Current Commentary

Breast Cancer Screening During Lactation

Ensuring Optimal Surveillance for Breastfeeding Women

Helen M. Johnson, MD, Tiffany C. Lewis, DO, and Katrina B. Mitchell, MD

Breast cancer is the most common malignancy among reproductive-aged women, and an increasing number of women are breastfeeding at the time of screening initiation. The literature was reviewed to identify evidence-based guidelines for breast cancer screening during lactation. Health care providers should consider routine age-related or high-risk screening; they should also discuss alternate surveillance strategies, including deferment until cessation of breastfeeding. Shared decision-making and individualized patient care should involve consideration of the limitations of current evidence. Lactation-related radiographic changes may make examination interpretation more challenging; preprocedure milk expression and use of particular supplemental imaging modalities can improve examination sensitivity. Despite these strategies, breastfeeding women may have higher rates of false-positive findings and therefore undergo more biopsies. However, given the increased risk of biologically aggressive breast cancers in postpartum women, these risks may be outweighed by the benefits of routine breast cancer screening for breastfeeding women.

(Obstet Gynecol 2019;00:1–5)

DOI: 10.1097/AOG.0000000000003600

As a result of national trends in delayed childbearing,[1] an increasing number of women are breastfeeding when they reach the age for initiation of breast cancer screening. Although it is clear that lactating women with a breast mass or persistent breast concerns should undergo diagnostic breast imaging,[2] more questions are arising regarding appropriate breast cancer screening in this population.

Few established guidelines for breast cancer screening in the setting of lactation exist. The American College of Radiology recently published guidelines for breast imaging in pregnant and lactating women,[3] including the recommendation that breastfeeding women be offered routine breast cancer screening depending on the individual's risk of malignancy and the anticipated duration of lactation. However, breast cancer screening recommendations vary among different national and specialty-specific societies.[4–10] Some, such as the American College of Radiology, advise that women be stratified into groups based on lifetime risk of breast cancer and offer specific recommendations for each group with regard to timing of screening initiation, screening frequency, and screening modalities.[4] Several organizations recommend that each woman undergo risk assessment to determine her individual lifetime risk of breast cancer before age 30.[5,6]

Rigorous analyses demonstrate that screening initiation at age 40 results in the greatest mortality benefit.[11] For this reason, the American College of Radiology,[4] the National Comprehensive Cancer Network,[7] and the American Society of Breast Surgeons[6] advise that average-risk women initiate screening at age 40 and undergo annual imaging. The American College of Obstetricians and Gynecologists advises that average-risk women be offered screening mammography beginning at age 40 and initiate screening no later than age 50, with a suggested screening interval of 1–2 years.[8] The U.S. Preventive Service Task Force recommends biennial mammographic screening beginning at age 50,[9] and the American Cancer Society recommends annual screening from ages 45–54 followed by screening every 1–2

From the Department of Surgery, Brody School of Medicine, East Carolina University, Greenville, North Carolina; X-Ray Associates of New Mexico, P.C., Albuquerque, New Mexico; and Surgical Oncology, Ridley-Tree Cancer Center, Sansum Clinic, Santa Barbara, California.

Dr. Mitchell thanks her patients for their consent to publish their radiographic images.

Each author has confirmed compliance with the journal's requirements for authorship.

Corresponding author: Katrina B. Mitchell, MD, Surgical Oncology, Ridley-Tree Cancer Center, Santa Barbara, CA; email: kbm9002@me.com.

Financial Disclosure

The authors did not report any potential conflicts of interest.

ISSN: 0029-7844/19

years thereafter.[10] Both of these organizations note that a woman may elect to initiate screening as early as age 40 if she believes that the potential benefits may outweigh the risks in her individual situation.

