammography: A Meta-analysis of Cancer Detection and Recall. J Natl Cancer Inst. 2018 Sep 1;110(9):942-949. doi: 10.1093/jnci/djy121.
9. Ohashi R, Nagao M, Nakamura I et al. Improvement in diagnostic performance of breast cancer: comparison between conventional digital mammography alone and conventional mammography plus digital breast tomosynthesis. Breast Cancer (2018) 25: 590. https://doi.org/10.1007/s12282-018-0859-3
10. Phi X-A, Tagliafico A, Houssami N, Greuter MJW, and Bock GH: Digital breast tomosynthesis for breast cancer screening and diagnosis in women with dense breasts – a systematic review and meta-analysis. BMC Cancer201818:380; https://doi.org/10.1186/s12885-018-4263-3

Radiation Dose

1. Svahn TM, Houssami N, Sechopoulos I, et al. Review of radiation dose estimates in digital breast tomosynthesis relative to those in two-view full-field digital mammography. Breast 2015;24(2)93-99
2. Miglioretti DL, Lange J, van den Broek JJ, et al. Radiation-Induced Breast Cancer Incidence and Mortality from Digital Mammography Screening: A Modeling Study Ann Intern Med. 2016 Feb 16; 164(4):205-14.

Mammography density assessment

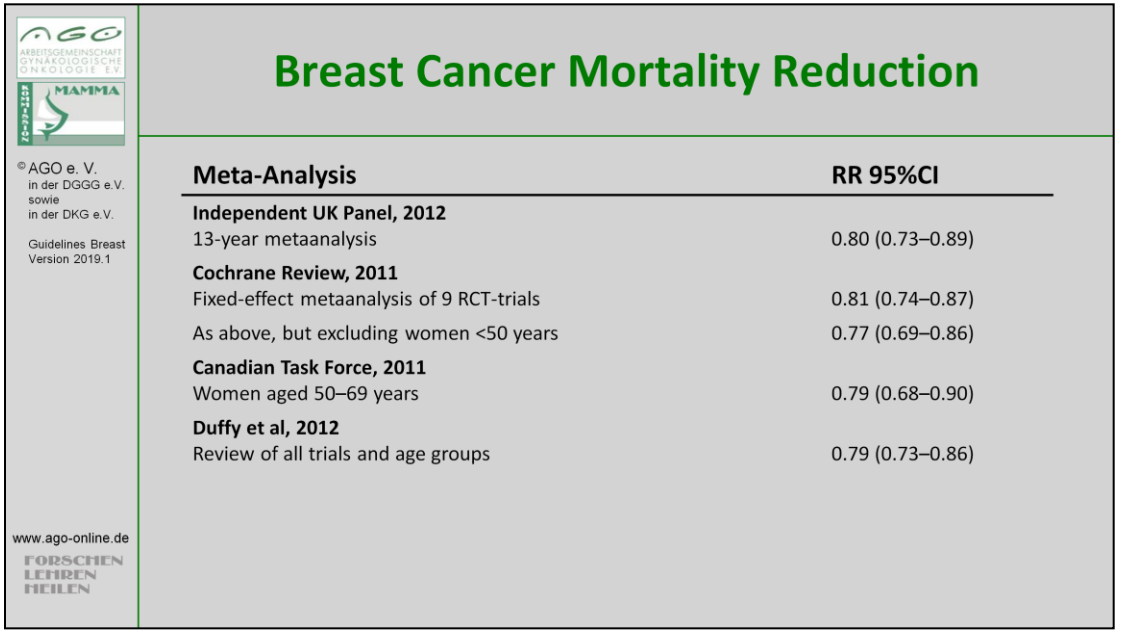
1. Jeffers AM, Sieh W, Lipson JA, et al. Breast Cancer Risk and Mammographic Density Assessed with Semiautomated and Fully Automated Methods and BI-RADS. Radiology. 2017 Feb;282(2):348-355.



1. Siu AL, on behalf of the US Preventive Services Task Force Screening for breast cancer: U.S. Preventive Services Task Force Recommendation Statement. Ann Intern Med 2016 doi:10.7326/M15-2886
2. Hodgson et al 2016 Hodgson R, Heywang-Köbrunner SH, Harvey SC, et al. Systematic review of 3D mammography for breast cancer screening. Breast. 2016 Jun;27:52-61. doi: 10.1016/j.breast.2016.01.002. Review.)
3. Ciatto S, Houssami N, Bernardi D, et al.: Integration of 3D digital mammography with tomosynthesis for population breast-cancer screening (STORM): a prospective comparison study. Lancet Oncol 2017; 14 (7): 583-9, 2013
4. Houssami N, Bernardi D, Pellegrini M, et al. Breast cancer detection using single-reading of breast tomosynthesis (3D-mammography) compared to double-reading of 2D-mammography: Evidence from a population-based trial.(Storm-2) Cancer Epidemiol. 2017 Apr;47:94-99. doi: 10.1016/j.canep.2017.01.008.
5. Aujero MP, Gavenonis SC, Benjamin R, et al. Clinical Performance of Synthesized Two-dimensional Mammography Combined with Tomosynthesis in a Large Screening Population. Radiology. 2017 Apr;283(1):70-76. doi: 10.1148/radiol.2017162674.
6. Raghu M, Durand MA, Andrejeva L, et al.Tomosynthesis in the Diagnostic Setting: Changing Rates of BI-RADS Final Assessment over Time. Radiology. 2016 Oct;281(1):54-61.
7. Zackrisson S, Lång K, Rosso A et al. One-view breast tomosynthesis versus two-view mammography in the Malmö Breast

Tomosynthesis Screening Trial (MBTST): a prospective, population-based, diagnostic accuracy study. Lancet Oncol. 2018 Nov;19(11):1493-1503. doi: 10.1016/S1470-2045(18)30521-7. Epub 2018 Oct 12.

8. Hofvind S, Hovda T, Holen ÅS et al. Digital Breast Tomosynthesis and Synthetic 2D Mammography versus Digital Mammography: Evaluation in a Population-based Screening Program. Radiology. 2018 Jun;287(3):787-794. doi: 10.1148/radiol.2018171361. Epub 2018 Mar 1.
9. Albert US, Schreer I; Arbeitsgruppe der Stufe-3-Leitlinie Mammarkarzinom.[S3 guideline breast cancer: update on early detection, and mammography screening]. Radiologe. 2019 Jan;59(1):13-18. doi: 10.1007/s00117-018-0473-6. Review. German.
10. Marinovich ML, Hunter KE, Macaskill P et al. Breast Cancer Screening Using Tomosynthesis or Mammography: A Meta-analysis of Cancer Detection and Recall. J Natl Cancer Inst. 2018 Sep 1;110(9):942-949. doi: 10.1093/jnci/djy121.
11. Ohashi R, Nagao M, Nakamura I et al. Improvement in diagnostic performance of breast cancer: comparison between conventional digital mammography alone and conventional mammography plus digital breast tomosynthesis. Breast Cancer (2018) 25: 590. https://doi.org/10.1007/s12282-018-0859-3
12. Phi X-A, Tagliafico A, Houssami N et al. Digital breast tomosynthesis for breast cancer screening and diagnosis in women with dense breasts – a systematic review and meta-analysis. BMC Cancer201818:380; https://doi.org/10.1186/s12885-018-4263-3
13. Weigel S, Gerss J, Hense HW et al.: Digital breast tomosynthesis plus synthesised images versus standard full-field digital mammography in population-based screening (TOSYMA): protocol of a randomised controlled trial. BMJ Open. 2018 May 14;8(5):e020475. doi: 10.1136/bmjopen-2017-020475.

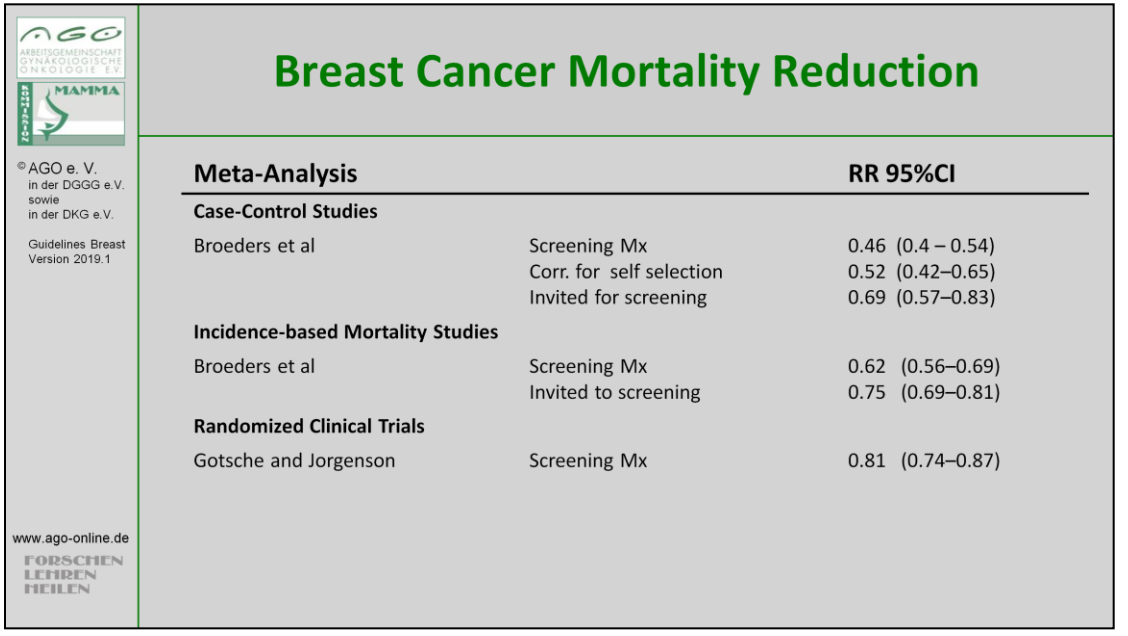


1. Broeders M, Moss S, Nyström L et al. The impact of mammography screening on breast cancer mortality in Europe: a review of observational studies. J Med Screen 2012; 19(Suppl 1):14-25

2. Nyström L, Bjurstam N, Jonsson H, et al. Reduced breast cancer mortality after 20+ years of follow-up in the Swedish randomized controlled mammography trials in Malmö, Stockholm, and Göteborg. Med Screen. 2017 Mar;24(1):34-42

Breast cancer mortality reduction

1. Morrell S, Taylor R, Roder D, et al. Mammography service screening and breast cancer mortality in New Zealand: a National Cohort Study 1999-2011. Br J Cancer. 2017 Mar 14;116(6):828-839
2. Johns LE, Coleman DA, Swerdlow JA, Moss SM, et al. Effect of population breast screening on breast cancer mortality up to 2005 in England and Wales: an individual-level cohort study Br J Cancer 2017;116: 246 -252
3. Sankatsing VDV, van Ravesteyn NT, Heijnsdijk EAM, et al. The effect of population-based mammography screening in Dutch municipalities on breast cancer mortality: 20 years of follow-up. Int J Cancer. 2017 Aug 15;141(4):671-677
4. Beau AB, Lynge E, Njor SH, et al. Benefit-to-harm ratio of the Danish breast cancer screening programme Int J Cancer. 2017 Aug 1;141(3):512-518.

