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Guidelines Breast
Version 2023.1D

In Zusammen-
arbeit mit:



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FORSCHEN
LEHREN
HEILEN

Diagnostik und Therapie früher und fortgeschrittener Mammakarzinome

Operative Therapie des Mammakarzinoms unter onkologischen Aspekten

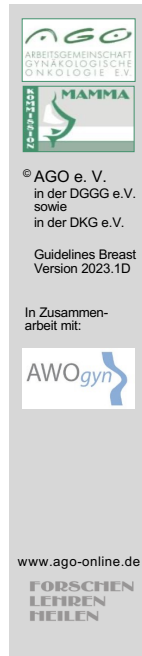
Operative Therapie des Mammakarzinoms unter onkologischen Aspekten

■ Versionen 2002–2022:

Banys-Paluchowski / Bauerfeind / Blohmer / Böhme / Brunnert / Costa /
Ditsch / Fallenberg / Fersis / Friedrich / Gerber / Hanf / Janni /
Junkermann / Kaufmann / Kühn / Kümmel / Möbus/ Nitz / Rezai / Simon
/ Solomayer / Thomssen / Thill / Untch / Wöckel

■ Version 2023:

Bauerfeind / Thill



Operative Therapie des Mammakarzinoms unter onkologischen Aspekten

AGO: ++

Die operative Therapie ist einer von mehreren Teilschritten bei der Behandlung des Mammakarzinoms. Für jeden Brustoperateur ist eine umfangreiche diagnostische und onkologische Expertise erforderlich.

AGO: +

Vermeidung von erheblichen Therapieverzögerungen

Delay of surgical therapy:

1. Hanna TP, King WD, Thibodeau S et al: Mortality due to cancer treatment delay: systematic review and meta-analysis. BMJ371:m4087
2. Cone EB, Marchese M, Paciotti M, et al: Assessment of Time-to-Treatment Initiation and Survival in a Cohort of Patients With Common Cancers. JAMA Netw Open. 2020;3(12):e2030072. doi: 10.1001/jamanetworkopen.2020.30072. PMID: 33315115; PMCID: PMC7737088.

Surgeon:

1. Dixon JM, Grewar J, Twelves D, et al: Factors affecting the number of sentinel lymph nodes removed in patients having surgery for breast cancer. Breast Cancer Res Treat 184:335-343, 2020

ARBEITSGEMEINSCHAFT
GYNÄKOLOGISCHE
ONKOLOGIE e.V.

MAMMA

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Guidelines Breast
Version 2023.1D

In Zusammen-
arbeit mit:

AWOgyn

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FORSCHEN
LEHREN
HEILEN

Prätherapeutische Mamma- und Axilladiagnostik

	Oxford		
	LoE	GR	AGO
▪ Klinische Untersuchung	5	D	++
▪ Mammographie	2b	B	++
▪ + Tomosynthese***	2b	B	+
▪ Kontrastmittelmammographie (alleine) nach Rx-Sensibilität und Verfügbarkeit	2a	B	+
▪ Sonographie (Mamma/Axilla*)	2b/2a*	B	++
▪ MRT*	1b	A	+
▪ Minimalinvasive Biopsie Mamma** (CNB, VAB)	1b	A	++
▪ CNB Axilla, wenn auffälliger LK-Befund und Markierung des LK wenn TAD geplant/≤3 susp. LK	2b	B	++
▪ Mamma-CT	4	D	-
▪ PET für die Axilla. (PET-CT, PET-MRT)	2b	B	-

* Möglichkeit der MRT-gestützten Biopsie (in domo oder im Rahmen eine Kooperation). MRT erwägen bei hohem familiären Risiko, eingeschränkter Beurteilbarkeit in MG & US (Beurteilbarkeit C/D), invasiv lobulärem Karzinom.

** Histologische Sicherung von Zusatzbefunden im Fall therapeutischer Relevanz.

*** Ersatz der DM durch synthetische Mammographie (SM)

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

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

Biopsie

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2. Lourenco AP, Mainiero MB Incorporating imaging into the locoregional management of breast cancer. Semin Radiat Oncol 2016;26(1)
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MRT

1. Mann RM, Loo CE, Wobbles 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
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3. Debal 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
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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
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Reviews CESM:

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3. Tagliafico, A.S., et al., Diagnostic performance of contrast-enhanced spectral mammography: Systematic review and meta-analysis. *Breast*, 2016. 28: p. 13-9.
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5. Jochelson, M.S., et al., Comparison of screening CEDM and MRI for women at increased risk for breast cancer: A pilot study. Eur J Radiol, 2017. 97: p. 37-43.
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11. Åhsberg K, Gardfjell A, Nimeus E, et al. Added value of contrast-enhanced mammography (CEM) in staging of malignant breast lesions-a feasibility study. World journal of surgical oncology. 2020;18(1):100.

12. Sumkin JH, Berg WA, Carter GJ, et al. Diagnostic Performance of MRI, Molecular Breast Imaging, and Contrast-enhanced Mammography in Women with Newly Diagnosed Breast Cancer. *Radiology*. 2019;293(3):531-40.
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Brust-CT:

1. Uhlig, J. A.-O., A. Uhlig, L. Biggemann, U. Fischer, J. Lotz and S. Wienbeck "Diagnostic accuracy of cone-beam breast computed tomography: a systematic review and diagnostic meta-analysis." (1432-1084 (Electronic)).
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Prätherapeutisches Staging			
	Oxford		
	LoE	GR	AGO
<p>■ Anamnese und klinische Untersuchung</p> <p>Nur bei hohem Risiko für Fernmetastasen und/oder Symptomen und/oder Indikation zur (neo-)adjuvanten Chemo- / Antikörpertherapie:</p> <p>■ CT Thorax / Abdomen</p> <p>■ Skelettszintigraphie</p> <p>■ Röntgen-Thorax</p> <p>■ Leberzonographie</p> <p>■ Weiterführende Diagnostik je nach Befund (z. B. Leber-MRT / CEUS* / Biopsie etc.)</p> <p>■ FDG-PET oder FDG-PET-CT** FDG-PET-MRT**</p> <p>■ Ganzkörper MRT</p>	<p>5</p> <p>2a</p> <p>2b</p> <p>5</p> <p>5</p> <p>2a</p> <p>2b</p> <p>4</p>	<p>D</p> <p>B</p> <p>B</p> <p>C</p> <p>D</p> <p>B</p> <p>B</p> <p>C</p>	<p>++</p> <p>+</p> <p>+</p> <p>+/-</p> <p>+/-</p> <p>+</p> <p>+/-</p> <p>+/-</p>
<p>* Contrast enhanced ultrasound</p> <p>** vorzugsweise bei hohem Stadium (III), wenn verfügbar</p>			

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
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cancer patients. A meta-analysis. Surg Oncol. 2013 Jun;22(2):86-91

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17. Ulaner GA, Castillo R, Goldman DA, et al. ¹⁸F-FDG-PET/CT for systemic staging of newly diagnosed triple-negative breast cancer. Eur J Nucl Med Mol Imaging 2016; 43:1937–1944
18. Ulaner GA, Castillo R, Wills J, Gönen M, Goldman DA. ¹⁸F-FDG-PET/CT for systemic staging of patients with newly diagnosed ER-positive and HER2-positive breast cancer. Eur J Nucl Med Mol Imaging 2017
19. Groheux D, Giacchetti S, Espié M, et al. The yield of ¹⁸F-FDG PET/CT in patients with clinical stage IIA, IIB, or IIIA breast cancer: a prospective study. J Nucl Med 2011; 52:1526–1534
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Stellenwert der operativen Optionen

	Oxford	
	LoE	GR
▪ Die Überlebensraten nach BET (Tumorektomie + RT) sind denen nach MRM mindestens äquivalent	1a	A
▪ Die Lokalrezidivraten nach „skin sparing mastectomy“ (SSM) und MRM sind äquivalent	2b	B
▪ Die Erhaltung des Mamillen-Areola-Komplexes (MAK) ist bei R0-Resektion onkologisch sicher	2b	C

Statement: lumpectomy – mastectomy

1. Fisher B, Anderson S, Bryant J, et al. Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer (2002) N Engl J Med 347:1233-1241
2. Veronesi U, Cascinelli N, Mariani L et al. Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer. NEJM 2002 Oct 17;347(16):1227-32
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5. Van Maare MC, de Munck L, de Bock GH et al. 10 year survival after breast-conserving surgery plus radiotherapy compared with mastectomy in early breast cancer in the Netherlands: a population-based study. Lancet Oncol. 2016;17(8):1158-1170. doi: 10.1016/S1470-2045(16)30067-5
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Statement: skin sparing mastectomy

1. Carlson GW, Bostwick J, Styblo TM et al. Skin-sparing mastectomy. Oncologic and reconstructive considerations. Ann Surg 1997; 225:570-575.
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3. Slavin SA, Schnitt SJ, Duda RB et al. Skin-sparing mastectomy and immediate reconstruction: oncologic risks and aesthetic results in patients with early-stage breast cancer. Plast Reconstr Surg 1998; 102:49-62.
4. Simmons RM, Fish SK, Gayle L et al. Local and distant recurrence rates in skin-sparing mastectomies compared with non-skin-sparing mastectomies. Ann Surg Oncol 1999; 6:676-681.
5. Rivadeneira D, Simmons RM, Fish SK et al. Skin-sparing mastectomy with immediate breast reconstruction: a critical analysis of local recurrence. Cancer 2000; 6:331-335.
6. Foster et al. Skin-sparing mastectomy and immediate breast reconstruction: a prospective cohort study for the treatment of advanced stages of breast carcinoma. Ann Surg Oncol 2002 Jun;9(5):462-6
7. Greenway RM, Schlossberg L, Dooley WC. Fifteen-year series of skin-sparing mastectomy for stage 0 to 2 breast cancer. Am J Surg 2005; 190:918-922.
8. Howard MA, Polo K, Pusic AL et al. Breast cancer local recurrence after mastectomy and TRAM flap reconstruction: incidence and treatment options. Plast Reconstr Surg 2006; 117:1381-1386.
9. Patani N, Devalia H, Anderson A et al. Oncological safety and patient satisfaction with skin-sparing mastectomy and immediate breast reconstruction. Surg Oncol 2007; 17:97-105.
10. Paepke S, Schmid R, Fleckner S, et al. Subcutaneous mastectomy with conservation of the nipple-areola skin: broadening the indications Ann Surg. 2009;250(2):288-92
11. Gerber et al.: Skin-sparing mastectomy with conservation of the nipple-areola complex and autologous reconstruction is an oncologically safe procedure. Ann Surg 2009 Mar;249(3):461-8
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Statement: Nipple sparing mastectomy