Breastfeeding women with an above-average lifetime risk of breast cancer, such as those with deleterious *BRCA* or other germline mutations that confer elevated risks of breast cancer, may benefit from a specific screening schedule during lactation. Expert consensus guidelines for *BRCA*-positive lactating women advise that those older than 30 years of age not postpone routine mammography and breast magnetic resonance imaging (MRI) screening, with the recognition that studies may have been delayed during pregnancy owing to concerns about fetal radiation exposure and gadolinium teratogenicity.[12] Alternatively, they suggest that, if a woman plans to breastfeed for fewer than 6 months, she may reasonably delay screening until 6–8 weeks after weaning.[12] Of note, longer duration of breastfeeding is associated with decreased risk of developing breast cancer in women with deleterious *BRCA* mutations, particularly *BRCA1*.[13]

Increasing evidence supports recognition of postpartum women as a unique population with a heightened risk of biologically aggressive breast cancer.[14,15] Women, including those who are breastfeeding, bear this increased risk for up to 10 years after childbirth.[16] As more evidence emerges, it may prove reasonable for lactating women to undergo more frequent, high-risk imaging during the postpartum period. At this time, it is the authors' opinion that this population should, at the very least, not forgo routine screening.

Patients should be reassured that there is no contraindication to mammography during lactation with regard to exposure to ionizing radiation.[17] The American College of Radiology states that breast MRI is "usually not appropriate" as the initial screening modality in this population but may be considered in women with above-average lifetime risk of breast cancer.[3] When contrast-enhanced breast MRI is indicated, health care providers should inform women that no adverse events have been reported in infants who breastfeed after maternal receipt of intravenous gadolinium. Less than 0.0004% of the dose is excreted into breast milk and absorbed by the infant.[18] Women electing to avoid any potential risks should be counseled to express and discard milk for 12–24 hours.[18]

Breastfeeding status should be disclosed to the breast imager at the time of the examination, because the physiologic changes of lactation affect the radiographic appearance of the breast and, therefore, examination interpretation. Proliferation and arborization of the ductal–lobular system as well as presence of breast milk within dilated lactiferous ducts result in increased parenchymal density on mammography (Fig. 1) and increased echogenicity on breast ultrasonography (Fig. 2).[19] On breast MRI, the relative hypervascularity of the lactating breasts confers increased background enhancement, and the presence of breast milk increases T2 signal (Figs. 3 and 4).[19] These radiographic changes appear to resolve by approximately 3 months after the cessation of lactation, potentially mirroring the corresponding involutional changes on a cellular level.[19,20]

Breastfeeding women should breastfeed or express milk just before the imaging examination to decrease parenchymal density and maximize the sensitivity of the study.[19,21] Interpretation of standard breast imaging examinations may still be challenging, requiring additional studies to discern a diagnosis. For example, the American College of Radiology suggests that lactating patients may benefit from digital breast tomosynthesis, or "3-D mammography," to reduce obscurement of abnormal radiographic findings by dense breast tissue (Fig. 1B).[3] Breast ultrasonography represents a particularly valuable supplemental screening examination for