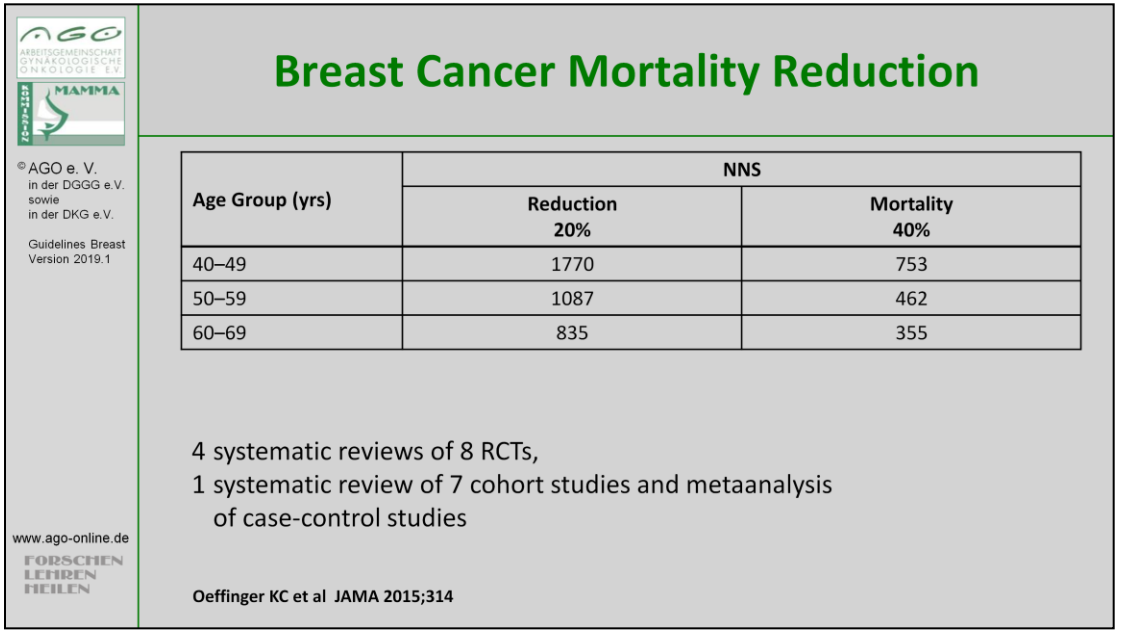


1. Broeders M, Moss S, Nyström L et al. The impact of mammography screening on breast cancer mortality in Europe: a review of observational studies. J Med Screen 2012; 19(Suppl 1):14-25

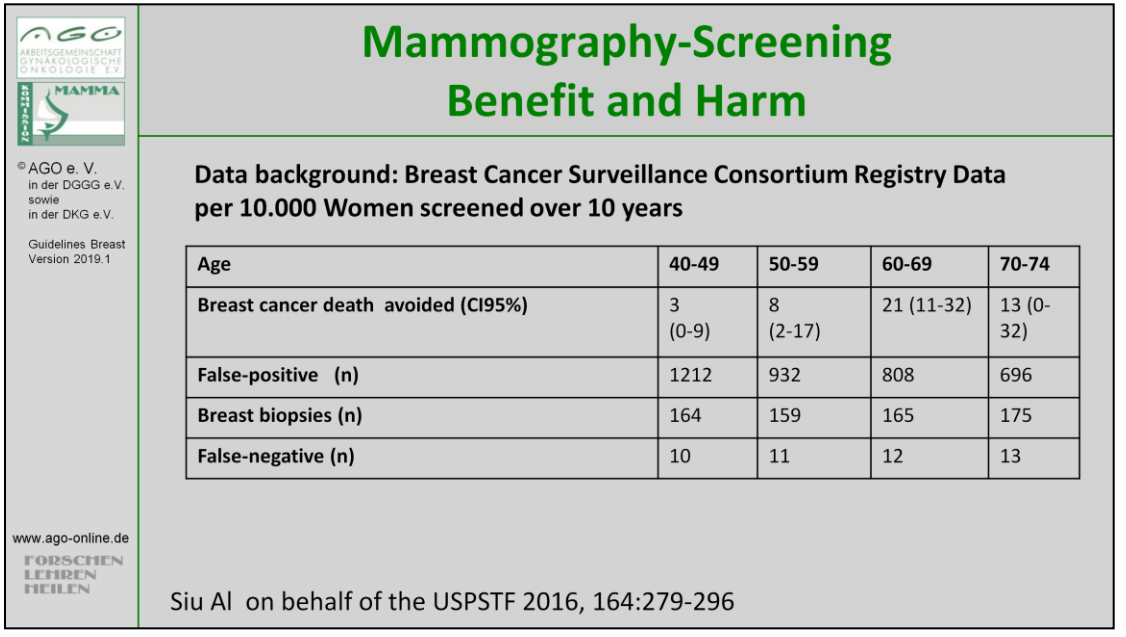
2. Nyström L, Bjurstam N, Jonsson H, et al. Reduced breast cancer mortality after 20+ years of follow-up in the Swedish randomized controlled mammography trials in Malmö, Stockholm, and Göteborg. Med Screen. 2017 Mar;24(1):34-42

Breast cancer mortality reduction

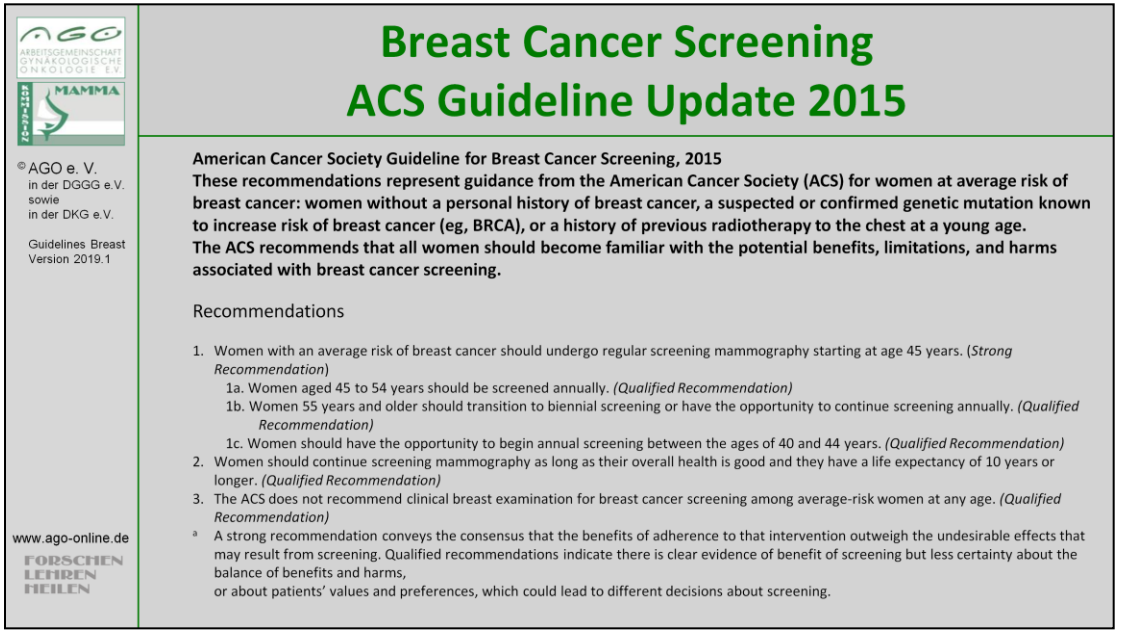
1. Morrell S, Taylor R, Roder D, et al. Mammography service screening and breast cancer mortality in New Zealand: a National Cohort Study 1999-2011. Br J Cancer. 2017 Mar 14;116(6):828-839
2. Johns LE, Coleman DA, Swerdlow JA, Moss SM, et al. Effect of population breast screening on breast cancer mortality up to 2005 in England and Wales: an individual-level cohort study Br J Cancer 2017;116: 246 -252
3. Sankatsing VDV, van Ravesteyn NT, Heijnsdijk EAM, et al. The effect of population-based mammography screening in Dutch municipalities on breast cancer mortality: 20 years of follow-up. Int J Cancer. 2017 Aug 15;141(4):671-677
4. Beau AB, Lynge E, Njor SH, et al. Benefit-to-harm ratio of the Danish breast cancer screening programme Int J Cancer. 2017 Aug 1;141(3):512-518.



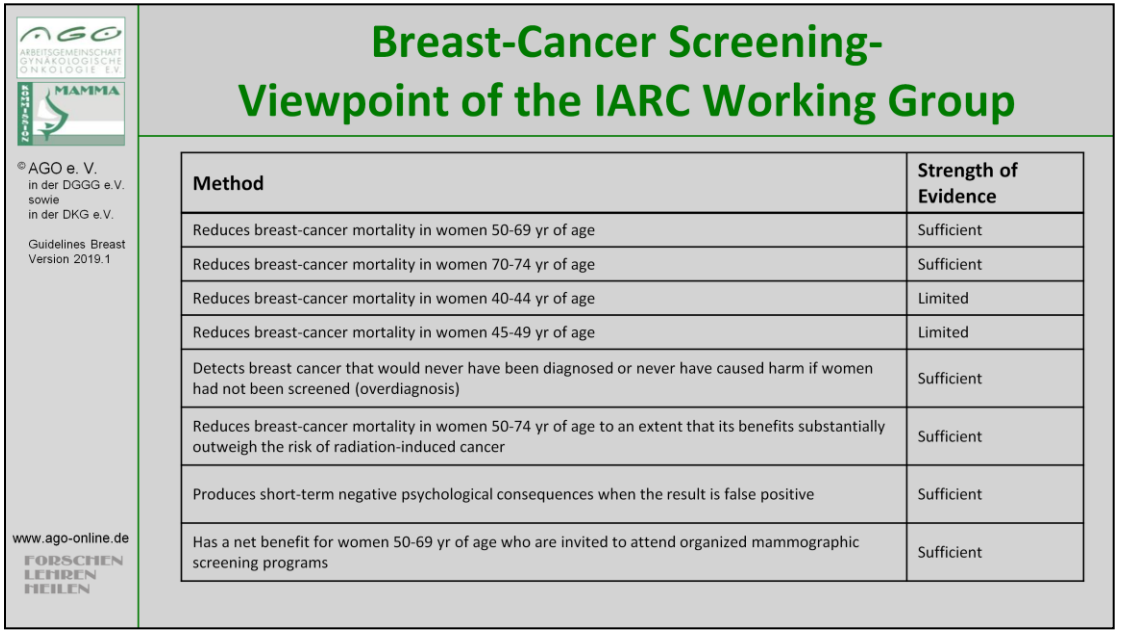
1. Myers ER, Moorman P, Gierisch JM, et al. Benefits and harms of breast cancer screening: a systematic review. JAMA 2015;314(15)1615-1634
2. Oeffinger KC, Fontham ETH, Etzioni R, et al. Breast Cancer Screening for women at average risk. 2015 Guideline Update from the American Cancer Society. JAMA 2015; 314:1599-1614



Siu AL, on behalf of the U.S. Preventive Services Task Force
Screening for Breast Cancer: U.S. Preventive Services Task Force
Recommendation Statement. Ann Internal Med 2016 vol 164: 279-296

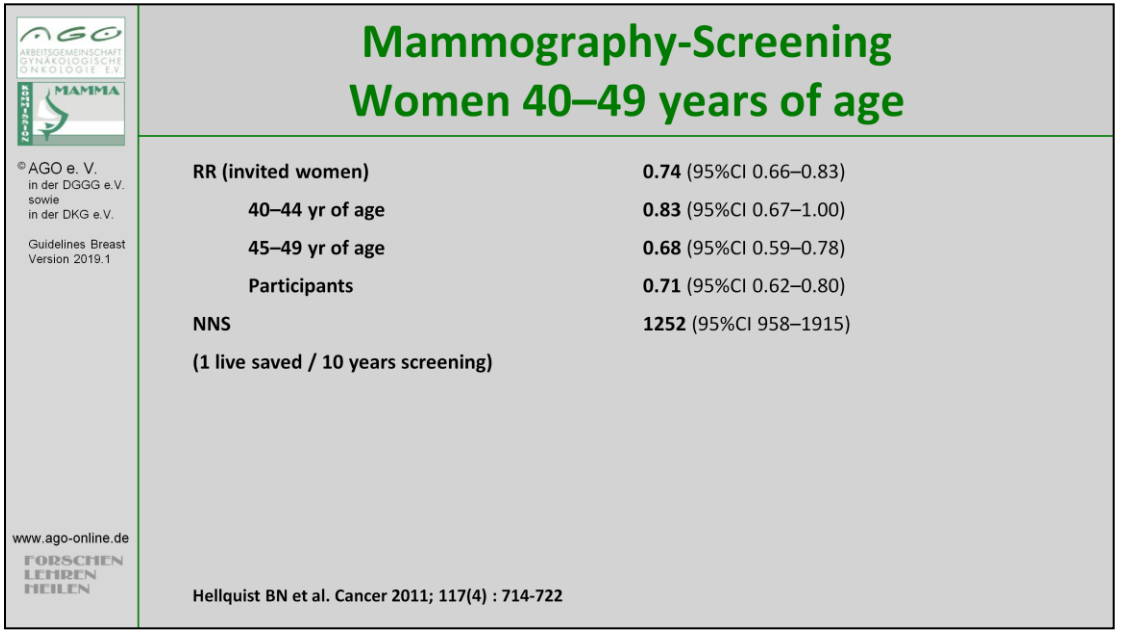


Oeffinger KC, Fontham ETH, Etzioni R, et al Breast Cancer Screening for women at average risk. 2015 Guideline Update from the American Cancer Society (ACR). JAMA 2015; 314:1599-1614