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3. Caruso F, Ferrara M, Castiglione G et al. Nipple sparing subcutaneous mastectomy: sixty-six months follow-up. *Eur J Surg Oncol* 2006; 32:937-940.
4. Howard MA, Polo K, Pusic AL et al. Breast cancer local recurrence after mastectomy and TRAM flap reconstruction: incidence and treatment options. *Plast Reconstr Surg* 2006; 117:1381-1386
5. Benediktsson KP, Perbeck L. Survival in breast cancer after nipple-sparing subcutaneous mastectomy and immediate reconstruction with implants: A prospective trial with 13 years median follow-up in 216 patients. *Eur J Surg Oncol* 2008; 34:143-148.
6. Gerber et al.: Skin-sparing mastectomy with conservation of the nipple-areola complex and autologous reconstruction is an oncologically safe procedure. *Ann Surg* 2009 Mar;249(3):461-8
7. Lanitis S1, Tekkis PP, Sgourakis G, et al.: Comparison of skin-sparing mastectomy versus non-skin-sparing mastectomy for breast cancer: a meta-analysis of observational studies. *Ann Surg.* 2010 Apr;251(4):632-9.
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Brusterhaltende Operation (BEO)

Markierungsoptionen nicht-palpabler Läsionen

	Oxford		
	LoE	GR	AGO
▪ Drahtmarkierung	1a	A	++
▪ Intraoperative sonographische Lokalisation ohne Drahtmarkierung*	1a	A	++
▪ Andere Markierungsarten:**			
Radar-Reflexion	2b	B	+/-
Magnetische Seeds***	2b	B	+/-
Radiofrequenz-Marker (RFID)	2b	B	+/-
Radionuklidmarkierung (ROLL)	1a	A	+/-
Radioaktive Seeds****	1a	A	+/-

* Die Läsion muss von demselben Untersucher prä- und intraoperativ sonographisch in der Gesamtausdehnung sicher dargestellt werden können. Voraussetzung: Adäquate Geräteausstattung und Ausbildung des Operateurs.
 ** gemäß Zulassung
 *** nicht geeignet bei MRT-Verlaufsbeurteilung unter NACT
 **** in Deutschland nicht zugelassen

Meta-analyses of different techniques:

1. Athanasiou C, Mallidis E, Tuffaha H. Comparative effectiveness of different localization techniques for non-palpable breast cancer. A systematic review and network meta-analysis. Eur J Surg Oncol. 2021 Oct 11;S0748-7983(21)00751-4. doi: 10.1016/j.ejso.2021.10.001.
2. Chan BKY, Wiseberg-Firtell JA, Jois RHS et al. Localization techniques for guided surgical excision of non-palpable breast lesions. Cochrane Database Syst Rev. 2015 Dec 31;(12):CD009206. doi: 10.1002/14651858.CD009206.pub2
3. Davey MG, O'Donnell JPM, Boland MR et al. Optimal localization strategies for non-palpable breast cancers -A network meta-analysis of randomized controlled trials. Breast. 2022 Apr;62:103-113. doi: 10.1016/j.breast.2022.02.004. Epub 2022 Feb 8

Meta-analysis WGL vs. ROLL:

1. Kiruparan N, Kiruparan P, Debnath D. Use of wire-guided and radio-guided occult lesion localization for non-palpable breast lesions: A systematic literature review and meta-analysis of current evidence. Asian J Surg. 2022 Jan;45(1):79-88.

Meta-analysis intraoperative ultrasound vs. wire-guided localization:

1. Ahmed M, Douek M. Intra-operative ultrasound versus wire-guided localization in the surgical management of non-palpable breast cancers: systematic review and meta-analysis. Breast Cancer Res Treat. 2013 Aug;140(3):435-46.

2. Pan H, Wu N, Ding H, et al. (2013) Intraoperative ultrasound guidance is associated with clear lumpectomy margins for breast cancer: a systematic review and meta-analysis. PLoS One 8:e74028. 10.1371/journal.pone.0074028
3. Banys-Paluchowski M, Rubio IT, Karadeniz Cakmak G et al. Intraoperative ultrasound-guided excision of non-palpable and palpable breast cancer: systematic review and meta-analysis. in press 2022

RCTs intraoperative ultrasound vs. wire-guided localization:

1. Hu X, Si Li, Yi Jiang et al: Intraoperative ultrasound-guided lumpectomy versus wire-guided excision for nonpalpable breast cancer. J Int Med Res 48 (1):1-12, 2020
2. Hoffmann J, Marx M, Hengstmann A, et al:Ultrasound-Assisted Tumor Surgery in Breast Cancer - A Prospective, Randomized, Single-Center Study (MAC 001); Ultraschall Med. 2019 Jun;40(3):326-332. doi: 10.1055/a-0637-1725
3. Rahusen FD, Bremers AJ, Fabry HF, et al. (2002) Ultrasound-guided lumpectomy of nonpalpable breast cancer versus wire-guided resection: a randomized clinical trial. Ann Surg Oncol 9:994-998. 10.1007/BF02574518

Intraoperative ultrasound: cohort studies:

1. Layeequr Rahman R, Puckett Y, et al. (2020) A decade of intraoperative ultrasound guided breast conservation for margin negative resection - Radioactive, and magnetic, and Infrared Oh My. Am J Surg 220:1410-1416. 10.1016/j.amjsurg.2020.09.008
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3. Ramos M, Diaz JC, Ramos T, et al. (2013) Ultrasound-guided excision combined with intraoperative assessment of gross macroscopic margins decreases the rate of reoperations for non-palpable invasive breast cancer. Breast 22:520-524. 10.1016/j.breast.2012.10.006
4. Arentz C, Baxter K, Boneti C, et al. (2010) Ten-year experience with hematoma-directed ultrasound-guided (HUG) breast lumpectomy. Ann Surg Oncol 17 Suppl 3:378-383. 10.1245/s10434-010-1230-x
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8. Barentsz MW, van Dalen T, Gobardhan PD, et al. (2012) Intraoperative ultrasound guidance for excision of non-palpable invasive breast cancer: a hospital-based series and an overview of the literature. *Breast Cancer Res Treat* 135:209-219. 10.1007/s10549-012-2165-7
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Magnetic seeds:

1. Struik GM, Schermers B, Mares I et al. Randomized controlled trial comparing magnetic marker localization (MaMaLoc) with wire-guided localization in the treatment of early-stage breast cancer. *Breast J.* 2021;27(8):638-650. doi: 10.1111/tbj.14262.
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Breast Care (Basel). 2021 Aug;16(4):383-388. doi: 10.1159/000510380. Epub 2020 Oct 14.PMID: 34602944

8. Kelly BN, Webster AJ, Lamb L, et al. Magnetic Seeds: An Alternative to Wire Localization for Nonpalpable Breast Lesions. Clin Breast Cancer. 2022 Jul;22(5):e700-e707. doi: 10.1016/j.clbc.2022.01.003. Epub 2022 Jan 17.PMID: 35101354
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10. Mariscal Martínez A, Vives Roselló I, Salazar Gómez A, et al. Advantages of preoperative localization and surgical resection of metastatic axillary lymph nodes using magnetic seeds after neoadjuvant chemotherapy in breast cancer. Surg Oncol. 2021 Mar;36:28-33.
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Radar reflector markers:

1. Kasem I, Mokbel K. Savi Scout® Radar Localisation of Non-palpable Breast Lesions: Systematic Review and Pooled Analysis of 842 Cases. Anticancer Res. 2020 Jul;40(7):3633-3643. doi: 10.21873/anticancer.14352.
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Radiofrequency-based markers (RFID): cohort studies (no RCTs available):

1. Tayeh S, Wazir U, Mokbel K. The Evolving Role of Radiofrequency Guided Localisation in Breast Surgery: A Systematic Review. Cancers (Basel). 2021 Oct 5;13(19):4996. doi: 10.3390/cancers13194996.
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Radioactive seeds (for RCTs see meta-analyses above):

1. Schermers B, van Riet YE, Schipper RJ et al. Nationwide registry study on trends in localization techniques and reoperation rates in non-palpable ductal carcinoma in situ and invasive breast cancer. Br J Surg. 2021 Oct 13;znab339. doi: 10.1093/bjs/znab339.


ROLL: for RCTs see meta-analyses above



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Guidelines Breast
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In Zusammen-
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Localization Methods for non-Palpable Breast Cancer: A Meta-Analysis

Athanasίου et al. Eur J Surg Onc 2021:

- Meta-analysis of RCTs
- 18 studies with 3112 patients
- Pairwise and network meta-analysis

Ultrasound-guided surgery vs. wire-guided surgery:

- decreased positive margin both in the pairwise [OR = 0.19 (0.11, 0.35); P < 0.01] and network meta-analysis [OR = 0.19 (0.11, 0.60)]
- a statistically significant reduction in re-operation rate [OR = 0.19 (0.11, 0.36); P < 0.01] and operative time [MD = -4.24 (-7.85, -0.63); P = 0.02]

Ultrasound-guided surgery vs. ROLL / RSL:

- a statistically significant reduction in positive margin compared to ROLL [OR = 0.19 (0.11, 0.6)] and RSL [OR = 0.26 (0.13, 0.52)]

„Ultrasound-guided surgery has potential benefits in reduction of positive surgical margin, the rest of the techniques seem to have equivalent efficacy.”