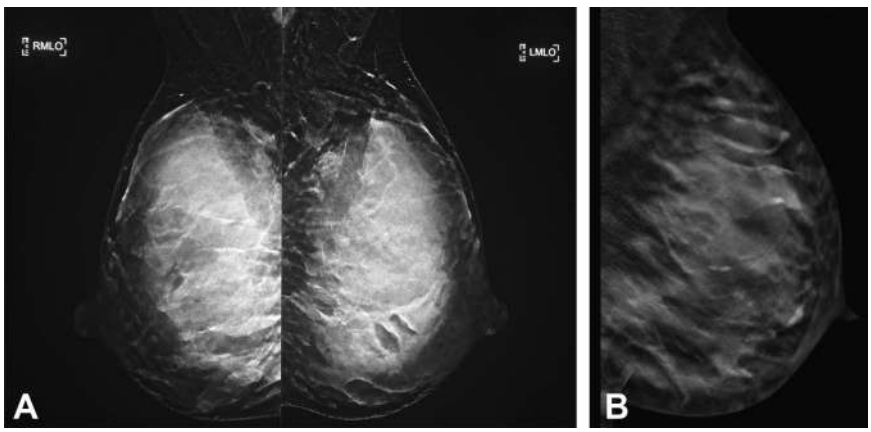

Fig. 1. Screening mammograms of lactating women with normal results. **A**. Bilateral breasts, 36-year-old woman, mediolateral oblique views demonstrate extremely dense breast parenchyma. **B**. Digital breast tomosynthesis, left breast, 30-year-old woman with a known deleterious *BRCA* mutation, mediolateral oblique view demonstrates extremely dense parenchyma.

Johnson. Breast Cancer Screening During Lactation. Obstet Gynecol 2019.

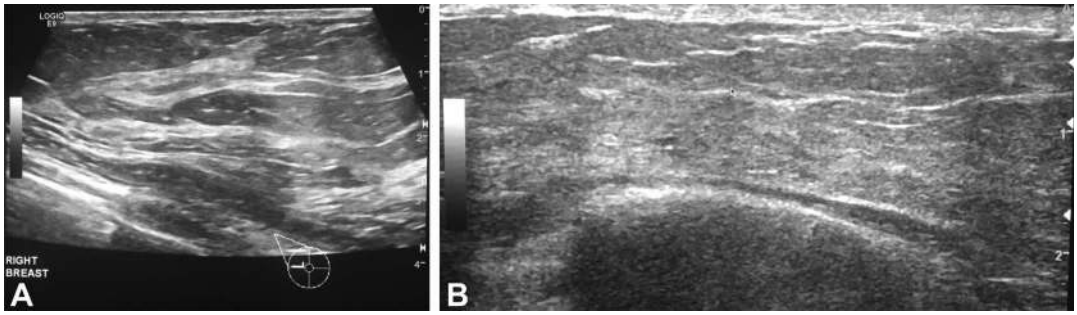

Fig. 2. Screening breast ultrasonograms with normal results, 9 o'clock position of the right breast of the patient described in Fig. 1B. **A**. Baseline ultrasonogram 1 year before pregnancy (2017) demonstrates a mixture of mildly echogenic glandular tissue (*white*) and adipose tissue (*dark grey*). **B**. Ultrasonogram performed during lactation (2019). Nearly all of the adipose tissue has been replaced by mildly echogenic glandular tissue.

Johnson. Breast Cancer Screening During Lactation. Obstet Gynecol 2019.

lactating women.[3] Although ultrasonography is more sensitive than mammography in detection of pregnancy-associated breast cancer and some postpartum breast cancers,[20] this modality has not been studied as a standalone screening test in the lactating population.[3] Moreover, ultrasonography is less sensitive than mammography in the detection of calcifications and architectural distortions.

Despite these considerations, lactating women may incur higher rates of false-positive imaging findings than nonlactating women and thus undergo more biopsies.[3] In addition, breastfeeding patients may develop secretory hyperplasia–related microcalcifications that raise concern for malignancy.[22] Though often round and distributed diffusely and bilaterally, their appearance may be indistinguishable from malignancy-associated calcifications and thus warrant biopsy.[22] Patients should be reassured that the risk of milk fistula after breast biopsy is extremely low and that weaning is not required for biopsy.

Often used in combination with mammography in high-risk, nonlactating women, breast MRI is known for its high sensitivity and accordingly high false-positive rate. Despite the challenge of interpreting MRI images of a lactating breast, diagnostic accuracy can still be expected.[23,24] In some cases, it may be reasonable to delay the examination until several months after weaning to minimize false-positive results that may lead to unnecessary biopsies. However, uninterrupted MRI screening should be considered in high-risk women who plan to breastfeed for long periods of time.[3]