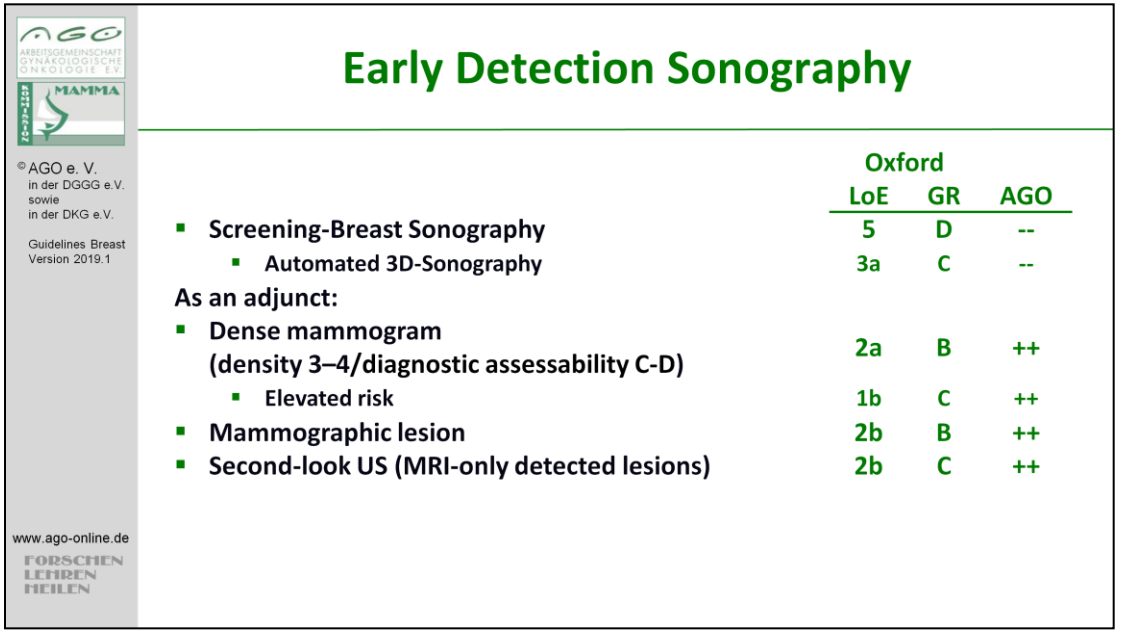
Method	Strength of Evidence
Reduces breast-cancer mortality in women 50-69 yr of age	Sufficient
Reduces breast-cancer mortality in women 70-74 yr of age	Sufficient
Reduces breast-cancer mortality in women 40-44 yr of age	Limited
Reduces breast-cancer mortality in women 45-49 yr of age	Limited
Detects breast cancer that would never have been diagnosed or never have caused harm if women had not been screened (overdiagnosis)	Sufficient
Reduces breast-cancer mortality in women 50-74 yr of age to an extent that its benefits substantially outweigh the risk of radiation-induced cancer	Sufficient
Produces short-term negative psychological consequences when the result is false positive	Sufficient
Has a net benefit for women 50-69 yr of age who are invited to attend organized mammographic screening programs	Sufficient

1. Lauby-Secretan B, Scoccianti C, Loomis D, et al; International Agency for Research on Cancer Handbook Working Group: Breast-cancer screening–viewpoint of the IARC Working Group. N Engl J Med 2015;372:2353-2358
2. IACR Handbook 2016: Website for the IARC publications: http://publications.iarc.fr/Book-And-Report-Series/Iarc-Handbooks-Of-Cancer-Prevention/Breast-Cancer-Screening-2016



1. Hellquist BN, Duffy SW, Abdsaleh S et al Effectiveness of population-based service screening with mammography for women ages 40 – 49 years: evaluation of the Swedish Mammography Screening in Young Women (SCRY) cohort. Cancer 2011; 117:714-722
2. Arleo EK, Dashevsky BZ, Reichmann M, et al. Screening mammography for women in their 40s: A retrospective study of the potential impact of U.S.Preventive Task Force's 2009 Breast Cancer Screening Recommendations. AJR 2013;201:1401-1406
3. De Gelder R, Draisma G, Heijnsdijk EA, et al. Population-based mammography screening below age 50: balancing radiation-induced vs prevented breast deaths. Br J Cancer 2011;104: 1214-1220
4. FH01 Collaborative Teams Mammographic surveillance in women younger than 50 years who have a family history of breast cancer: tumour characteristics and projected effect on mortality in the prospective, single-arm, FH01 study. Lancet Oncol 2010;11:1127-1134
5. Feig SA: Screening strategy for breast cancer. Sem Breast Disease 2004; 6: 161-172
6. Gunsoy N, Garcia-Closas M, Moss S. Modelling the overdiagnosis of breast cancer due to mammography screening in women aged 40-49 in the United Kingdom. Breast Cancer Res 2012; 14:1-1, http://breast-cancer-research.com/content/14/6/R152
7. Johns LE, Moss SM Randomized controlled trial of mammographic screening from age 40 ("Age Trial"): patterns of screening attendance. J Med Screen 2010; 17: 37-43

8. Lee CH, Dershaw D, Kopans D, et al. Breast cancer screening with imaging: Recommendations from the Society of Breast Imaging and the ACR on the use of mammography, breast MRI, breast ultrasound and other technologies for the detection of clinically occult cancer. J Am Coll Radiol 2010; 7; 18-27
9. Malmgren JA, Parikh J, Atwood MK, et al. Impact of mammography detection on the course of breast cancer in women aged 40-49 years. Radiology 2012;262(3):787
10. Moss SM et al. Effect of mammographic screening from age 40 years on breast cancer mortality a 10 years follow-up: a randomised controlled trial. The Lancet 2006; 368: 2053 – 2060
11. Miglioretti DL, Zhu W, Kerlikowske K, et al. for the Breast Surveillance Consortium. Breast tumor prognostic characteristics and biennial vs annual mammography, age and menopausal status. JAMA Oncol 2015;1(8):1069-1077
12. Moss SM, Cuckle H, Evans A, et al; Trial Management Group. Effect of mammographic screening from age 40 years on breast cancer mortality at 10 years follow-up: a randomised controlled trial. Lancet Oncol 2006;368:2053-2060
13. Moss SM, Wale C, Smith R, et al. Effect of mammographic screening from age 40 years on breast cancer mortality in the UK Age Trial at 17 years follow-up: a randomised controlled trial. Lancet Oncol 2015;16:1123-32



Breast ultrasound as an adjunct to screening mammography

1. Berg W A, Blume J D, Cormack J B, et al. Combined Screening With Ultrasound and Mammography vs Mammography Alone in Women et Elevated Risk of Breast Cancer, JAMA 2008; 299 (18): 2151-216
2. Cochrane Database Syst Rev. 2013 Apr 30;4:CD009632. doi: 10.1002/14651858.CD009632.pub2.
3. Corsetti V, Houssami N, Ferrari A, et al. Breast screening with ultrasound in women with mammography-negative dense breasts:evidence on incremental cancer detection and false positives, and associated cost. Eur J Cancer 2008;44:539-44
4. Corsetti V, Houssami N, Ghirardi M et al Evidence of the effect of adjunct ultrasound screening in women with mammography-negative dense breasts: interval breast cancers at 1 year follow-up. Eur J Cancer 2011 May;47(7):1021-1026
5. Mendelson E, D'Orsi C, Sickles E, et al. Breast cancer screening with imaging: Recommendations from the Society of Breast Imaging and the ACR on the use of mammography, breast MRI, breast ultrasound and other technologies for the detection of clinically occult cancer. J Am Coll Radiol 2010; 7; 18-2
6. Kolb T, Lichy J, J.Newhouse J. Comparison of the performance of screening mammography, physical examination and breast US and evaluation of factors that influence them: an analysis of 27,825 patient evaluations, Radiology 2002; 225: 165-175

7. Liu,Z, Huang G, Lin M, et al. Breast lesions: quantitative diagnosis using ultrasound shear-wave elastography – a systematic review and meta-analysis. Ultrasound Med Biol 2016 Jan 6, doi 10.1016/j.ultrasmedbio.2015.10.024
8. Nothacker M, Duda V, Hahn M, et al. Early detection of breast cancer: benefits and risks of supplemental breast ultrasound in asymptomatic women with mammographically dense tissue: A systematic review. BMC Cancer 2009; 9: 335-344
9. Schaefer KW, Waldmann A, Katalinic A, et al. Influence of additional ultrasound on cancer detection in a cohort study for quality assurance in breast diagnosis- analysis of 102,577 diagnostic procedures. Eur Radiol 2010; 20:1085-1092
10. Sprague BL, Stout N, Schechter C, et al. Benefits, harms and cost-effectiveness of supplemental ultrasonography screening for women with dense breasts. Ann Intern Med 2015;162(3):157-166
11. Buchberger W1, Geiger-Gritsch S2, Knapp R3, Gautsch K4, Oberaigner W5. Combined screening with mammography and ultrasound in a population-based screening program. Eur J Radiol. 2018 Apr;101:24-29. doi: 10.1016/j.ejrad.2018.01.022. Epub 2018 Jan 31.
12. Evans A, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bick U, Camps Herrero J, Clauser P, Colin C, Cornford E, Fallenberg EM, Fuchsjaeger MH, Gilbert FJ, Helbich TH, Kinkel K, Heywang-Köbrunner SH, Kuhl CK, Mann RM, Martincich L, Panizza P, Pediconi F, Pijnappel RM, Pinker K, Zackrisson S, Forrai G, Sardanelli F; Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging.European Society of Breast Imaging (EUSOBI) , with language review by Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.

ABUS/AVUS

1. Golatta M, Franz D, Harcos A, et al. Interobserver reliability of automated breast volume scanner (ABVS) interpretation and agreement of ABVS findings with hand held breast ultrasound (HHUS), mammography and pathology results. Eur J Radiol. 2013 Aug;82(8):e332-6.
2. Wojcinski S, Gyapong S, Farrokh A, et al. Diagnostic performance and inter-observer concordance in lesion detection with the automated breast volume scanner (ABVS). BMC Med Imaging. 2013 Nov 12;13:36. doi: 10.1186/1471-2342-13-36.
3. Golatta M, Baggs C, Schweitzer-Martin M, et al. Evaluation of an automated breast 3D-ultrasound system (ABUS) by comparing it with hand-held ultrasound (HHUS) and mammography. Arch Gynecol Obstet 2014 Oct 14.

4. Choi WJ, Cha JH, Kim HH, et al. Comparison of automated breast volume scanning and hand- held ultrasound in the detection of breast cancer: an analysis of 5,566 patient evaluations. Asian Pac J Cancer Prev. 2014;15(21):9101-5.
5. Golatta M, Baggs C, Schweitzer-Martin M, et al. Evaluation of an automated breast 3D-ultrasound system by comparing it with hand-held ultrasound (HHUS) and mammography. Arch Gynecol Obstet 2015;291:889-895
6. Hee Jung Shin, Hak Hee Kim, Joo Hee Cha. Current status of automated breast ultrasonography: Review. Ultrasonography 2015;34:165-172
7. Skaane P, Gullien R, Eben EB, et al. Interpretation of automated breast ultrasound (ABUS) with and without knowledge of mammography: a reader performance study. Acta Radiol 2014 Mar 28. pii: 0284185114528835. [Epub ahead of print]
8. Shin HJ, Kim HH, Cha HJ. Current status of automated breast ultrasonography: Review. Ultrasonography 2015;34:165-172
9. Brem RF, Tabár L, Duffy SW, et al.Assessing improvement in detection of breast cancer with three-dimensional automated breast US in women with dense breast tissue: the SomoInsight Study. Radiology. 2015 Mar;274(3):663-73.
10. Hellgren R, Dickman P, Leifland K, et al. Comparison of handheld ultrasound and automated breast ultrasound in women recalled after mammography screening Acta Radiol. 2016
11. Wilczek B, Wilczek HE, Rasouliyan L, et al. 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 Sep;85(9):1554-63
12. Giger ML, Inciardi MF, Edwards A, et al. Automated Breast Ultrasound in Breast Cancer Screening of Women With Dense Breasts: Reader Study of Mammography-Negative and Mammography-Positive Cancers. AJR Am J Roentgenol. 2016 Jun;206(6):1341-50.