1. Athanasίου C, Mallidis E, Tuffaha H. Comparative effectiveness of different localization techniques for non-palpable breast cancer. A systematic review and network meta-analysis. Eur J Surg Oncol. 2021 Oct 11;S0748-7983(21)00751-4. doi: 10.1016/j.ejso.2021.10.001.

Brusterhaltende Operation (BEO) Resektionsränder

	Oxford		
	LoE	GR	AGO
■ Invasives Mammakarzinom ohne extensive intraduktale Komponente (EIC)*			
■ Ziel: tumorfreie Resektionsränder (auch bei ungünstiger Biologie ist "no ink on tumor" ausreichend)	2a	A	++
■ Nachresektion bei invasivem oder in situ Tumorausläufer bis in den Resektionsrand (Paraffinschnitt)	2a	B	++
■ Invasives Mammakarzinom mit EIC*			
■ Nachresektion bei invasivem oder in situ Tumorausläufer bis in den Resektionsrand (Paraffinschnitt)	2a	B	++
■ Nachresektion bei knappem Resektionsrand der intraduktalen Komponente (< 2 mm im Paraffinschnitt)**	2a	B	-

* Keine einheitliche Definition der EIC in der Literatur. Da die EIC das Lokalrezidivrisiko erhöht, wenn die Größe der intraduktalen Komponente in einer Dimension mindestens das Doppelte der Größe der invasiven Komponente beträgt, wird die Verwendung dieser Definition entsprechend der S3-Leitlinie empfohlen.
 ** individuelles Vorgehen mit Berücksichtigung des Alters und der Tumorausdehnung

Invasive cancer – margins:

1. Moran MS, Schnitt SJ, Giuliano AE et al. Society of Surgical Oncology-American Society for Radiation Oncology consensus guideline on margins for breast-conserving surgery with whole-breast irradiation in stages I and II invasive breast cancer. J Clin Oncol. 2014 May 10;32(14):1507-15. doi: 10.1200/JCO.2013.53.3935.
2. Houssami N, Macaskill P, Marinovich ML, Morrow M. The Association of Surgical Margins and Local Recurrence in Women with Early-Stage Invasive Breast Cancer Treated with Breast-Conserving Therapy: a Meta-analysis. Ann Surg Oncol. 2014 March ; 21(3): 717–730. doi:10.1245/s10434-014-3480-5
3. Buchholz TA, Somerfield MR, Griggs JJ, et al. Margins for breast-conserving surgery with whole-breast irradiation in stage I and II invasive breast cancer: American Society of Clinical Oncology endorsement of the Society of Surgical Oncology/American Society for Radiation Oncology consensus guideline. J Clin Oncol. 2014 May 10;32(14):1502-6.
4. Consensus Guideline on Breast Cancer Lumpectomy Margins. The American Society of Breast Surgeons 2018. <https://www.breastsurgeons.org/docs/statements/Consensus-Guideline-on-Breast-Cancer-Lumpectomy-Margins.pdf>
5. Schnitt SJ, Moran MS, Giuliano AR. Lumpectomy Margins for Invasive Breast Cancer and Ductal Carcinoma in Situ: Current Guideline Recommendations, Their Implications, and Impact. J Clin Oncol. 2020; 38(20):2240-2245. doi: 10.1200/JCO.19.03213.

Invasive cancer with intraductal component - margins:

1. Morrow M, Van Zee KJ, Solin LJ et al. Society of Surgical Oncology-American Society for Radiation Oncology-American Society of Clinical Oncology Consensus Guideline on Margins for Breast-Conserving Surgery With Whole-Breast Irradiation in Ductal Carcinoma In Situ. J Clin Oncol. 2016 Nov 20;34(33):4040-4046. doi: 10.1200/JCO.2016.68.3573.
2. Marinovich ML, Azizi L, Macaskill P et al. The Association of Surgical Margins and Local Recurrence in Women with Ductal Carcinoma In Situ Treated with Breast-Conserving Therapy: A Meta-Analysis. Ann Surg Oncol. 2016 Nov;23(12):3811-3821. doi: 10.1245/s10434-016-5446-2.

Statement: tumor free margins in intrinsic subtypes

1. Sioshansi S, Ehdaivand S, Cramer C, et al. Triple negative breast cancer is associated with an increased risk of residual invasive carcinoma after lumpectomy. Cancer. 2012 Aug 15;118(16):3893-8
2. Gangi A, Chung A, Mirocha J et al. Breast-conserving therapy for triple-negative breast cancer. JAMA Surg. 2014 Mar;149(3):252-8
3. Vaz-Luis I, Ottesen RA, Hughes ME, et al. Outcomes by tumor subtype and treatment pattern in women with small, node-negative breast cancer: a multi-institutional study. J Clin Oncol. 2014 Jul 10;32(20):2142-50.
4. Pilewski M, Ho A, Orell E, et al. Effect of margin width on local recurrence in triple-negative breast cancer patients treated with breast conserving therapy. Ann Surg Oncol. 2014 Apr;21(4):1209-14.

Statement: ... re-excision ...

1. Hennigs A, Fuchs V, Sinn HP et al. Do Patients After Reexcision Due to Involved or Close Margins Have the Same Risk of Local Recurrence as Those After One-Step Breast-Conserving Surgery? Ann Surg Oncol. 2016 Jun;23(6):1831-7. doi: 10.1245/s10434-015-5067-1
2. Fisher S, Yasui Y, Dabbs K, et al. (2018) Re-excision and survival following breast conserving surgery in early stage breast cancer patients: a population-based study. BMC Health Serv Res 18:94. 10.1186/s12913-018-2882-7
3. Kitchen PR, Cawson JN, Moore SE: Margins and outcome of screen-detected breast cancer with extensive in situ component. ANZ J Surg. 2006 Jul;76(7):591-5

4. Schouten van der Velden AP, Van de Vrande SL, Boetes C: Residual disease after re-excision for tumor-positive surgical margins in both ductal carcinoma in situ and invasive carcinoma of the breast: The effect of time. J Surg Oncol. 2007 Dec 1;96(7):569-74
5. McIntosh A, Freedman G, Eisenberg D: Recurrence rates and analysis of close or positive margins in patients treated without re-excision before radiation for breast cancer. Am J Clin Oncol. 2007 Apr;30(2):146-51.
6. Kurniawan ED, Wong MH, Windle I: Predictors of surgical margin status in breast-conserving surgery within a breast screening program. Ann Surg Oncol. 2008 Sep;15(9):2542-9.
7. Tamburelli F, Maggiorotto F, Marchio C, et al. (2020) Reoperation rate after breast conserving surgery as quality indicator in breast cancer treatment: A reappraisal. Breast 53:181-188. 10.1016/j.breast.2020.07.008

Extensive intraductal component:

1. Sinn HP, Anton HW, Magener A et al. Extensive and predominant in situ component in breast carcinoma: their influence on treatment results after breast-conserving therapy. Eur J Cancer, 1998. 34(5): p. 646- 53.
2. S3-Guideline Early Detection, Diagnosis, Treatment and Follow-up Care of Breast Cancer (Version 4.4, June 2021)
3. Ha SM, Cha JH, Shin HJ et al. Mammography, US, and MRI to Assess Outcomes of Invasive Breast Cancer with Extensive Intraductal Component: A Matched Cohort Study. Radiology. 2019 Aug;292(2):299-308. doi: 10.1148/radiol.2019182762.

Brusterhaltende Operation (BEO)

Vorgehensweise, Technische Aspekte

	Oxford		
	LoE	GR	AGO
▪ Präparateradiographie und / oder -sonographie bei nicht-palpablen Befunden und / oder tumorassoziertem Mikrokalk*	2b	B	++
▪ Intraoperative Sonographie zur Erhöhung der R0-Resektionsrate bei nicht-palpablen Befunden	1a	A	+
▪ Intraoperative Sonographie zur Erhöhung der R0-Resektionsrate bei palpablen Befunden (geringeres Resektionsvolumen)	1b	B	+
▪ Intraoperative Clipmarkierung des Tumorbetts bei Indikation für Boost- oder Teilbrustbestrahlung	2b	B	+
▪ Intraoperative Schnittrandbeurteilung (mit Margin Probe®)	1b	A	+/-
▪ Stereotaktische Befundentfernung als alleinige Therapie	4	D	--

* obligat auch bei Verwendung von sondengestützten Detektionssystemen (magnetische Seeds, Radar-Reflexion, RFID, radioaktive Seeds, ROLL)

Statement: stereotactic excision alone ...

1. Jackman RJ, Birdwell RL, Ikeda DM: Atypical ductal hyperplasia: can some lesions be defined as probably benign after stereotactic 11-gauge vacuum-assisted biopsy, eliminating the recommendation for surgical excision? Radiology. 2002 Aug;224(2):548-54
2. Jacobs TW, Connolly JL, Schnitt SJ: Nonmalignant lesions in breast core needle biopsies: to excise or not to excise? Am J Surg Pathol. 2002 Sep;26(9):1095-110
3. Plantade R, Hammou JC, Fighiera M: Underestimation of breast carcinoma with 11-gauge stereotactically guided directional vacuum-assisted biopsy. J Radiol. 2004 Apr;85(4 Pt 1):391-401
4. Jeevan R, Cromwell DA, Trivella M, et al. Reoperation rates after breast conserving surgery for breast cancer among women in England: retrospective study of hospital episode statistics. BMJ. 2012 Jul 12;345:e4505. doi: 10.1136/bmj.e4505.