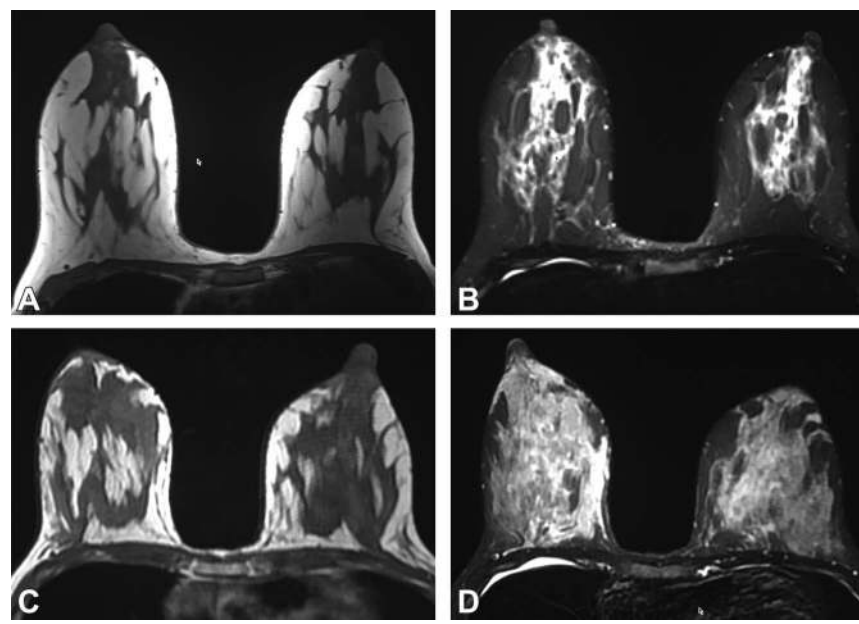

Fig. 3. Screening contrast-enhanced breast magnetic resonance imaging examination with normal results of the patient described in Fig. 1B. T1- (**A**) and T2-weighted short-T1 inversion recovery (STIR) sequences (**B**) obtained in 2017 before pregnancy. In 2019, the patient was postpartum and lactating. T1-weighted images (**C**) demonstrate a marked increase in the ratio of glandular tissue (*dark grey*) to adipose tissue (*white*) compared with the baseline image in **A**, consistent with hypertrophy of glandular tissue. T2-weighted STIR image (**D**) demonstrates marked bilateral T2 hyperintensity compared with the baseline imaging in **B**, consistent with increased fluid content.

Johnson. Breast Cancer Screening During Lactation. Obstet Gynecol 2019.