US-Screening

1. Gartlehner G, Thaler KJ, Chapman A, et al. Mammography in combination with breast ultrasonography versus mammography for breast cancer screening in women at average risk. Cochrane Database Syst Rev. 2013 Apr 30;4:CD009632.
2. Health Quality Ontario.Ultrasound as an Adjunct to Mammography for Breast Cancer Screening: A Health Technology Assessment. Ont Health Technol Assess Ser. 2016 Jul 1;16(15):1-71.
3. Ohuchi, N, Suzuki, A, Sobue, T et al. Sensitivity and specificity of mammography and adjunctive ultrasonography to screen for breast

cancer in the Japan Strategic Anti-cancer Randomized Trial (J-START): a randomised controlled trial. Lancet. 2015; 387: 341–348

4. Evans A, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bick U, Camps Herrero J, Clauser P, Colin C, Cornford E, Fallenberg EM, Fuchsjaeger MH, Gilbert FJ, Helbich TH, Kinkel K, Heywang-Köbrunner SH, Kuhl CK, Mann RM, Martincich L, Panizza P, Pediconi F, Pijnappel RM, Pinker K, Zackrisson S, Forrai G, Sardanelli F; Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging.European of Breast Imaging (EUSOBI) , with language review by Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.

Dense Breast

1. American College of Radiology (ACR): ACR BIRADS fifth edition: Breast imaging reporting and data system, Breast Imaging Atlas. American College of Radiology, Reston, VA, 2013
2. Müller-Schimpfle M. et al. BI-RADS die 5.–Eine Kurzmitteilung aus deutsch-/ österreichischer Sicht. Fortschr Röntgenstr 2016; 188: 346–352 ;Geburtshilfe Frauenheilkd 2016; 76(05): 490-496;
3. Senologie - Zeitschrift für Mammadiagnostik und -therapie 2016; 13(03): 132-143.
4. Health Quality Ontario.. Ultrasound as an Adjunct to Mammography for Breast Cancer Screening: A Health Technology Assessment.
5. Ont Health Technol Assess Ser. 2016; 16(15):1-71
6. Tagliafico AS1, Mariscotti G2, Valdora F3, Durando M2, Nori J4, La Forgia D5, Rosenberg I6, Caumo F7, Gandolfo N8, Sormani MP9, Signori A9, Calabrese M10, Houssami N11. A prospective comparative trial of adjunct screening with tomosynthesis or ultrasound in women with mammography-negative dense breasts (ASTOUND-2). Eur J Cancer. 2018 Nov;104:39-46. doi: 10.1016/j.ejca.2018.08.029. Epub 2018 Oct 11.
7. Evans A, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bick U, Camps Herrero J, Clauser P, Colin C, Cornford E, Fallenberg EM, Fuchsjaeger MH, Gilbert FJ, Helbich TH, Kinkel K, Heywang-Köbrunner SH, Kuhl CK, Mann RM, Martincich L, Panizza P, Pediconi F, Pijnappel RM, Pinker K, Zackrisson S, Forrai G, Sardanelli F; Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging.European of Breast Imaging (EUSOBI) , with language review by

Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.

8. Rebolj M, Assi V, Brentnall A, Parmar D, Duffy SW. Addition of ultrasound to mammography in the case of dense breast tissue: systematic review and metaanalysis. Br J Cancer. 2018 Jun;118(12):1559-1570. doi: 10.1038/s41416-018-0080-3. Epub 2018 May 8.

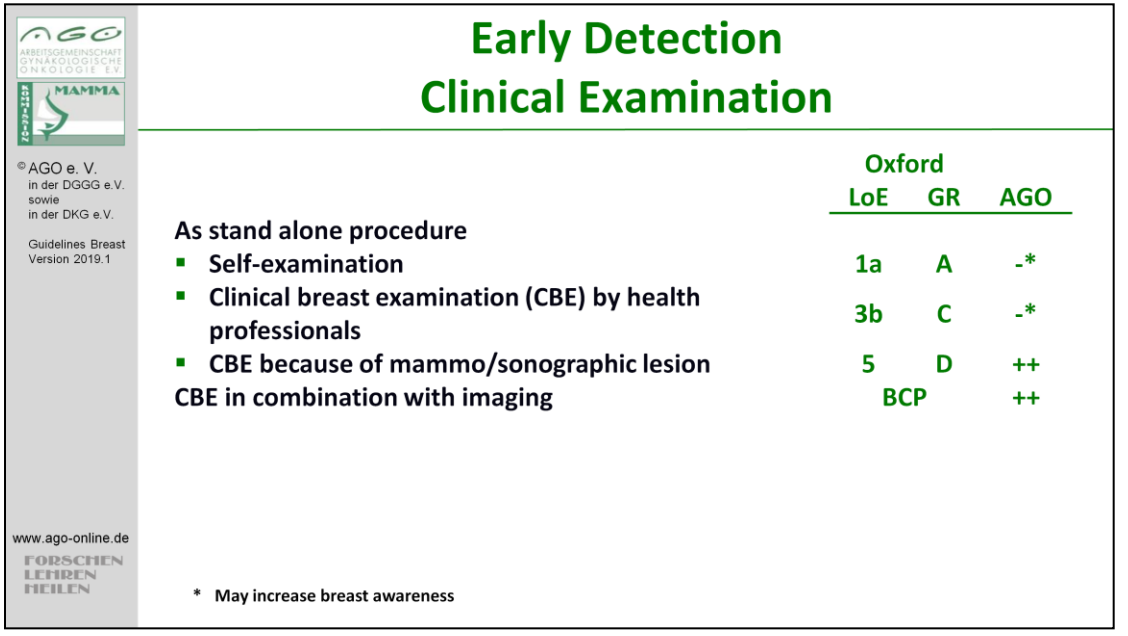
Elevated Risk

1. Berg WA, Zhang Z, Lehrer D, et al. Detection of breast cancer with addition of annual screening ultrasound or a single screening MRI to mammography in women with elevated breast cancer risk. JAMA. 2012;307(13):1394–1404.
2. Berg WA, Blume JD, Adams AM, et al. Reasons women at elevated risk of breast cancer refuse breast MRI imaging screening: ACRIN 6666. Radiology. 2010;254(1):79–87.
3. Health Quality Ontario.. Ultrasound as an Adjunct to Mammography for Breast Cancer Screening: A Health Technology Assessment.
4. Ont Health Technol Assess Ser. 2016; 16(15):1-71
5. Evans A, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bick U, Camps Herrero J, Clauser P, Colin C, Cornford E, Fallenberg EM, Fuchsjaeger MH, Gilbert FJ, Helbich TH, Kinkel K, Heywang-Köbrunner SH, Kuhl CK, Mann RM, Martincich L, Panizza P, Pediconi F, Pijnappel RM, Pinker K, Zackrisson S, Forrai G, Sardanelli F; Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging.European of Breast Imaging (EUSOBI) , with language review by Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.

Recommendations International

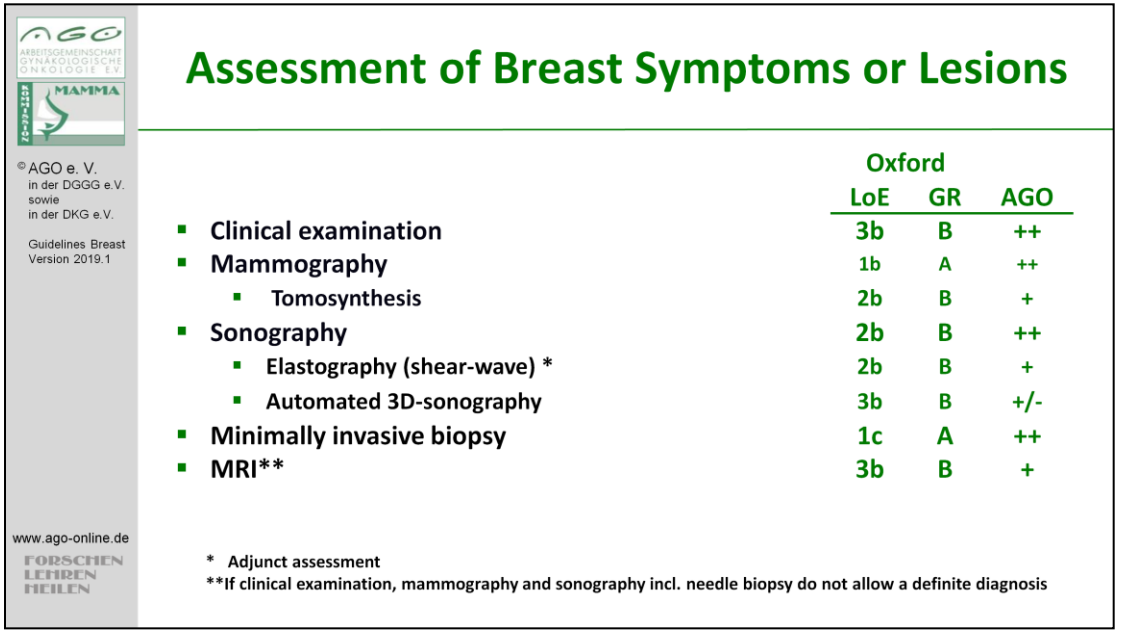
1. Oeffinger KC, Fontham ETH, Etzioni R, et al. Breast Cancer Screening for women at average risk. 2015 Guideline Update from the American Cancer Society (ACR). JAMA 2015; 314:1599-1614

2. Lauby-Secretan B, Scoccianti C, Loomis D, et al; International Agency for Research on Cancer Handbook Working Group: Breast-cancer screening–viewpoint of the IARC Working Group. N Engl J Med 2015;372:2353-2358
3. IACR Handbook 2016: Website for the IARC publications: http://publications.iarc.fr/Book-And-Report-Series/Iarc-Handbooks-Of-Cancer-Prevention/Breast-Cancer-Screening-2016
4. Melnikow J, Fenton JJ, Whitlock EP, et al. Supplemental Screening for Breast Cancer in Women With Dense Breasts: A Systematic Review for the U.S. Preventive Service Task Force Rockville (MD): Agency for Healthcare Research and Quality (US); 2016 Jan. Report No.: 14-05201-EF-3.
5. Evans A, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bick U, Camps Herrero J, Clauser P, Colin C, Cornford E, Fallenberg EM, Fuchsjaeger MH, Gilbert FJ, Helbich TH, Kinkel K, Heywang-Köbrunner SH, Kuhl CK, Mann RM, Martincich L, Panizza P, Pediconi F, Pijnappel RM, Pinker K, Zackrisson S, Forrai G, Sardanelli F; Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging.European of Breast Imaging (EUSOBI) , with language review by Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.