Intraoperative ultrasound: Meta-analyses:

1. Athanasiou C, Mallidis E, Tuffaha H. Comparative effectiveness of different localization techniques for non-palpable breast cancer. A systematic review and network meta-analysis. Eur J Surg Oncol. 2021 Oct 11;S0748-7983(21)00751-4. doi: 10.1016/j.ejso.2021.10.001.

2. Ahmed M; Douek, M. Intra-operative ultrasound versus wire-guided localization in the surgical management of non-palpable breast cancers: systematic review and meta-analysis. *Breast Cancer Res Treat.* 2013 Aug;140(3):435-46.
3. Pan H, Wu N, Ding H, et al. Intraoperative Ultrasound Guidance Is Associated with Clear Lumpectomy Margins for Breast Cancer: A Systematic Review and Meta-Analysis. *PLOS One* 2013;8(9), e74028
4. Banys-Paluchowski M, Rubio IT, Karadeniz Cakmak G et al. Intraoperative ultrasound-guided excision of non-palpable and palpable breast cancer: systematic review and meta-analysis. in press 2022

Intraoperative ultrasound: RCTs in non-palpable breast cancer:

1. Hu X, Si Li, Yi Jiang et al: Intraoperative ultrasound-guided lumpectomy versus wire-guided excision for nonpalpable breast cancer. *J Int Med Res* 48 (1):1-12, 2020
2. Hoffmann J, Marx M, Hengstmann A, et al:Ultrasound-Assisted Tumor Surgery in Breast Cancer - A Prospective, Randomized, Single-Center Study (MAC 001); *Ultraschall Med.* 2019 Jun;40(3):326-332. doi: 10.1055/a-0637-1725.
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Intraoperative ultrasound: RCTs in palpable breast cancer:

1. Volders JH, Haloua MH, Krekel NM et al. (2017) Intraoperative ultrasound guidance in breast-conserving surgery shows superiority in oncological outcome, long-term cosmetic and patient-reported outcomes: Final outcomes of a randomized controlled trial (COBALT). *Eur J Surg Oncol* 43:649-657. 10.1016/j.ejso.2016.11.004
2. Volders JH, Negenborn VL, Haloua MH, et al. (2018) Breast-specific factors determine cosmetic outcome and patient satisfaction after breast-conserving therapy: Results from the randomized COBALT study. *J Surg Oncol* 117:1001-1008. 10.1002/jso.25012
3. Krishna KL, Srinath BS, Santosh D, Velusamy S, Divyamala KP, Sariya Mohammadi J, Kurpad V, Kulkarni S, Yaji P, Goud S, Dhanireddy S, Ram J (2020) A comparative study of perioperative techniques to attain negative margins and spare healthy breast tissue in breast conserving surgery. *Breast Dis* 39:127-135. 10.3233/BD-200443
4. Vispute T, Suhani, Seenu V, et al. (2018) Comparison of resection margins and cosmetic outcome following intraoperative ultrasound-guided excision versus conventional palpation-guided breast conservation surgery in breast cancer: A randomized

controlled trial. Indian J Cancer 55:361-365. 10.4103/ijc.IJC_2_18

Margin probe:

1. Freya Schnabel, Susan K. Boolbol, Mark Gittleman, et al: A Randomized Prospective Study of Lumpectomy Margin Assessment with Use of MarginProbe in Patients with Nonpalpable Breast Malignancies Ann Surg Oncol (2014) 21:1589–1595
2. Geha RC, Taback B, Cadena L et al. A Single institution's randomized double-armed prospective study of lumpectomy margins with adjunctive use of the MarginProbe in nonpalpable breast cancers. Breast J. 2020 Nov;26(11):2157-2162. doi: 10.1111/tbj.14004.
3. Allweis TM, Kaufman Z, Lelcuk S et al. A prospective, randomized, controlled, multicenter study of a real-time, intraoperative probe for positive margin detection in breast-conserving surgery. Am J Surg. 2008 Oct;196(4):483-9. doi: 10.1016/j.amjsurg.2008.06.024.
4. Thill M, Dittmer C, Baumann K, Friedrichs K, Blohmer JU. MarginProbe®--final results of the German post-market study in breast conserving surgery of ductal carcinoma in situ. Breast. 2014 Feb;23(1):94-6.

Specimen radiography/Specimen ultrasound:

1. Versteegden DPA, Keizer LGG, Schlooz-Vries MS et al. Performance characteristics of specimen radiography for margin assessment for ductal carcinoma in situ: a systematic review. Breast Cancer Res Treat. 2017 Dec;166(3):669-679. doi: 10.1007/s10549-017-4475-2
2. St John ER, Al-Khudairi R, Ashrafian H et al. Diagnostic Accuracy of Intraoperative Techniques for Margin Assessment in Breast Cancer Surgery: A Meta-analysis. Ann Surg 2017 Feb;265(2):300-310. doi: 10.1097/SLA.0000000000001897.
3. Tan KY et al. Breast specimen ultrasound and mammography in the prediction of tumour-free margins. ANZ J Surg. 2006 Dec;76(12):1064-7.
4. Mazouni C, Rouzier R, Balleyguier C. Specimen radiography as predictor of resection margin status in non-palpable breast lesions. Clin Radiol. 2006 Sep;61(9):789-96.
5. Singletary: Surgical margins in patients with early-stage breast cancer treated with breast conservation therapy. Am J Surg. 2002 Nov;184(5):383-93.
6. Funk A, Heil J, Harcos A et al. Efficacy of intraoperative specimen radiography as margin assessment tool in breast conserving

surgery. Breast Cancer Res Treat. 2020 Jan;179(2):425-433. doi: 10.1007/s10549-019-05476-6.

Intraoperative clip marking of the tumor bed:

1. van Mourik AM, Elkhuisen PHM, Minkema D et al.; Dutch Young Boost Study Group; Corine van Vliet-Vroegindeweij Multiinstitutional study on target volume delineation variation in breast radiotherapy in the presence of guidelines. Radiother Oncol 2010 Mar;94(3):286-91.
2. Hlavka A, Vanasek J, Odrazka K et al. Tumor bed radiotherapy in women following breast conserving surgery for breast cancer-safety margin with/without image guidance. Oncol Lett. 2018 Apr;15(4):6009-6014.
3. Goldberg H, Prosnitz RG, Olson JA, Marks LB. Definition of postlumpectomy tumor bed for radiotherapy boost field planning: CT versus surgical clips. Int J Radiat Oncol Biol Phys. 2005 Sep 1;63(1):209-13.
4. Koch CA, Corey G, Liu ZA et al. Partial Breast Irradiation and Surgical Clip Usage for Tumor Bed Delineation After Breast-Conserving Surgery in Canada: A Radiation Oncology Perspective. Adv Radiat Oncol. 2021 Apr 20;6(4):100701. doi: 10.1016/j.adro.2021.100701. eCollection 2021 Jul-Aug. PMID: 34409206
5. Ebner F, de Gregorio N, Rempfen A, To clip or not to clip the breast tumor bed? A retrospective look at the geographic miss index and normal tissue index of 110 patients with breast cancer. J Turk Ger Gynecol Assoc. 2017 Jun 1;18(2):67-71.

Brusterhaltende Operation (BEO) ohne neoadjuvante Therapie

	Oxford		
	LoE	GR	AGO
▪ Multifokalität / Multizentrität (Voraussetzung: R0-Resektion aller Herde)	2b	B	+
▪ Histologisch befallene Resektionsränder trotz wiederholter Nachresektion	2b	B	--
▪ Inflammatorisches Mammakarzinom	2b	B	--

OP nach neoadjuvanter Chemotherapie siehe Kap. „Neoadjuvante Chemotherapie“

Statement: Multicentricity

1. Wolters R, Wöckel A, Janni W. et al; BRENDA Study Group. Comparing the outcome between multicentric and multifocal breast cancer: what is the impact on survival, and is there a role for guideline-adherent adjuvant therapy? A retrospective multicenter cohort study of 8,935 patients. Breast Cancer Res Treat. 2013 Dec;142(3):579-90.
2. Tan MP, Sitoh NY, Sim AS. Breast conservation treatment for multifocal and multicentric breast cancers in women with small-volume breast tissue. ANZ J Surg. 2014 Dec 5. doi: 10.1111/ans.12942.
3. Winters ZE, Horsnell J, Elvers KT et al. Systematic review of the impact of breast-conserving surgery on cancer outcomes of multiple ipsilateral breast cancers. BJS Open. 2018 May 22;2(4):162-174.
4. Masannat YA, Agrawal A, Maraqa L et al. Multifocal and multicentric breast cancer, is it time to think again? Ann R Coll Surg Engl. 2020 Jan;102(1):62-66.
5. Neri A, Marrelli D, Megha T et al. Clinical significance of multifocal and multicentric breast cancers and choice of surgical treatment: a retrospective study on a series of 1158 cases. BMC Surg. 2015 Jan 14;15:1.
6. Boughey JC, Rosenkranz KM, Ballman KV et al., Impact of breast conservation therapy on local recurrence in patients with multiple ipsilateral breast cancer - results from ACOSOG Z11102 (Alliance). SABCS 2022, GS4-01

Statement: positive microscopic margins

1. Houssami N, Macaskill P, Marinovich ML, et al. The association of surgical margins and local recurrence in women with early-stage invasive breast cancer treated with breast-conserving therapy: a meta-analysis. *Ann Surg Oncol*. 2014 Mar;21(3):717-30.
2. Marinovich ML, Azizi L, Macaskill P, et al: The Association of Surgical Margins and Local Recurrence in Women with Ductal Carcinoma In Situ Treated with Breast-Conserving Therapy: A Meta-Analysis. *Ann Surg Oncol*. 2016 Nov;23(12):3811-3821

Statement: Inflammatory Carcinoma

1. Coleman CN, Wallner PE, Abrams JS. Inflammatory breast issue. *J Natl Cancer Inst*. 2003 Aug 20;95(16):1182-3.
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3. Woodward WA, Buchholz TA. The role of locoregional therapy in inflammatory breast cancer. *Semin Oncol*. 2008 Feb;35(1):78-86
4. Bristol IJ, Woodward WA, Strom EA, Locoregional treatment outcomes after multimodality management of inflammatory breast cancer. *Int J Radiat Oncol Biol Phys*. 2008 Oct 1;72(2):474-84.
5. Singletary SE Surgical management of inflammatory breast cancer. *Semin Oncol*. 2008 Feb;35(1):72-7
6. van Uden DJ, van Laarhoven HW, Westenberg AH et al. Inflammatory breast cancer: An overview. *Crit Rev Oncol Hematol*. 2015 Feb;93(2):116-26.
7. Matro JM, Li T, Cristofanilli M, Hughes ME, et al. Inflammatory breast cancer management in the national comprehensive cancer network: the disease, recurrence pattern, and outcome. *Clin Breast Cancer*. 2015 Feb;15(1):1-7.
8. Mamouch F, Berrada N, Aoullay Z et al. Inflammatory Breast Cancer: A Literature Review. *World J Surg*;9(5-6):129-135

Statement: general

1. Marret H, Perrotin F, Bougnoux P. Histologic multifocality is predictive of skin recurrences after conserving treatment of stage I and II breast cancers. *Breast Cancer Res Treat*. 2001 Jul;68(1):1-8.
2. Cho LC, Senzer N, Peters GN. Conservative surgery and radiation therapy for macroscopically multiple ipsilateral invasive breast cancers. *Am J Surg*. 2002 Jun;183(6):650-4.
3. Okumura S, Mitsumori M, Yamauchi C. Feasibility of breast-conserving therapy for macroscopically multiple ipsilateral breast cancer. *Int J Radiat Oncol Biol Phys*. 2004 May 1;59(1):146-51.
4. Oh JL, Dryden MJ, Woodward WA. Locoregional control of clinically diagnosed multifocal or multicentric breast cancer after neoadjuvant chemotherapy and locoregional therapy. *J Clin Oncol*. 2006 Nov 1;24(31):4971-5
5. Meijnen P, Bartelink H. Multifocal ductal carcinoma in situ of the breast: a contraindication for breast-conserving treatment? *J Clin*

Oncol. 2007 Dec 10;25(35):5548-9.

6. Chen H, Wu K, Wang M, et al: Standard mastectomy should not be the only recommended breast surgical treatment for non-metastatic inflammatory breast cancer: A large population-based study in the Surveillance, Epidemiology, and End Results database 18. Breast. 2017 Oct;35:48-54.

Axilläre Lymphknotendisektion (ALND) ohne neoadjuvante Chemotherapie

	Oxford		
	LoE	GR	AGO
▪ Endpunkt: Überleben (bei adäquater, multimodaler Therapie)	3	D	-
▪ Endpunkt: Staging	3	A	-
▪ Endpunkt: Lokoregionale Tumorkontrolle	2a	A	+/-
▪ pN+ (präoperativ histologisch gesichert)	2a	B	+
▪ cN0 pN0 (i+) (sn)	1b	A	--
▪ cN0 pN1mi (sn)	2b	B	--
▪ cN0 pN1 (sn) (T1/2, < 3 SN+, BEO + RT + adäquate Systemtherapie)	1b	A	-
▪ cN0 pN1 (sn) und Mastektomie (keine Radiotherapie der Thoraxwand)	1b	B	++
▪ cN0 pN1 (sn) und Mastektomie (T1/2, < 3 SN+, Radiotherapie der Thoraxwand)	5	D	+/-**
▪ ALND indiziert, aber nicht möglich			
▪ Radiatio analog AMAROS-Studie (evaluiert für cN0 pN1sn)	1b	B	+

*ACOSOG Z0011 Studie ohne klare Definition eines extrakapsulären Wachstums; **Studienteilnahme empfohlen

Statement: Axillary lymph node dissection

1. Brackstone M, Baldassarre FG, Perera FE et al. Management of the Axilla in Early-Stage Breast Cancer: Ontario Health (Cancer Care Ontario) and ASCO Guideline. J Clin Oncol. 2021 Sep 20;39(27):3056-3082. doi: 10.1200/JCO.21.00934
2. Kuehn T, Bembenek A, Decker T. A concept for the clinical implementation of sentinel lymph node biopsy in patients with breast carcinoma with special regard to quality assurance. Cancer. 2005 Feb 1;103(3):451-61
3. Rudenstam CM, Zahrieh D, Forbes JF: Randomized trial comparing axillary clearance versus no axillary clearance in older patients with breast cancer: first results of International Breast Cancer Study Group Trial 10-93. J Clin Oncol 24(3): 337-344, 2006.
4. Van la Parra: The value of sentinel lymph node biopsy in ductal carcinoma in situ (DCIS) and DCIS with microinvasion of the breast. Eur J Surg Oncol. 2008 Jun;34(6):631-5
5. Gerber B, Heintze K, Stubert J, et al. Axillary lymph node dissection in early-stage invasive breast cancer: is it still standard today? Breast Cancer Res Treat. 2011 Aug;128(3):613-24. Epub 2011 Apr 27. Review.
6. Lyman GH, Temin S, Edge SB, et al; American Society of Clinical Oncology Clinical Practice. Sentinel lymph node biopsy for patients with early-stage breast cancer: American Society of Clinical Oncology clinical practice guideline update. Clin Oncol. 2014 May 1;32(13):1365-83

7. Lyman GH, Somerfield MR, Bosserman CD et al. Sentinel Lymph Node Biopsy for Patients with Early Stage Breast Cancer: American Society of Clinical Oncology Clinical Practice Guideline Update. DOI :10.1200/JCO.2016.71.
8. Bromham N, Schmidt-Hansen M, Astin M, et al. Axillary treatment for operable primary breast cancer. Cochrane Database Syst Rev. 2017 Jan 4;1:CD004561.

pN+ (pre-surgery) without neoadjuvant systemic therapy LoE 2a B AGO +

1. Euhus DM. Management of the clinically positive axilla. Breast J. 2020 Jan;26(1):35-38.

cN0 pN0(sn)(i+)LoE 1b A AGO –

1. Rutgers EJ. Sentinel node biopsy: interpretation and management of patients with immunohistochemistry-positive sentinel nodes and those with micrometastases. J Clin Oncol. 2008 Feb 10;26(5):698-702.
2. Li Y, Zhang H, Zhang W, et al: A competing risk analysis model to determine the prognostic value of isolated tumor cells in axillary lymph nodes for T1N0M0 breast cancer patients based on the surveillance, epidemiology, and end results database. Frontiers in Oncology 10:572316, 2020

cN0 pN1 (mi) LoE 2b B AGO --

1. Mamtani A, Patil S, Stempel M, et al. Axillary Micrometastases and Isolated Tumor Cells Are Not an Indication for Post-mastectomy Radiotherapy in Stage 1 and 2 Breast Cancer. Ann Surg Oncol. 2017 Aug;24(8):2182-2188.
2. Cserni G, Gregori D, Merletti F: Meta-analysis of non-sentinel node metastases associated with micrometastatic sentinel nodes in breast cancer. Br J Surg 91(10): 1245-1252, 2004.
3. Rutgers EJ. Sentinel node biopsy: interpretation and management of patients with immunohistochemistry-positive sentinel nodes and those with micrometastases. J Clin Oncol. 2008 Feb 10;26(5):698-702
4. Galimberti V, Cole BF, Zurrada S, et al. International Breast Cancer Study Group Trial 23-01 investigators. Axillary dissection versus no axillary dissection in patients with sentinel-node micrometastases (IBCSG 23-01): a phase 3 randomised controlled trial. Lancet Oncol. 2013 Apr;14(4):297-305.

cN0 pN1 (sn) (cT1/2 , < 3 SN +, BCS + tangential radiation field, adequate systemic therapy) LoE 1b A AGO -

1. Giuliano AE, Ballman KV, McCall L, et al. Effect of Axillary Dissection vs No Axillary Dissection on 10-Year Overall Survival Among Women With Invasive Breast Cancer and Sentinel Node Metastasis: The ACOSOG Z0011 (Alliance) Randomized Clinical Trial. JAMA. 2017 Sep 12;318(10):918-926.
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5. Jagsi R, Chadha M, Moni J, et al. Radiation field design in the ACOSOG Z0011 (Alliance) Trial. J Clin Oncol. 2014 Nov 10;32(32):3600-6.
6. Barrio AV, Downs-Canner S, Edelweiss M et al. Microscopic Extracapsular Extension in Sentinel Lymph Nodes Does Not Mandate Axillary Dissection in Z0011-Eligible Patients. Ann Surg Oncol. 2019 Dec 9.

cN0 pN1 (sn) and mastectomy (no chestwall radiotherapy) LoE 1b B AGO +*



1. Cody HS 3rd. Extending ACOSOG Z0011 to Encompass Mastectomy: What Happens Without RT? Ann Surg Oncol. 2017 Mar;24(3):621-623.

ALND indicated, but not feasible – Radiotherapy according to AMAROS-trial (validated for cN0 pN1sn) LoE 1b B AGO +

1. Donker M, van Tienhoven G, Straver ME, et al. Radiotherapy or surgery of the axilla after a positive sentinel node in breast cancer (EORTC 10981-22023 AMAROS): a randomised, multicentre, open-label, phase 3 non-inferiority trial. Lancet Oncol. 2014 Nov;15(12):1303-10.