1. Bancej C, Decker K, Chiarelli A, et al. Contributions of clinical breast examination to mammography screening in the early detection of breast cancer, J Med Screen 2003; 10: 16-21
2. Haakinson DJ, Stucky CCH, Dueck AC, et al. A significant number of women present with palpable breast cancer even with a normal mammogram within 1 year. Am J Surg 2010; 200: 712-718
3. Kolb T, Lichy J, Newhouse J. Comparison of the performance of screening mammography, physical examination, and breast US and evaluation of factors that influence them: an analysis of 27,825 patient evaluations. Radiology 2002: 225: 165-175
4. Kosters J, Gotzsche P. Regular self-examination or clinical examination for early detection of breast cancer, The Cochrane Database of Systematic Reviews 1 2003.
5. Oestreicher N, White E, Lehman C, et al., Predictors of sensitivity of clinical breast examination (CBE), Breast Cancer Res and Treat 2002; 76: 73-81
6. Oestreicher N, Lehmann C, Seger D, et al. The incremental contribution of clinical breast examination to invasive cancer detection in a mammography screening program, AJR 2005; 184: 428-432
7. Thomas D, Gao D, Ray R, et al. Randomized trial of breast-self-examination in Shanghai: Final results, J Nat Cancer Inst 2002; 94 (19): 14445-1457

8. Oeffinger KC, Fontham ETH, Etzioni R, et al. Breast Cancer Screening for women at average risk. 2015 Guideline Update from the American Cancer Society (ACR). JAMA 2015; 314:1599-1614
9. Lehman CD, Lee AY, Lee CI. Imaging Management of palpable breast abnormality.Review. AJR 2014;203:1142-1153



1. Ciatto S, Houssami N, Ambrogetti D, et al. Accuracy and underestimation of malignancy of breast core needle biopsy: the Florence experience of over 4000 consecutive biopsies. Breast Cancer Res Treat 2007; 101(3): 291-7
2. Crystal P, Koretz M, Shcharynsky S, et al. Accuracy of sonographically guided 14-gauge core-needle biopsy: results of 715 consecutive breast biopsies with at least two-year follow-up of benign lesions. Clin Ultrasound 2005; 33: 47-52
3. Elizalde A, Pina L, Ebrano J, et al. Additional ultrasound or DBT after digital mammography: which one is the best combination? Acta Radiol 2016;57(1)13-18
4. Fahrbach K, Sledge I, Cella C, et al. A comparison of the accuracy of two minimally invasive breast biopsy methods: a systematic literature review and meta-analysis. Arch Gynecol Obstet 2006;274 (2): 63-73
5. Fischer U, Zachariae O, Baum F, et al The influence of preoperative MRI of the breasts on recurrence rate in patients with breast cancer. Eur Radiol 2004; 14: 1725-1731
6. Heu Jung Shin, Hak Hee Kim, Joo Hee Cha. Current status of automated breast ultrasonography: Review. Ultrasonography 2015;34:165-172
7. Houssami N Digital breast tomosynthesis (3D-mammography) screening: data and implications for population screening. Expert Rev Med Devices 2015;12(4):377-379

8. Ijima K, Miyagi Y, Nishimura S, et al. Diagnostic ultrasonography and mammography for invasive and non-invasive breast cancer in women aged 30 to 39 years. Breast Cancer 2007; 14 (2): 229-33
9. Katalinic A, Bartel C, Raspe H, et al: Beyond mammography screening: quality assurance in breast cancer diagnosis. Br J Cancer 2007; 96:157-161
10. Kim WH, Chang JM, Moon HG, et al. Comparison of the diagnostic performance of digital breast tomosynthesis and magnetic resonance imaging added to digital mammography in women with known breast cancers. Eur Radiol 2015 Sept16, epub ahead of print
11. Lehman CD, Gatsonis C, Kuhl CK, et al MRI evaluation of the contralateral breast in women with recently diagnosed breast cancer. N Engl J Med 2007; 356: 1295-1303
12. Mariscotti G, Houssami N, Durando M, et al. Digital breast tomosynthesis (DBT) to characterize MRI-detected additional lesions unidentified at targeted ultrasound in newly diagnosed breast cancer patients. Eur Radiol 2015;25(9):2673-2681
13. Perlet C, Heywang.-Köbrunner SH, et al. Magnetic resonance-guided, vacuum-assisted breast biopsy: results from a European multicenter study of 538 lesions. Cancer 2006; 106: 982-990
14. Schelfout K, Van Goethem M, Kersschot E et al MR imaging of breast lesions and effect on treatment. Eur Surg Oncol 2004; 30: 501-507
15. Van Goethem M, Schelfout K, Kersschot E et al MR mammography is useful in the preoperative locoregional staging of breast carcinoma with extensive intraductal component. Eur J Radiol 2007; 62 (2): 273-282
16. Evans A, Trimboli RM, Athanasiou A et al. Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging.European of Breast Imaging (EUSOBI) , with language review by Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.

<u>Tomosynthese vs Spotkompression / abnormalities in mammography</u>

1. Taglliafico A, Astengo D, Cavagnetto F, et al. One-to-one comparison between digital spot compression view and digital breast tomosynthesis. Eur Radiol 2012;22:539-544

2. Zuley ML, Bandos AI, Ganott MA, et al. Digital breast tomosynthesis versus supplemental diagnostic mammographic views for evaluation of non-calcified breast lesions Radiology 2013;266(1):89
3. Morel JC, Iqbal A, Wasan RK, et al. The accuracy of digital breast tomosynthesis compared with coned compression magnification mammography in the assessment of abnormalities found on mammography. Clin Radiol. 2014 Nov;69(11):1112-6.
4. Mhuircheartaigh N, Coffey L, Fleming H, et al. With the Advent of Tomosynthesis in the Workup of Mammographic Abnormality, is Spot Compression Mammography Now Obsolete? An Initial Clinical Experience. Breast J. 2017 Sep;23(5):509-518.
5. Phi X-A, Tagliafico A, Houssami N et al. Digital breast tomosynthesis for breast cancer screening and diagnosis in women with dense breasts – a systematic review and meta-analysis. BMC Cancer201818:380; https://doi.org/10.1186/s12885-018-4263-3
6. Ohashi R, Nagao M, Nakamura I et al. Improvement in diagnostic performance of breast cancer: comparison between conventional digital mammography alone and conventional mammography plus digital breast tomosynthesis. Breast Cancer (2018) 25: 590. https://doi.org/10.1007/s12282-018-0859-3

<u>Tomosynthese for screen-detected abnormalities</u>

1. Whelehan P, Heywang-Köbrunner SH, Vinnicombe SJ, et al.Clinical performance of Siemens digital breast tomosynthesis versus standard supplementary mammography for the assessment of screen-detected soft-tissue abnormalities: a multi-reader study. Clin Radiol. 2017 Jan;72(1):95.e9-95.e15. doi: 10.1016/j.crad.2016.08.011. Epub 2016 Oct 10.
2. Cornford EJ, Turnbull AE, James JJ, et al. Accuracy of GE digital breast tomosynthesis vs supplementary mammographic views for diagnosis of screen-detected soft-tissue breast lesions. Br J Radiol. 2016;89(1058):20150735
3. Lee CI, Cevik M, Alagoz O, et al. Comparative effectiveness of combined digital mammography and tomosynthesis screening for women with dense breasts. Radiology 2015;274(3) March
4. Heywang-Köbrunner S, Jaensch A, Hacker A, et al. Value of Digital Breast Tomosynthesis versus Additional Views for the Assessment of Screen-Detected Abnormalities - a First Analysis. Breast Care (Basel). 2017 May;12(2):92-97. doi: 10.1159/000456649.
5. Tagliafico AS, Mariscotti G, Valdora F et al. A prospective comparative trial of adjunct screening with tomosynthesis or ultrasound in women with mammography-negative dense breasts (ASTOUND-2). Eur J Cancer. 2018 Nov;104:39-46. doi:

10.1016/j.ejca.2018.08.029. Epub 2018 Oct 11.

6. Phi X-A, Tagliafico A, Houssami N et al. Digital breast tomosynthesis for breast cancer screening and diagnosis in women with dense breasts – a systematic review and meta-analysis. BMC Cancer201818:380; https://doi.org/10.1186/s12885-018-4263-3

Tomosynthese Accuracy screening population

1. Caumo, F Bernardi D, Ciatto S, et al. Incremental effect from integrating 3D-mammography (tomosynthesis) with 2D-mammography: Increased breast cancer detection evident for screening centres in a population-based trial. The Breast 2014;23:76-80
2. Friedewald SM, Rafferty EA, Rose SL, et al. Breast cancer screening using tomosynthesis in combination with digital mammography. JAMA 2014;311(24):2499-2507
3. Gilbert FJ, Tucker L, Gillan MG, et al. Accuracy of digital breast tomosynthesis for depicting breast cancer subgroups in a UK retrospective reading study (TOMMY Trial). Radiology2015,277(3):697-706
4. Gilbert FJ, Tucker L, Gillan MG, et al. The TOMMY trial: a comparison of TOMosynthesis with digital MammographY in the UK NHS Breast Screening Programme - a multicentre retrospective reading study comparing the diagnostic performance of digital breast tomosynthesis and digital mammography with digital mammography alone. Health Technol Assess. 2015 Jan;19(4):1-136. doi: 10.3310/hta19040.
5. Partyka L, Lourenco AP, Mainiero MB: Detection of mammographically occult architectural distortion on digital breast tomosynthesis screening: initial clinical experience. AJR Am J Roentgenol 203 (1): 216-22, 2014. [PubMed: 24951218
6. Skaane P, Bandos AI, Gullien R et al Comparison of digital mammography alone and digital mammography plus tomosynthesis in a population –based screening program. Radiology 2013;267(1) 47-56
7. Skaane P, Bandos AI, Eben EB, et al. Two-view breast tomosynthesis screening with synthetically reconstructed projection images; Comparison with digital breast tomosynthesis with full-field digital mammographic images. Radiology 2014:271(3)655-663

8. Vedantham S, Karellas A, Vjayaraghaman GP, et al. Digital breast tomosynthesis: state of the art.
9. Chae EY, Kim HH, Cha JH, et al. Detection and characterization of breast lesions in a selective diagnostic population: diagnostic accuracy study for comparison between one-view digital breast tomosynthesis and two-view full-field digital mammography. Br J Radiol. 2016 Jun;89(1062):20150743. doi: 10.1259/bjr.20150743.
10. Chan HP, Helvie MA, Hadjiiski L, et al.Characterization of Breast Masses in Digital Breast Tomosynthesis and Digital Mammograms: An Observer Performance Study. Acad Radiol. 2017 Nov;24(11):1372-1379.

Elastography

1. Berg WA, Cosgrove DO, Doré CJ, et al. BE1 Investigators. Shear-wave elastography improves the specificity of breast US: the BE1 multinational study of 939 masses. Radiology 2012 Feb;262(2):435-49.
2. Fischer T, Sack I, Thomas A. Characterization of focal breast lesions by means of elastography. Röfo 2013 Sep;185(9):816-23.
3. Golatta M, Schweitzer-Martin M, Harcos A, et al. Normal breast tissue stiffness measured by a new ultrasound technique: virtual touch tissue imaging quantification (VTIQ). Eur J Radiol 2013 Nov;82(11):e676-9. doi: 10.1016/j.ejrad.2013.06.029.
4. Li G, Li DW, Fang YX, Song YJ, et al. Performance of shear wave elastography for differentiation of benign and malignant solid breast masses. PLoS One. 2013 Oct 18;8(10):e76322
5. Liu B, Zheng Y, Huang G, et al. Breast lesions: Quantitative diagnosis using ultrasound shear wave elastography- a systematic review and meta-analysis. Ultrasound Med Biol 2016; Jan 6. pii: S0301-5629(15)00638-9 doi: 10.1016/j.ultrasmedbio.2015.10.024
6. Vinnicombe SJ, Whelehan P, Thomson K, et al. What are the characteristics of breast cancers misclassified as benign by quantitative ultrasound shear wave elastography? Eur Radiol. 2013 Dec 11. [Epub ahead of print]
7. Wojcinski S, Brandhorst K, Sadigh G, et al. Acoustic radiation force impulse imaging with Virtual Touch™ tissue quantification: mean shear wave velocity of malignant and benign breast masses. Int J Womens Health 2013 Sep 30;5:61

Automated Breast Ultrasound (ABUS)