2. Euhus DM. Management of the clinically positive axilla. Breast J. 2020 Jan;26(1):35-38.


ACOSOG Z0011 ohne klare Definition des extrakapsulären Wachstums: A, Giuliano: persönliche Kommunikation 04. Januar 2023

 ARBEITSGEMEINSCHAFT GYNÄKOLOGISCHE ONKOLOGIE E.V.							Oxford		
 MAMMA							LoE	GR	AGO
cN-Status (vor NACT)	pN-Status (vor NACT)	ycN-Status (nach NACT)	Axilläre operative Intervention (nach NACT)	AGO	ypN-Status (nach NACT und Operation)	Operative Konsequenz aus Histobefund			
cN0*	Keine OP vor NACT	ycN0	SLNE	++	ypN0 (sn)	Keine	2b	B	++
					ypN0 (i+) (sn)	ALND	2b	C	+/-
					ypN1mi (sn)	ALND	2b	C	+
					ypN1 (sn)	ALND	2b	C	++

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sowie
in der DKG e.V.

Guidelines Breast
Version 2023.1D

In Zusammen-
arbeit mit:



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FORSCHEN
LEHREN
HEILEN

* Studienbeteiligung an EUBREAST-01 empfohlen

1. Giuliano AE, Ballman KV, McCall L et al. Effect of axillary dissection vs no axillary dissection on 10-year overall survival among women with invasive breast cancer and sentinel node metastasis: The acosog z0011 (alliance) randomized clinical trial. JAMA 2017, 318, 918-926
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5. Cortazar P, Geyer CE Jr. Pathological complete response in neoadjuvant treatment of breast cancer. Ann Surg Oncol 2015, 22, 1441-1446.
6. Early Breast Cancer Trialists' Collaborative Group (EBCTCG). Long-term outcomes for neoadjuvant versus adjuvant chemotherapy in early breast cancer: Meta-analysis of individual patient data from ten randomised trials. Lancet Oncol 2018, 19, 27-39.
7. Cirier J, Body G, Jourdan ML et al. Impact of pathological complete response to neoadjuvant chemotherapy in invasive breast cancer according to molecular subtype. Gynecologie, obstetrique, fertilité & senologie 2017, 45, 535-544.
8. Gustavo Werutsky G, Untch M, Hanusch C, Fasching PA, Blohmer JU, Seiler S, Denkert C, Tesch H, Jackisch C, Gerber B et al.

Locoregional recurrence risk after neoadjuvant chemotherapy: A pooled analysis of nine prospective neoadjuvant breast cancer trials. *Eur J Cancer* 2020, 130, 92-101.

9. Kuehn T, Bauerfeind I, Fehm T et al. Sentinel-lymph-node biopsy in patients with breast cancer before and after neoadjuvant chemotherapy (sentina): A prospective, multicentre cohort study. *Lancet Oncol* 2013, 14, 609-618.
10. Boughey JC, Suman VJ, Mittendorf EA et al. Sentinel lymph node surgery after neoadjuvant chemotherapy in patients with node-positive breast cancer: The acosog z1071 (alliance) clinical trial. *Jama* 2013, 310, 1455-1461.
11. Carter S, Neuman H, Mamounas EP et al. Debating the optimal approach to nodal management after pathologic complete response to neoadjuvant chemotherapy in patients with breast cancer. American Society of Clinical Oncology educational book. American Society of Clinical Oncology. Annual Meeting 2019, 39, 42-48.
12. Simons JM, van Nijnatten TJA, van der Pol CC et al. Diagnostic accuracy of different surgical procedures for axillary staging after neoadjuvant systemic therapy in node-positive breast cancer: A systematic review and meta-analysis. *Ann Surg* 2019, 269, 432-442.
13. Tee, S.R.; Devane, L.A.; Evoy, D.; et al. E.W. Meta-analysis of sentinel lymph node biopsy after neoadjuvant chemotherapy in patients with initial biopsy-proven node-positive breast cancer. *Br J Surg* 2018, 105, 1541-1552.
14. Schneeweiss A, Mobus V, Tesch H et al. Intense dose-dense epirubicin, paclitaxel, cyclophosphamide versus weekly paclitaxel, liposomal doxorubicin (plus carboplatin in triple-negative breast cancer) for neoadjuvant treatment of high-risk early breast cancer (geparocto-gbg 84): A randomised phase iii trial. *Eur J Cancer* 2019, 106, 181-192.
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16. Samiei, S.; Simons, J.M.; Engelen, S.M.E.; et al. Axillary pathologic complete response after neoadjuvant systemic therapy by breast cancer subtype in patients with initially clinically node-positive disease: A systematic review and meta-analysis. *JAMA surgery* 2021, e210891.
17. Tadros, A.B.; Yang, W.T.; Krishnamurthy, S.; et al. Identification of patients with documented pathologic complete response in the breast after neoadjuvant chemotherapy for omission of axillary surgery. *JAMA surgery* 2017, 152, 665-670.
18. Samiei, S.; van Nijnatten, T.J.A.; de Munck, L.; et al. Correlation between pathologic complete response in the breast and absence of axillary lymph node metastases after neoadjuvant systemic therapy. *Ann Surg* 2018.
19. Kuemmel, S.; Heil, J.; Rueland, A.; et al. A prospective, multicenter registry study to evaluate the clinical feasibility of targeted axillary dissection (tad) in node-positive breast cancer patients. *Ann Surg* 2020.
20. Banys-Paluchowski M, Gasparri ML, de Boniface J et al. Surgical management of the axilla in clinically node-positive breast cancer patients converting to clinical node negativity through neoadjuvant chemotherapy: Current status, knowledge gaps, and rationale

for the eubrest-03 axsana study. *Cancers* 2021, 13.

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23. Wong S.M.; Almana N.; Choi J.; et al. Prognostic Significance of Residual Axillary Nodal Micrometastases and Isolated Tumor Cells After Neoadjuvant Chemotherapy for Breast Cancer. *Ann Surg Oncol* 2019, 26:3502-3509.
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25. Moo, T.A.; Jochelson, M.S.; Zabor, E.C.; et al. Is clinical exam of the axilla sufficient to select node-positive patients who downstage after nac for slnb? A comparison of the accuracy of clinical exam versus mri. *Ann Surg Oncol* 2019, 26:4238-4243.
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30. Liedtke, C.; Gorlich, D.; Bauerfeind, I.; et al. Validation of a nomogram predicting non-sentinel lymph node metastases among patients with breast cancer after primary systemic therapy - a transsentina substudy. *Breast Care (Basel)* 2018, 13, 440-446.
31. Moo, T.A.; Jochelson, M.S.; Zabor, E.C.; et al. Is clinical exam of the axilla sufficient to select node-positive patients who downstage after nac for slnb? A comparison of the accuracy of clinical exam versus mri. *Ann Surg Oncol* 2019, 26, 4238-4243.
32. Kantor, O.; Sipsy, L.M.; Yao, K.; et al. A predictive model for axillary node pathologic complete response after neoadjuvant chemotherapy for breast cancer. *Ann Surg Oncol* 2018, 25, 1304-1311.

Statement: SLNE after NACT

1. El Hage Chehade H, Headon H, El Tokhy O et al. Is sentinel lymph node biopsy a viable alternative to complete axillary dissection following neoadjuvant chemotherapy in women with node-positive breast cancer at diagnosis? An updated meta-analysis involving 3,398 patients. *Am J Surg.* 2016 Nov;212(5):969-981.

Axilläre operative Interventionen bei NACT (cN+)							Oxford		
							LoE	GR	AGO
cN-Status (vor NACT)	pN-Status (vor NACT)	ycN-Status (nach NACT)	Axilläre operative Intervention (nach NACT)	AGO	ypN-Status (nach NACT und Operation)	Operative Konsequenz aus Histobefund			
cN+*	pN+CNB	ycN0	ALND	+	ypN0 / ypN+	Keine	2b	B	++
			TAD	+	ypN0	Keine	2b	B	+
					ypN0 (i+)	ALND	2b	B	+/-
					ypN+ inkl. ypN1mi	ALND	2b	B	+
			SLNE	+/-	ypN0	Keine	2b	B	+/-
					ypN0 (i+)	ALND	2b	B	+/-
					ypN+ inkl. ypN1mi	ALND	2b	B	+
			TLNE	+/-	ypN0	keine	2b	B	+/-
					ypN0 (i+)	ALND	3b	B	+/-
					ypN+ inkl. ypN1mi	ALND	3b	B	+
		ycN+**	ALND	++	ypN0 / ypN+	Keine	2b	B	++

* Studienbeteiligung an AXSANA empfohlen; **Cave: In 30,3% falsch-positive Befunde, ggf. CNB

1. Giuliano AE, Ballman KV, McCall L et al. Effect of axillary dissection vs no axillary dissection on 10-year overall survival among women with invasive breast cancer and sentinel node metastasis: The acosog z0011 (alliance) randomized clinical trial. JAMA 2017, 318, 918-926
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Statement: SLNE after NACT

1. El Hage Chehade H, Headon H, El Tokhy O et al. Is sentinel lymph node biopsy a viable alternative to complete axillary dissection following neoadjuvant chemotherapy in women with node-positive breast cancer at diagnosis? An updated meta-analysis

involving 3,398 patients. Am J Surg. 2016 Nov;212(5):969-981.