1. An YY, Kim SH, Kang BJ The image quality and lesion characterization of breast using whole-breast ultrasound : A comparison with

handheld ultrasound. Eur J Radiology 2015;84:1232-1235

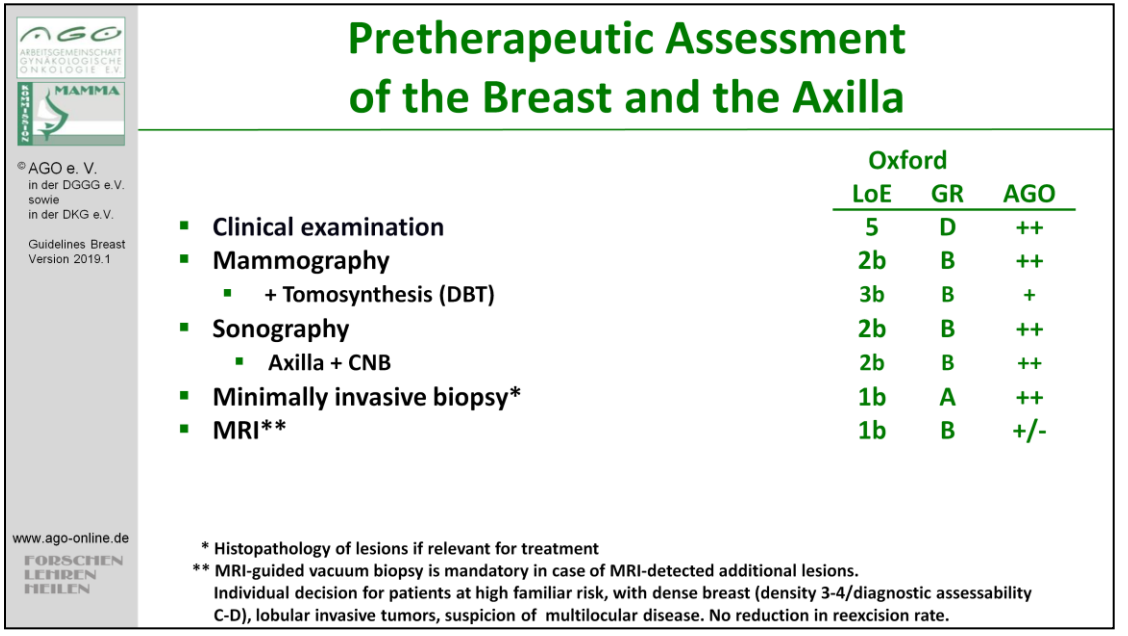
2. Choi WJ, Cha JH, Kim HH, et al. Comparison of automated breast volume scanning and hand- held ultrasound in the detection of breast cancer: an analysis of 5,566 patient evaluations. Asian Pac J Cancer Prev 2014;15(21):9101-5.
3. Golatta M, Baggs C, Schweitzer-Martin M, Domschke C, Schott S, Harcos A, Scharf A, Junkermann H, Rauch G, Rom J, et al. Evaluation of an automated breast 3D-ultrasound system by comparing it with hand-held ultrasound (HHUS) and mammography. Arch Gynecol Obstet 2014 Oct 14.
4. Golatta M, Franz D, Harcos A, et al. Interobserver reliability of automated breast volume scanner (ABVS) interpretation and agreement of ABVS findings with hand held breast ultrasound (HHUS), mammography and pathology results. Eur J Radiol 2013 Aug;82(8):e332-6. doi: 10.1016/j.ejrad.2013.03.005. Epub 2013 Mar 27.
5. Heu Jung Shin, Hak Hee Kim, Joo Hee Cha. Current status of automated breast ultrasonography: Review. Ultrasonography 2015;34:165-172
6. Skaane P, Gullien R, Eben EB, et al. Interpretation of automated breast ultrasound (ABUS) with and without knowledge of mammography: a reader performance study. Acta Radiol 2014 Mar 28. pii: 0284185114528835. [Epub ahead of print]
7. Sprague BL, Stout NK, Schechter C, et al. Benefits and harms and cost-effectiveness of supplemental ultrasonography screening for women with dense breasts. Ann Intern Med 2015;162(3):157-166
8. Wojcinski S, Gyapong S, Farrokh A, et al. Diagnostic performance and inter-observer concordance in lesion detection with the automated breast volume scanner (ABVS). BMC Med Imaging 2013 Nov 12;13(1):36
9. Hellgren R, Dickman P, Leifland K, et al. Comparison of handheld ultrasound and automated breast ultrasound in women recalled after mammography screening. Acta Radiol. 2017 May;58(5):515-520.

Biopsy and Standards of Hygiene

Heil J, Hug S, Martiny H et al. Standards of hygiene for ultrasound-guided core cut biopsies of the breast. Ultraschall Med. 2018 Dec;39(6):636-642. doi: 10.1055/a-0667-7898. Epub 2018 Sep 25.

MRT

1. Giess CS, Chikarmane SA, Sippo DA, et al. Clinical Utility of Breast MRI in the Diagnosis of Malignancy After Inconclusive or Equivocal Mammographic Diagnostic Evaluation. AJR Am J Roentgenol. 2017;208:1378-1385.
2. Piato JR, de Andrade RD, Chala LF, et al. MRI to Predict Nipple Involvement in Breast Cancer Patients. AJR Am J Roentgenol. 2016 May;206(5):1124-30
3. Luparia A, Mariscotti G, Durando M, et al. Radiol Med. Accuracy of tumour size assessment in the preoperative staging of breast cancer: comparison of digital mammography, tomosynthesis, ultrasound and MRI.2013 Oct;118(7):1119-36
4. Bennani-Baiti B, Bennani-Baiti N, Baltzer PA (2016) Diagnostic Performance of Breast Magnetic Resonance Imaging in Non-Calcified Equivocal Breast Findings: Results from a Systematic Review and Meta-Analysis. PLoS One 11:e0160346
5. Mann RM, Balleyguier C, Baltzer PA, European Society of Breast Imaging wlrbED-TEBCC et al. (2015) Breast MRI: EUSOBI recommendations for women's information. Eur Radiol 25:3669-3678
6. Di Leo G, Trimboli RM, Benedek A, et al. (2015) MR Imaging for Selection of Patients for Partial Breast Irradiation: A Systematic Review and Meta-Analysis. Radiology 277:716-726



Combined DM + DBT + US + MRI

1. Mariscotti G, Houssami N, Durando M, et al. Accuracy of mammography, digital breast tomosynthesis, ultrasound and MR imaging in preoperative assessment of breast cancer. Anticancer Res. 2014 Mar;34(3):1219-25.
2. Campanino PP, Ruggieri C, Regini E, et al. Accuracy of mammography, digital breast tomosynthesis, ultrasound and MR imaging in preoperative assessment of breast cancer.Anticancer Res. 2014 Mar;34(3):1219-25.

US-Axilla +FNA/CNB

1. Diepstraten SC, Sever AR, Buckens CFM, et al. Value of preoperative ultrasound guided lymphnode biopsy for preventing completion axillary lymphnode dissection in breast cancer: a systematic review and meta-analysis. Ann Surg Oncol 2014;21:51-59
2. Evans A, Rauchhaus P, Whelehan P, et al. Does shear wave ultrasound independently predict axillary lymph node metastasis in women with invasive breast cancer? Breast Cancer Res Treat. 2013 Dec 4. [Epub ahead of print]
3. Feng Y, Huang R, He Y, et al. Efficacy of physical examination, ultrasound, and ultrasound combined with fine-needle aspiration for axilla staging of primary breast cancer. Breast Cancer Res Treat. 2015 Feb;149(3):761-5. doi: 10.1007/s10549-015-3280-z. Epub 2015 Feb 10.

4. Evans A, Trimboli RM, Athanasiou A et al. Breast ultrasound: recommendations for information to women and referring physicians by the European Society of Breast Imaging. European of Breast Imaging (EUSOBI) , with language review by Europa Donna–The European Breast Cancer Coalition. Insights Imaging. 2018 Aug;9(4):449-461. doi: 10.1007/s13244-018-0636-z. Epub 2018 Aug 9.

Biopsie

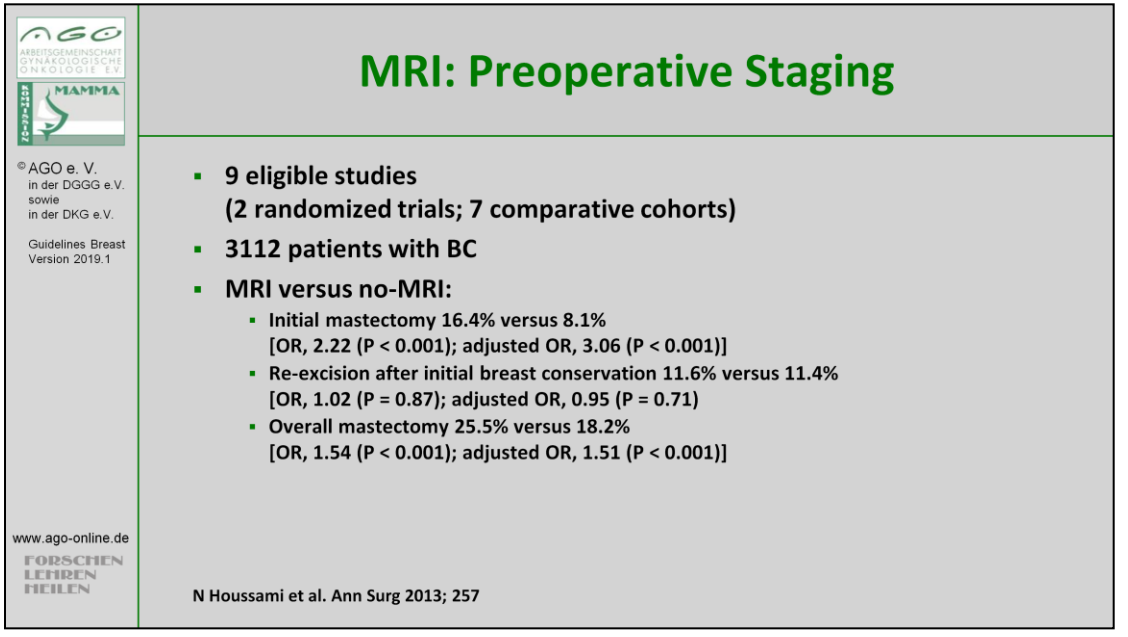
1. Chan KY, WiseberdFirtell, J, Jois HSR, et al. Localisation techniques for guided surgical excision of non-palpable breast lesions. Cochrane Database of Systematic reviews 2015;vol 12
2. Lourenco AP, Mainiero MB Incorporating imaging into the locoregional management of breast cancer. Semin Radiat Oncol 2016;26(1)
3. Mariscotti G, Houssami N, Durando M, et al. Accuracy of mammography, digital breast tomosynthesis, ultrasound and MR imaging in preoperative assessment of breast cancer. Anticancer Res. 2014 Mar;34(3):1219-25.

MRT

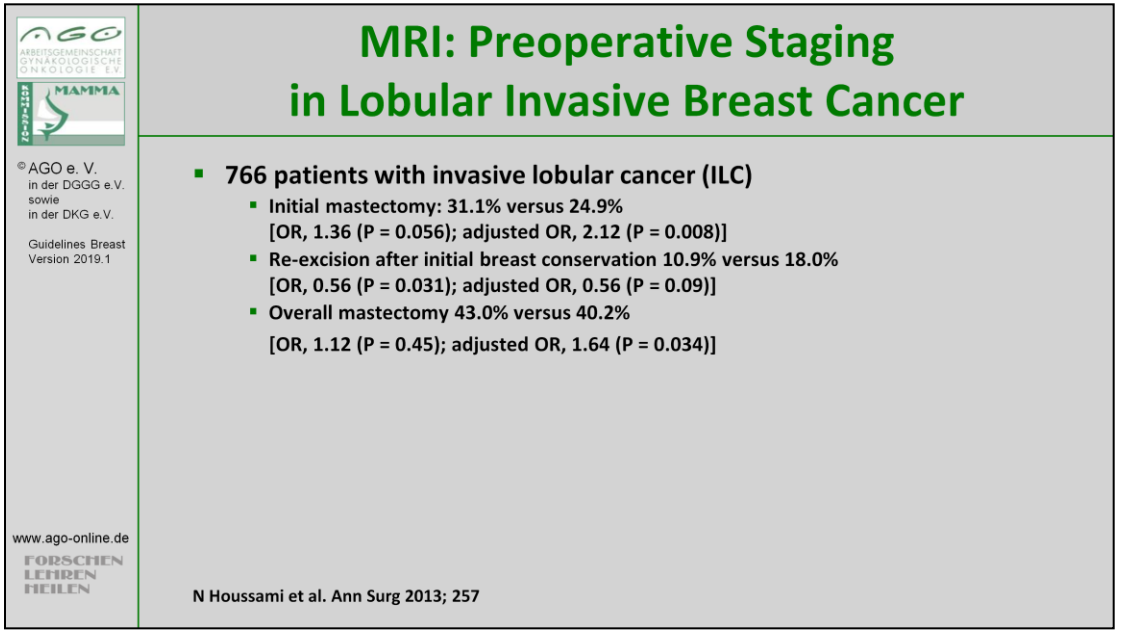
1. Mann RM, Loo CE, Wobbes T et al The impact of preoperative MRI on the re-excision rate in invasive lobular carcinoma of the breast. Breast Cancer Res Treat 2010; 119: 415-422
2. Houssami N, Turner R, Morrow M. Preoperative magnetic resonance imaging in breast cancer: meta-analysis of surgical outcomes. Ann Surg. 2013 Feb;257(2):249-55.
3. Debald M, Abramian A, Nemes L, et al. Who may benefit from preoperative MRI? A single-center analysis of 1102 consecutive patients with primary breast cancer. Breast Cancer Res Treat 2015;153(3):531-537
4. Arnaut A, Catley C, Booth CM, et al. Use of preoperative Magnetic Resonance Imaging for breast cancer: A Canadian population-based study. JAMA Oncol 2015;1(9):1238-1250
5. Fancellu A, Turner RM, Dixon JM, et al. Metaanalysis of the effect of preoperative MRI on the surgical management of ductal carcinoma in situ. Brit J Surg2015;192(8)883-893
6. Houssami N, Turner R, Macaskill P, et al. An individual person data meta-analysis of preoperative magnetic resonance imaging and