Statement: False-positives in ALND after ycN+

1. Hartmann S, Kühn T, Hauptmann M et al., Axillary staging after neoadjuvant chemotherapy for initially node-positive breast carcinoma in Germany. Geburtsh Frauenheilk 2022, online

Statement: TLNE alone:

1. Swarnkar PK, Tayeh S, Michell MJ et al., The Evolving Role of Marked Lymph Node Biopsy (MLNB) and Targeted Axillary Dissection (TAD) after Neoadjuvant Chemotherapy (NACT) for Node-Positive Breast Cancer: Systematic Review and Pooled Analysis. Cancers (Basel) 2021; 13(7):1539

Targeted Axillary Dissection (TAD) = TLNE + SLNE

	Oxford		
	LoE	GR	AGO
▪ Stanzbiopsische Sicherung der LK-Metastase und Markierung	2b	B	++
▪ Markierung von mehreren Lymphknoten bei mehr als 1 suspekten LK	2b	B	+/-
▪ Evidenz für den Vergleich einzelner Marker (Clip / Coil, Kohle, magnetischer Seed, Radar-Reflexion, Radiofrequenzmarker etc.) nicht ausreichend*	2b	B	
▪ TAD bei 1-3 suspekten LK vor NACT	2b	B	+
▪ TAD bei ≥ 4 suspekten LK vor NACT	5	D	+/-
▪ Vollständige Aufarbeitung aller Lymphknoten am Paraffinschnitt mit Schnittstufen von ≤ 500 µm	5	D	++
▪ Immunhistochemie zum Nachweis von ITC	5	D	+/-
▪ ALND bei prä- oder intraoperativ nicht auffindbarem Marker	5	D	+
▪ Weitere Intervention zur Entfernung des nicht auffindbaren Markers (auch nach ALND)	5	D	-
▪ Alleinige TLNE ohne SLNE	2B	B	+/-

* Studienbeteiligung an AXSANA empfohlen

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2. Banys-Paluchowski M, Gasparri ML, de Boniface J et al. Surgical Management of the Axilla in Clinically Node-Positive Breast Cancer Patients. Converting to Clinical Node Negativity through Neoadjuvant Chemotherapy: Current Status, Knowledge Gaps, and Rationale for the EUBREAST-03 AXSANA Study. Cancers (Basel). 2021 Mar 29;13(7):1565. doi: 10.3390/cancers13071565.
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4. Caudle AS, Yang WT, Krishnamurthy S et al. Improved Axillary Evaluation Following Neoadjuvant Therapy for Patients With Node-Positive Breast Cancer Using Selective Evaluation of Clipped Nodes: Implementation of Targeted Axillary Dissection. J Clin Oncol 2016;34(10):1072-8
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23. Lim GH, Gudi M, Teo SY et al. Would Removal of All Ultrasound Abnormal Metastatic Lymph Nodes Without Sentinel Lymph Node Biopsy Be Accurate in Patients with Breast Cancer with Neoadjuvant Chemotherapy? *Oncologist*. 2020; 25(11):e1621-e1627. doi: 10.1634/theoncologist.2020-0494
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Statement: TLNE alone:

1. Swarnkar PK, Tayeh S, Michell MJ et al., The Evolving Role of Marked Lymph Node Biopsy (MLNB) and Targeted Axillary Dissection (TAD) after Neoadjuvant Chemotherapy (NACT) for Node-Positive Breast Cancer: Systematic Review and Pooled Analysis. *Cancers (Basel)* 2021; 13(7):1539

Sentinel-Lymphknoten-Exzision (SLNE) Indikationen I

	Oxford		
	LoE	GR	AGO
▪ Klinisch / sonographisch neg. Axilla (cN0)	1b	A	++
▪ cT 1–2	2b	A	++
▪ cT 3–4c	3b	B	+
▪ Multifokales / multizentrisches Mammakarzinom	2b	B	+
▪ DCIS			
▪ Mastektomie	3b	B	+
▪ BET	3b	B	-
▪ DCIS beim Mann	5	D	+/-
▪ Mammakarzinom des Mannes	2b	B	+
▪ Verzicht auf axilläre Intervention bei der älteren Patientin (≥ 70 J., Co-Morbiditäten, pT1, HR+)	3b	B	+/-

Statement: SLNE

1. Brackstone M, Baldassarre FG, Perera FE et al. Management of the Axilla in Early-Stage Breast Cancer: Ontario Health (Cancer Care Ontario) and ASCO Guideline. J Clin Oncol. 2021 Sep 20;39(27):3056-3082. doi: 10.1200/JCO.21.00934. Epub 2021 Jul 19.
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- experience of the European institute of oncology on 854 patients in 10 years. *Ann Surg.* 2008 Feb;247(2):315-9
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 10. Pugliese MS, Karam AK, Hsu M, et al. Predictors of Completion Axillary Lymph Node Dissection in Patients With Immunohistochemical Metastases to the Sentinel Lymph Node in Breast Cancer. *Ann Surg Oncol.* 2009 Dec 22. [Epub ahead of print]
 11. Lyman GH, Temin S, Edge S et al. American Society of Clinical Oncology Clinical Practice. Sentinel lymph node biopsy for patients with early-stage breast cancer: American Society of Clinical Oncology clinical practice guideline update. *Clin Oncol.* 2014 May 1;32(13):1365-83
 12. Lyman GH, Somerfield MR et al. Sentinel Lymph Node Biopsy for Patients With Early-Stage Breast Cancer: American Society of Clinical Oncology Clinical Practice Guideline Update. *J Clin Oncol.* 2017;35(5):561–564.
 13. Charalampoudis P, Markopoulos C, Kovacs T.: Controversies and recommendations regarding sentinel lymph node biopsy in primary breast cancer: A comprehensive review of current data. *Eur J Surg Oncol.* 2017 Nov 13. pii: S0748-7983(17)30955-1. doi: 10.1016/j.ejso.2017.10.215. [Epub ahead of print]
 14. Morrow M1, Van Zee KJ, Patil S, et al: Axillary Dissection and Nodal Irradiation Can Be Avoided for Most Node-positive Z0011-eligible Breast Cancers: A Prospective Validation Study of 793 Patients. *Ann Surg.* 2017 Sep;266(3):457-462.

Statement: preoperative FNA / CNB (core needle biopsy) of suspicious lymph nodes

1. Houssami N, Ciatto S, Turner RM, et al. Preoperative ultrasound-guided needle biopsy of axillary nodes in invasive breast cancer – a metaanalysis. *Ann Surg Oncol* 2011;254:243-251
2. Diepstraten SC, Sever AR, Buckens CF, et al. Value of preoperative ultrasound-guided axillary lymph node biopsy for preventing completion axillary lymph node dissection in breast cancer: a systematic review and meta-analysis. *Ann Surg Oncol.* 2014;21(1):51-9.
3. Nakamura R, Yamamoto N, Miyaki T, et al. Impact of sentinel lymph node biopsy by ultrasound-guided core needle biopsy for patients with suspicious node positive breast cancer. *Breast Cancer.* 2018;25(1):86–93.

Statement: Multifocal / multicentric MaCa

1. Ferrari A, Dionigi P, Rovera F. Multifocality and multicentricity are not contraindications for sentinel lymph node biopsy in breast

cancer surgery. World J Surg Oncol. 2006 Nov 20;4:79.

Statement: DCIS

1. Tuttle TM, Shamliyan T, Virnig BA, et al. The impact of sentinel lymph node biopsy and magnetic resonance imaging on important outcomes among patients with ductal carcinoma in situ. J Natl Cancer Inst Monogr. 2010;2010(41):117-20.
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3. van Roozendaal LM, Goorts B, Klinkert M, et al. Sentinel lymph node biopsy can be omitted in DCIS patients treated with breast conserving therapy. Breast Cancer Res Treat. 2016 Apr;156(3):517-525.
4. Bonev V, De Paz Villanueva CC, et al. Is Sentinel Lymph Node Dissection Necessary in All Patients with Ductal Carcinoma In Situ Undergoing Total Mastectomy? Am Surg. 2016 Oct;82(10):982-984.

Statement: Male

1. Boughey JC et al. Comparative analysis of sentinel lymph node operation in male and female breast cancer patients. J Am Coll Surg. 2006 Oct;203(4):475-80.
2. Gentilini O et al. Sentinel Lymph Node Biopsy in Male Patients with Early Breast Cancer. *Oncologist* 2007;12;512-515

Statement: Elderly

1. Reimer T, Gerber B. Quality-of-life considerations in the treatment of early-stage breast cancer in the elderly. Drugs Aging. 2010 Oct 1;27(10):791-800.
2. Gerber B, Heintze K, Stubert J, et al. Axillary lymph node dissection in early-stage invasive breast cancer: is it still standard today? Breast Cancer Res Treat. 2011 Aug;128(3):613-24

Statement: Lymphedema

1. Miller CL, Specht MC, Skolny MN, et al. Sentinel lymph node biopsy at the time of mastectomy does not increase the risk of lymphedema: implications for prophylactic surgery. Breast Cancer Res Treat. 2012 Oct;135(3):781-9.

Sentinel-Lymphknoten-Exzision (SLNE)

Indikationen II

	Oxford		
	LoE	GR	AGO
▪ Während Schwangerschaft oder Stillzeit (nur ^{99m} Tc-Kolloid, keine Markierung mit Patent- oder Methylenblau, keine Daten zu SPIO oder ICG)	3	C	++
▪ Nach vorausgegangener Tumorektomie	2b	B	+
▪ Nach vorausgegangener „großer“ Brust-Operation (z. B. Reduktionsplastik)	3b	C	+/-
▪ Ipsilaterales intramammäres Rezidiv nach vorheriger BET und SLNE	4	D	-
▪ SLNE entlang der A. mammaria interna	2b	B	-
▪ Nach Axilla-Voroperation	3b	B	+/-
▪ Prophylaktische bilaterale / kontralaterale Mastektomie	3b	B	--
▪ Inflammatorisches Mammakarzinom	3b	C	-

Statement: pregnancy

1. Khera SY, Kiluk JV, Hasson DM Pregnancy-associated breast cancer patients can safely undergo lymphatic mapping. Breast J. 2008 May-Jun;14(3):250-4
2. Bergkvist L. Resolving the controversies surrounding lymphatic mapping in breast cancer. Future Oncol. 2008 Oct;4(5):681-8.
3. Classe JM, Loussouarn D, Campion L, et al. Validation of axillary sentinel lymph node detection in the staging of early lobular invasive breast carcinoma: a prospective study. Cancer. (2004); 100(5):935-41.
4. Han SN, Amant F, Cardonick EH, et al. International Network on Cancer, Infertility and Pregnancy: Axillary staging for breast cancer during pregnancy: feasibility and safety of sentinel lymph node biopsy. Breast Cancer Res Treat. 2018 Apr;168(2):551-557.
5. Liberale V, Tripodi E, Ottino L, Biglia N. Surgery on breast cancer in pregnancy. Transl Cancer Res. 2019 Oct;8(Suppl 5):S493-S502.

Statement: internal mammarian

1. Avisar E, Molina MA, Scarlata M: Internal mammary sentinel node biopsy for breast cancer. Am J Surg. 2008 Oct;196(4):490-4.
2. Chen RC, Lin NU, Golshn M: Internal mammary nodes in breast cancer: diagnosis and implications for patient management -- a systematic review. J Clin Oncol. 2008 Oct 20;26(30):4981-9.
3. Wouters MW, van Geel AN, Menke-Pluijmers M: Should internal mammary chain (IMC) sentinel node biopsy be performed? Outcome in 90 consecutive non-biopsied patients with a positive IMC scintigraphy. Breast. 2008 Apr;17(2):152-8.

Statement: prophylactic mastectomy

1. Dupont et al. The role of sentinel lymph node biopsy in women undergoing prophylactic mastectomy. Am J Surg 2000 Oct;180(4):274-7
2. Soran A et al.: Is routine sentinel lymph node biopsy indicated in women undergoing contralateral prophylactic mastectomy? Magee-Womens Hospital experience. Ann Surg Oncol 2007 Feb;14(2):646-51.
3. Boughey JC et al.: Decision analysis to assess the efficacy of routine sentinel lymphadenectomy in patients undergoing prophylactic mastectomy. Cancer 2007 Dec 1;110(11):2542-50

Statement: After previous tumor excision

1. Celebioglu et al.: Sentinel node biopsy in non-palpable breast cancer and in patients with a previous diagnostic excision. Eur J Surg Oncol 2007 Apr;33(3):276-80.

Statement: previous major breast surgery

1. Intra et al. Sentinel lymph node biopsy is feasible even after total mastectomy. J Surg Oncol 2007 Feb 1;95(2):175-9
2. Kaminski A, Amr D, Kimbrell ML: Lymphatic mapping in patients with breast cancer and previous augmentation mammoplasty. Am Surg. 2007 Oct;73(10):981-3
3. Karam A, Stempel M, Cody HS 3rd: Reoperative sentinel lymph node biopsy after previous mastectomy. J Am Coll Surg. 2008;207(4):543-8
4. Ruano R, Ramos M, Garcia-Talavera JR: Staging the axilla with selective sentinel node biopsy in patients with previous excision of non-palpable and palpable breast cancer. Eur J Nucl Med Mol Imaging. 2008 Jul;35(7):1299-304.

Statement: Ipsilateral breast recurrence after prior BCS and prior SLNB

1. Mattia Intra M, Triro G, Viale G: Second Biopsy of Axillary Sentinel Lymph Node for Reappearing Breast Cancer After Previous Sentinel Lymph Node Biopsy. Ann Surg Oncol. 2005;12(11):895-9
2. Intra et al. Second axillary sentinel node biopsy for ipsilateral breast tumour recurrence. Br J Surg 2007 Oct;94(10):1216-9
3. Schrenk P et al. Lymphatic mapping in patients with primary or recurrent breast cancer following previous axillary surgery. Eur J Surg Oncol. 2008 Aug;34(8):851-6.
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2008;29:565-567

5. Intra M, Viale G, Vila J, et al. Second Axillary Sentinel Lymph Node Biopsy for Breast Tumor Recurrence: Experience of the European Institute of Oncology. *Ann Surg Oncol*. 2015 Jul;22(7):2372-7.
6. Moffat FL Jr, Yakoub D.: Bilateral mastectomy and the retreat from breast-conserving surgery. *Breast Cancer Res Treat*. 2016 Aug;159(1):15-30.
7. Folli S, Falco G, Mingozi M, et al. Repeat sentinel lymph node biopsy in patients with ipsilateral recurrent breast cancer after breast-conserving therapy and negative sentinel lymph node biopsy: a prospective study. *Minerva Chir*. 2016 Apr;71(2):73-9.

Statement: inflammatory breast cancer

1. Fayanju OM, Ren Y, Greenup RA, et al. Extent of axillary surgery in inflammatory breast cancer: a survival analysis of 3500. *Breast Cancer Res Treat*. 2020 Feb;180(1):207-217.
2. Singletary SE. Surgical management of inflammatory breast cancer. *Semin Oncol*. 2008 Feb;35(1):72-7
3. van Uden DJ, van Laarhoven HW, Westenberg AH, et al. Inflammatory breast cancer: An overview. *Crit Rev Oncol Hematol*. 2015 Feb;93(2):116-26.
4. Matro JM, Li T, Cristofanilli M, Hughes ME, et al. Inflammatory breast cancer management in the national comprehensive cancer network: the disease, recurrence pattern, and outcome. *Clin Breast Cancer*. 2015 Feb;15(1):1-7.

Statement: Others

1. Schwartz GF, Giuliano AE, Veronesi U; Consensus Conference Committee. Proceedings of the consensus conference on the role of sentinel lymph node biopsy in carcinoma of the breast, April 19-22, 2001, Philadelphia, Pennsylvania. *Cancer* 2002;94:2542-51
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4. Schrenk et al. Symmetrization reduction mammoplasty combined with sentinel node biopsy in patients operated for contralateral breast cancer. *J Surg Oncol* 2006 Jul 1;94(1):9-15.
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6. Lyman GH, Somerfield MR et al. Sentinel Lymph Node Biopsy for Patients With Early-Stage Breast Cancer: American Society of Clinical Oncology Clinical Practice Guideline Update. *J Clin Oncol*. 2017;35(5):561–564.

Sentinel-Lymphknoten-Exzision (SLNE) Markierung

- ^{99m}Tc Kolloid
- Präoperative Lymphszintigraphie (diagnostischer Zugewinn limitiert, aber gesetzlich vorgeschrieben)*
- Patentblau
- Indocyaningrün (ICG)^o
- SPIO[#]
- Methylenblau

Oxford		
LoE	GR	AGO
1a	A	++
1b	A	+
1a	A	+/-
2a	B	+
2a	B	+
2a	B	+/-

* Qualitätssicherung Nuklearmedizin

SPIO: Superparamagnetic Iron Oxide; Cave: eingeschränkte MRT-Sensitivität in der Nachsorge

^o zur Darstellung des SN in der Axilla nicht zugelassen, Off-Label

Statement radiotracer/blue dye:

1. Shams S, Lippold K, Blohmer JU, et al. A Pilot Study Evaluating the Effects of Magtrace® for Sentinel Node Biopsy in Breast Cancer Patients Regarding Care Process Optimization, Reimbursement, Surgical Time, and Patient Comfort Compared With Standard Technetium99. Ann Surg Oncol. 2021 Jun;28(6):3232-3240. doi: 10.1245/s10434-020-09280
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Statement Magnetic Tracer

1. Shams S, Lippold K, Blohmer JU, et al. A Pilot Study Evaluating the Effects of Magtrace® for Sentinel Node Biopsy in Breast Cancer Patients Regarding Care Process Optimization, Reimbursement, Surgical Time, and Patient Comfort Compared With Standard Technetium99. *Ann Surg Oncol*. 2021 Jun;28(6):3232-3240. doi: 10.1245/s10434-020-09280
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Statement: ICG

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Statement: SPIO

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Statement: Comparisons

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Operatives Vorgehen im Rahmen der neoadjuvanten Therapie

	Oxford		
	LoE	GR	AGO
▪ Frühzeitige Markierung des Tumors mit exakter topographischer Dokumentation	5	D	++
▪ Resektion des Tumors / repräsentative Exzision des posttherapeutischen, markierten Tumorareals	2b	C	++
▪ Exzision in neuen Tumorgrenzen	2b	C	++
▪ Freie Resektionsränder	2a	B	++

OP nach neoadjuvanter Chemotherapie siehe Kap. „Neoadjuvante Chemotherapie“

Statement: clip marking

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Statement: operation and : tumor resection in new margins

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Statement: tumor free margins ...

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7. Buchholz TA, Somerfield MR, Griggs JJ et al. Margins for breast-conserving surgery with whole-breast irradiation in stage I and II invasive breast cancer: American Society of Clinical Oncology endorsement of the Society of Surgical Oncology/American Society for Radiation Oncology consensus guideline. *J Clin Oncol*. 2014 May 10;32(14):1502-6.
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Beginn adjuvanter Therapiemaßnahmen nach primärer Operation

	Oxford		
	LoE	GR	AGO
▪ Zeitnahe Beginn der Systemtherapie und adjuvanten Radiotherapie (RT) nach OP	1b	A	++
▪ Beginn der Chemo- ± AK-Therapie nach OP baldmöglichst, vor Radiotherapie	1b	A	++
▪ Wenn keine Chemo- ± Antikörpertherapie:			
▪ Beginn der adjuvanten RT innerhalb von 6–8 Wochen nach OP	2b	B	++
▪ Beginn der endokrinen Therapie nach OP baldmöglichst	5	D	++
▪ Endokrine Therapie gleichzeitig mit RT	2b	B	+

Statement: Timing of radiation and chemotherapy

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Statement: Tamoxifen concurrent with chemotherapy

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cancer. J Clin Oncol. 2005 Jan 1;23(1):24-9.

Statement AI concurrent with radiotherapy

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Statement start of radiation after surgery

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