breast cancer recurrence. J Clin Oncol 2014;32(5):392-401

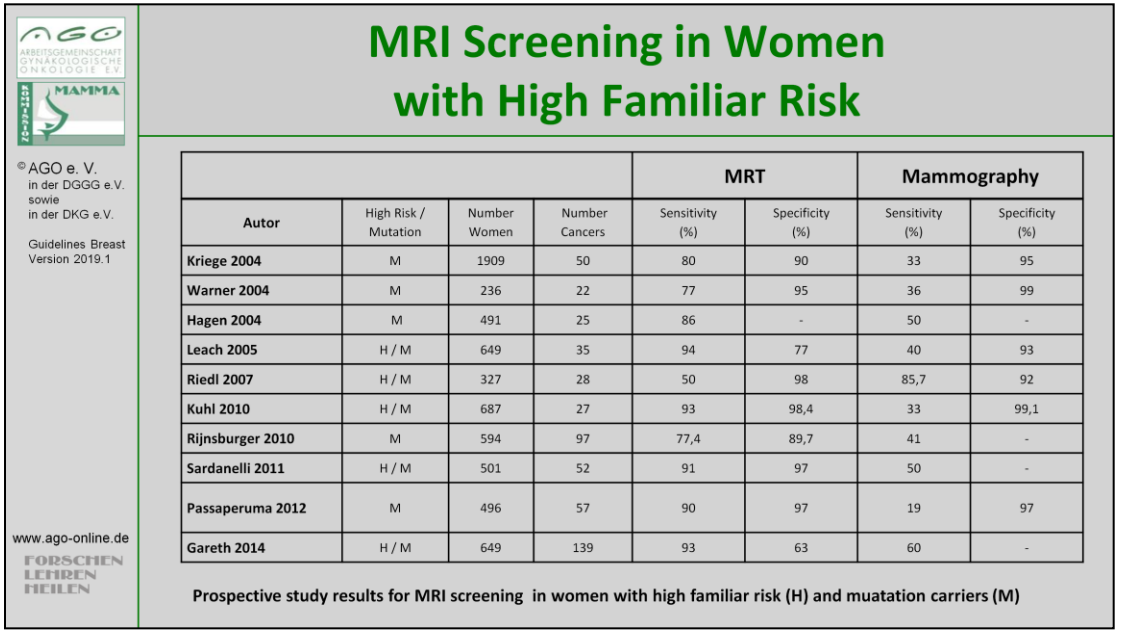
7. Vos EL, Voogd AC, Verhoef C, et al. Benefits of preoperative MRI in breast cancer surgery studied in a large population-based cancer registry. Br J Surg 2015:102(13)1649-1657
8. Lehman CD, Lee JM, DeMartini WS, et al. Screening MRI in women with a personal history of breast cancer. J Natl Cancer Inst 2016;108(3)
9. Wang SY, Long JB, Killelea BK, et al. Preoperative breast MRI and contralateral breast cancer occurrence among older women with breast cancer. J Clin Oncol 2015;Nov 30, epub ahead of print
10. Riedl CC, Luft N, Clemens B, et al. Triple-modality screening trial for familial breast cancer underlines the importance of magnetic resonance imaging and questions the role of mammography and ultrasonography regardless of patient mutation status, age and breast density. JCO 2015;33(10):1128-1135
11. El Sharouni M, Postma EL, Menezes GLG et al. High prevalence of MRI-detected contralateral and ipsilateral malignant findings in patients with invasive ductolobular breast cancer: Impact on surgical management. Clin Breast Cancer. 2016 Aug;16(4):269-75.
12. Vriens BE, de Vries B, Lobbes MB, et al. Ultrasound is at least as good as magnetic resonance imaging in predicting tumour size post-neoadjuvant chemotherapy in breast cancer. Eur J Cancer. 2016 Jan;52:67-76.
13. Health Quality Ontario. Magnetic Resonance Imaging as an Adjunct to Mammography for Breast Cancer Screening in Women at Less Than High Risk for Breast Cancer: A Health Technology Assessment. Ont Health Technol Assess Ser. 2016; Nov 1;16(20):1-30
14. Lobbes MB, Vriens IJ, van Bommel AC, et al. Breast MRI increases the number of mastectomies for ductal cancers, but decreases them for lobular cancers. Breast Cancer Res Treat. 2017;162:353-364.
15. Houssami N, Turner RM, Morrow M. Meta-analysis of pre-operative magnetic resonance imaging (MRI) and surgical treatment for breast cancer. Breast Cancer Res Treat. 2017 Sep;165(2):273-283
16. Achim Wöckel, Jasmin Festl, Tanja Stüber, et al: Interdisciplinary Screening, Diagnosis, Therapy and Follow-up of Breast Cancer. Guideline of the DGGG and the DKG (S3-Level, AWMF Registry Number 032/045OL, December 2017) – Part 1 with Recommendations for the Screening, Diagnosis and Therapy of Breast Cancer. Geburtshilfe Frauenheilkd. 2018 Oct; 78(10): 927–948.



1. Houssami N, Turner R, Morrow M. Preoperative magnetic resonance imaging in breast cancer: meta-analysis of surgical outcomes. Ann Surg. 2013 Feb;257(2):249-55.
2. Houssami N, Turner RM, Morrow M. Meta-analysis of pre-operative magnetic resonance imaging (MRI) and surgical treatment for breast cancer. Breast Cancer Res Treat. 2017 Sep;165(2):273-283
3. Houssami N, Turner R, Macaskill P, et al. An individual person data meta-analysis of preoperative magnetic resonance imaging and breast cancer recurrence. J Clin Oncol 2014;32(5):392-401



1. Houssami N, Turner R, Morrow M. Preoperative magnetic resonance imaging in breast cancer: meta-analysis of surgical outcomes. Ann Surg. 2013 Feb;257(2):249-55. doi: 10.1097/SLA.0b013e31827a8d17.
2. El Sharouni M, Postma EL, Menezes GLG, et al. High prevalence of MRI-detected contralateral and ipsilateral malignant findings in patients with invasive ductolobular breast cancer: Impact on surgical management. Clin Breast Cancer. 2016 Aug;16(4):269-75.
3. Menezes GL, van den Bosch MA, et al. Invasive ductolobular carcinoma of the breast: spectrum of mammographic, ultrasound and magnetic resonance imaging findings correlated with proportion of the lobular component. Springerplus. 2013 Nov 20;2:621. doi: 10.1186/2193-1801-2-621.



MRI Screening in Women with High Familiar Risk

Guidelines Breast
Version 2019.1

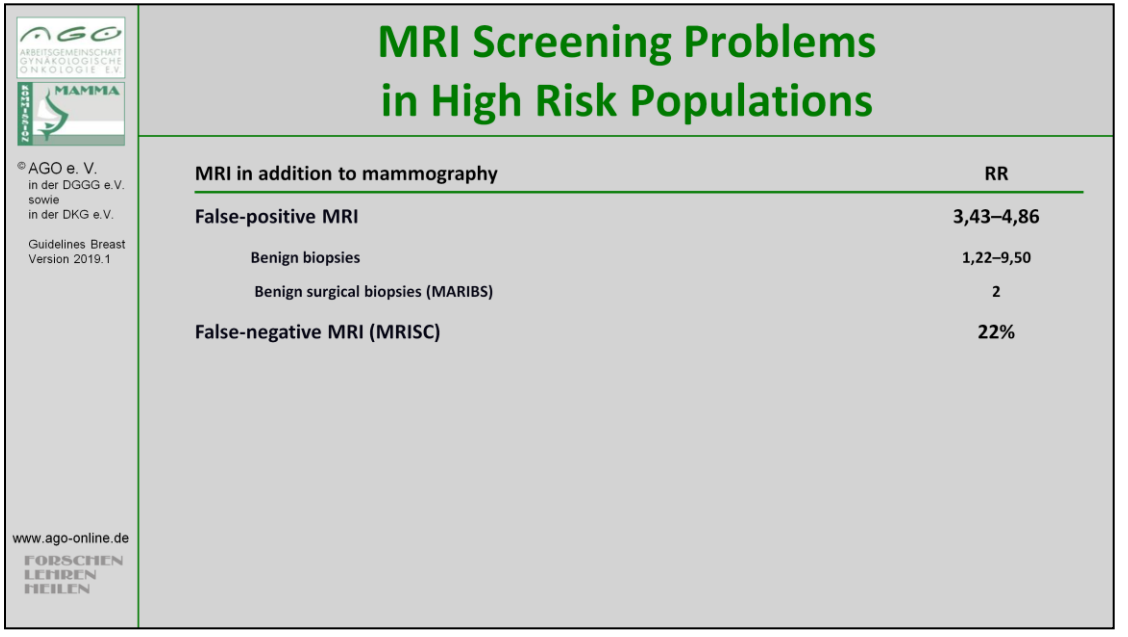
				MRT		Mammography	
Autor	High Risk / Mutation	Number Women	Number Cancers	Sensitivity (%)	Specificity (%)	Sensitivity (%)	Specificity (%)
Kriege 2004	M	1909	50	80	90	33	95
Warner 2004	M	236	22	77	95	36	99
Hagen 2004	M	491	25	86	-	50	-
Leach 2005	H / M	649	35	94	77	40	93
Riedl 2007	H / M	327	28	50	98	85,7	92
Kuhl 2010	H / M	687	27	93	98,4	33	99,1
Rijnsburger 2010	M	594	97	77,4	89,7	41	-
Sardanelli 2011	H / M	501	52	91	97	50	-
Passaperuma 2012	M	496	57	90	97	19	97
Gareth 2014	H / M	649	139	93	63	60	-

Prospective study results for MRI screening in women with high familiar risk (H) and muatation carriers (M)

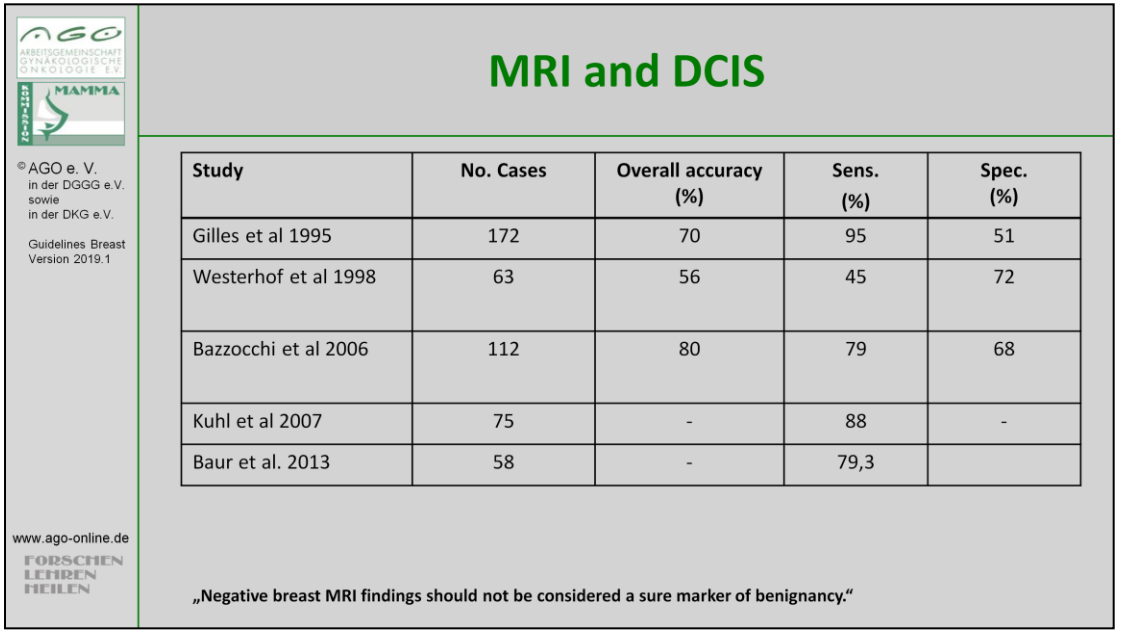
1. Chiarelli AM, Prummel MV, Muradali D et al. Effectiveness of Screening With Annual Magnetic Resonance Imaging and Mammography: Results of the Initial Screen From the Ontario High Risk Breast Screening Program. J Clin Oncol 2014; 32: 2224-22302
2. Gareth ED, Nisha K, Yit L ,et al. MRI breast screening in high-risk women: cancer detection and survival analysis. Breast Cancer Res Treat 2014; 145(3): 663-67
3. Hallam S, Govindarajulu S, Huckett B, et al. BRCA1/2 mutation-associated breast cancer, wide local excision and radiotherapy or unilateral mastectomy; A systematic review. Clin Oncol 2015;27(9):527-535
4. Heijnsdijk EAM, Warner E, Gilbert FJ et al. Differences in natural history between breast cancers in BRCA1 and BRCA2 mutation carries and effects of MRI Screening-MRISC, MARIBS, and Canadian studies combined. Cancer Epidemiol Biomarkers Prev 2012; 21: 1458-1468
5. Hagen AI, Kvistad KA, Maehle L, et al. Sensitivity of MRI versus conventional screening in the diagnosis of BRCA-associated breast cancer in a national prospective series. The Breast 2007;16:367-274
6. Kriege M, Brekelmans CT, Boetes C et al. Efficacy of MRI and mammography for breast-cancer cancer screening in women with a familial or genetic predisposition. N Engl J Med 2004; 351: 427-437

7. Kuhl C, Weigel S, Schrading S, et al. Prospective multicenter cohort study to refine management recommendations for women at elevated familial risk of breast cancer: the EVA trial. J Clin Oncol 2010;28:1450-1457
8. Lehman CD, Lee JM, DeMartini WS, et al. Screening MRI in women with a personal history of breast cancer. J Natl Cancer Inst 2016;108(3)
9. Obdeijn IMA, Loo CE, Rijnsburger AJ, et al. Assessment of false-negative cases of breast MR imaging in women with a familiar or genetic disposition. Breast Cancer Res Treat 2010; 119: 399-407
10. Rijnsburger AJ, Obdeijn IM, Kaas R et al. BRCA1-associated breast cancers present differently from BRCA2-associated and familial cases: long-term follow-up of the Dutch MRISC Screening Study. J. Clin Oncol 2010; 28: 5265-5273
11. Riedl CC, Ponhold L, Flöry D, et al. Magnetic resonance imaging of the breast improves detection of invasive cancer, preinvasive cancer and premalignant lesions during surveillance of women at high risk for breast cancer. Clin Cancer Res 2007;13(20)6144
12. Riedl CC, Luft N, Clemens B, et al. Triple-modality screening trial for familial breast cancer underlines the importance of magnetic resonance imaging and questions the role of mammography and ultrasonography regardless of patient mutation status, age and breast density. JCO 2015;33(10):1128-1135
13. Saadatmand S, Vos JR, Honning MJ et al. Relevance and efficacy of breast cancer screening in BRCA1 and BRCA2 mutation carriers above 60 years: A national cohort study. Int J Cancer 2014; 135: 2940-2949
14. Saadatmand S, Obdeijn IM, Rutgers EJ, et al. Survival benefit in women with BRCA1 mutaion or familial risk in the MRI screening study (MRISC) Int J Cancer 2015;137(7)1729-1738
15. Sardanelli F, Podo F, Santoro F et al Multicenter surveillance of women at high genetic breast cancer risk using mammography, ultrasonography and contrast-enhanced magnetic resonance (The High Breast Cancer Risk Italian 1 study. Final results. Invest Radiol 2011;57(2):75-89
16. Shao J, Yang J, Wang JN, et al. Effect of BRCA2 mutation on familial breast cancer survival: A systematic review and meta-analysis. doi 10.1007/s11596-015-1481-7
17. Van den Broek AJ, Schmidt MK, van't Veer LJ et al. Worse breast cancer prognosis of BRCA1/ BRCA2 mutation carriers: what is the evidence? A systematic review with metaanalysis.PloS one 2015;Vol 10(3):
18. Zhong Q, Peng HL, Zhao X, et al. Effects of BRCA1- and BRCA2-related mutations on the ovarian and breast cancer survival. Clin

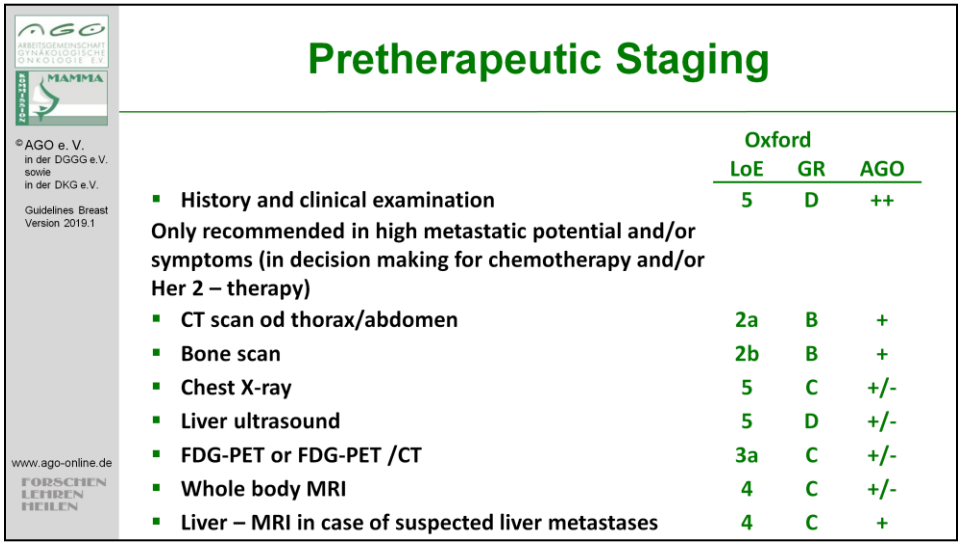
Cancer Res 2015;21(1):211-220



1. Gareth ED, Nisha K, Yit L ,et al. MRI breast screening in high-risk women: cancer detection and survival analysis. Breast Cancer Res Treat 2014; 145(3): 663-67
2. Heijnsdijk EAM, Warner E, Gilbert FJ et al. Differences in natural history between breast cancers in BRCA1 and BRCA2 mutation carries and effects of MRI Screening-MRISC, MARIBS, and Canadian studies combined. Cancer Epidemiol Biomarkers Prev 2012; 21: 1458-1468
3. Saadatmand S, Obdeijn IM, Rutgers EJ, et al. Survival benefit in women with BRCA1 mutaion or familial risk in the MRI screening study (MRISC) Int J Cancer 2015;137(7)1729-1738
4. Van den Broek AJ, Schmidt MK, van't Veer LJ, et al. Worse breast cancer prognosis of BRCA1/ BRCA2 mutation carriers: what is the evidence? A systematic review with metaanalysis.PloS one 2015;Vol 10(3):



1. Bazzocchi M, Zuiani C, Panizza P, et al. Contrast-enhanced breast MRI in patients with suspicious microcalcifications on mammography; results of a multicenter trial. AJR Am J Roentenol. 2006; 186 (6): 1723-32
2. Fancellu A, Turner RM, Dixon JM, et al. Metaanalysis of the effect of preoperative breast MRI on the surgical management of ductal carcinoma in situ. Brit J Surg 2015;102(8)883-893
3. Gilles R, Zafrani B, Guinebretiere JM et al. Ductal carcinoma in situ: MR imaging-histologic correlation. Radiology 1995; 196: 415-9
4. Kuhl CK, Schrading S, Bieling HB, et al. MRI for diagnosis of pure ductal carcinoma in situ: a prospective observational study. Lancet. 2007; 370 (9586): 485-92
5. Pilawskie M, Olcese C, Eaton A, et al. Perioperative breast MRI is not associated with lower locoregional recurrence rates in DCIS patients treated with and without radiation. Ann Surg Oncol 2014;21:1552-1560
6. Schouten van der Felde AP, Schlooz-Vries MS, Boetes C, et al. Magnetic resonance imaging of ductal carcinoma in situ: what is its clinical application. Am J Surg 2009; 298: 262-269
7. Westerhof J P, Fischer U, Moritz J D, et al. MR Imaging of Mammographically Detected Clustered Microcalcifications: Is There Any Value? Radiology 1998; 207: 675-681



Statement: history and physical examination

1. GCP

Statement: high metastatic potential / symptoms

1. Rutgers, EJ et al: Quality control in the locoregional treatment of breast cancer (2001) EJC 37: 447-453
2. Gerber B, Seitz E, Muller H et al: Perioperative screening for metastatic disease is not indicated in patients with primary breast cancer and no clinical signs of tumor spread. Breast Cancer Res Treat 82:29-37; 2003
3. Schneider C, Fehr MK, Steiner RA et al: Frequency and distribution pattern of distant metastases in breast cancer patients at the time of primary presentation Arch Gynecol Obstet. 2003 Nov;269(1):9-12.
4. Isasi CR, Moadel RM, Blaufox MD. A meta-analysis of FDGPET for the evaluation of breast cancer recurrence and metastases. Breast Cancer Res Treat 2005;90(2):105–12.
5. Schmidt GP, Baur-Melnyk A, Haug A, et al.: Comprehensive imaging of tumor recurrence in breast cancer patients using whole-body MRI at 1.5 and 3 T compared to FDG–PET–CT. European Journal of Radiology 2008; 65, 47–58.
6. Shie P, Cardarelli R, Brandon D et al: Meta-analysis: comparison of F-18 Fluorodeoxyglucose-positron emission tomography and bone scintigraphy in the detection of bone metastases in patients with breast cancer. Clin Nucl Med. 2008 Feb;33(2):97-101.
7. Barrett T, Bowden DJ, Greenberg DC et al.: Radiological staging in breast cancer: which asymptomatic patients to image and how. British Journal of Cancer 2009; 101, 1522 – 1528.
8. Rong J, Wang S, Ding Q, et al. Comparison of 18 FDG PET-CT and bone scintigraphy for detection of bone metastases in breast cancer patients. A meta-analysis. Surg Oncol. 2013 Jun;22(2):86-91
9. Hong S, Li J, Wang S. 18FDG PET-CT for diagnosis of distant metastases in breast cancer patients. A meta-analysis. Surg Oncol.

2013 Jun;22(2):139-43.

10. Gutzeit A, Doert A, Froehlich JM, et al. Comparison of diffusion-weighted whole body MRI and skeletal scintigraphy for the detection of bone metastases in patients with prostate or breast carcinoma. Skeletal Radiol. 2010 Apr;39(4):333-43.
11. Department of Health. Diagnosis, staging and treatment of patients with breast cancer. National Clinical Guideline No. 7. June 2015. ISSN 2009-6259
12. Bychkovsky BL, Lin NU: Imaging in the evaluation and follow-up of early and advanced breast cancer: When, why, and how often? 2017; 31, 318–324.
13. deSouza NM, Liu Y, Chiti A et al.: Strategies and technical challenges for imaging oligometastatic disease: Recommendations from the European Organisation for Research and Treatment of Cancer imaging group. Eur J Cancer. 2018 Jan 10. [Epub ahead of print].
14. Wöckel A, Festl J, Stüber T, et al: Interdisciplinary Screening, Diagnosis, Therapy and Follow-up of Breast Cancer. Guideline of the DGGG and the DKG (S3-Level, AWMF Registry Number 032/045OL, December 2017) - Part 2 with Recommendations for the Therapy of Primary, Recurrent and Advanced Breast Cancer. Geburtshilfe Frauenheilkd. 2018 Nov;78(11):1056-1088.