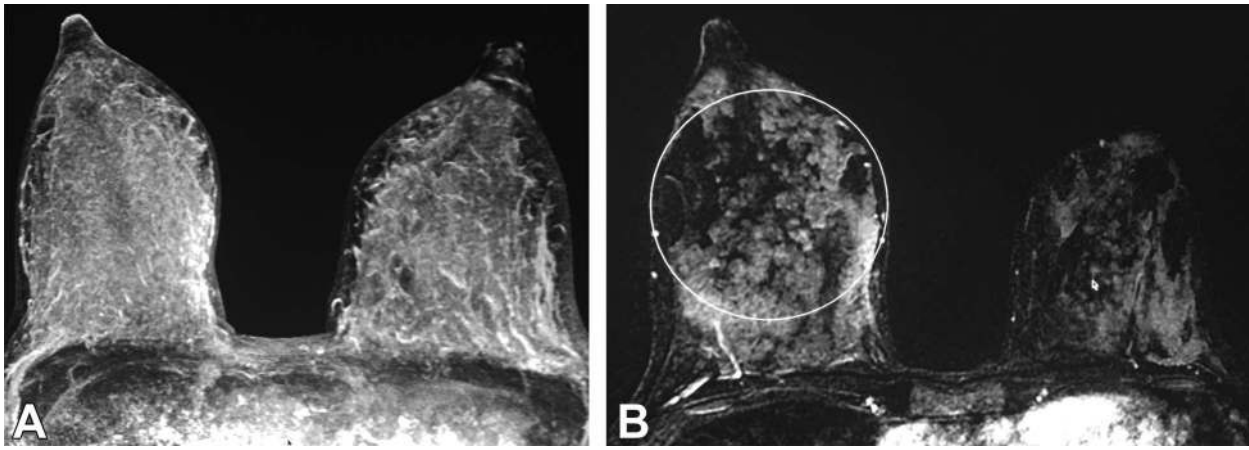

Fig. 4. Screening contrast-enhanced breast magnetic resonance imaging examination with normal results of the patient described in Fig. 1B, performed during lactation. **A**. Postcontrast T1-weighted subtracted maximum intensity projection image demonstrates marked background parenchymal enhancement. **B**. Postcontrast T-weighted fat-suppressed image showing marked background enhancement with a nodular pattern (*circled area, right breast*) corresponding to hypertrophic lobules.

Johnson. Breast Cancer Screening During Lactation. Obstet Gynecol 2019.

In summary, the authors suggest that breastfeeding women should undergo routine breast cancer screening with at least the same frequency as nonlactating women. Special considerations such as preprocedure milk expression and use of particular supplemental imaging modalities can maximize the utility of screening in this unique patient population.

REFERENCES

1. Martin JA, Hamilton BE, Osterman MJK, Driscoll AK, Drake P; Division of Vital Statistics. National vital statistics report. Births: final data for 2017. Available at: https://www.cdc.gov/nchs/data/nvsr/nvsr67/nvsr67_08-508.pdf. Updated November 7, 2018. Retrieved July 15, 2019.
2. Mitchell KB, Johnson HM, Eglash A. ABM clinical protocol #30: breast masses, breast complaints, and diagnostic breast imaging in the lactating woman. Breastfeed Med 2019;14:208–14.
3. diFlorio-Alexander RM, Slanetz PJ, Moy L, Baron P, Didwania AD, Heller SL, et al. ACR Appropriateness Criteria® breast imaging of pregnant and lactating women. J Am Coll Radiol 2018;15:S263–75.
4. Mainiero MB, Moy L, Baron P, Didwania AD, diFlorio RM, Green ED, et al. ACR Appropriateness Criteria® breast cancer screening. J Am Coll Radiol 2017;14:S383–90.
5. Monticciolo DL, Newell MS, Moy L, Niell B, Monsees B, Sickles EA. Breast cancer screening in women at higher-than-average risk: recommendations from the ACR. J Am Coll Radiol 2018;15:408–14.
6. The American Society of Breast Surgeons position statement on screening mammography. Available at: https://www.breastsurgeons.org/docs/statements/Position-Statement-on-Screening-Mammography.pdf. Retrieved July 15, 2019.
7. National Comprehensive Cancer Network. NCCN clinical practice guidelines in oncology: breast cancer screening and diagnosis, version 1. Available at: https://www.nccn.org/professionals/physician_gls/pdf/breast-screening.pdf. Retrieved July 15, 2019.
8. Breast cancer risk assessment and screening in average-risk women. Practice Bulletin No. 179. American College of Obstetricians and Gynecologists. Obstet Gynecol 2017;130:e1–16.
9. Siu AL. Screening for breast cancer: U.S. Preventive services Task Force recommendation statement. Ann Intern Med 2016;164:279–96.
10. Oeffinger KC, Fontham ET, Etzioni R, Herzig A, Michaelson JS, Shih YC, et al. Breast cancer screening for women at average risk: 2015 guideline update from the American cancer society. JAMA 2015;314:1599–614.
11. Ray KM, Joe BN, Freimanis RI, Sickles EA, Hendrick RE. Screening mammography in women 40–49 years old: current evidence. AJR Am J Roentgenol 2018;210:264–70.
12. Carmichael H, Matsen C, Freer P, Kohlmann W, Stein M, Buys SS, et al. Breast cancer screening of pregnant and breastfeeding women with BRCA mutations. Breast Cancer Res Treat 2017;162:225–30.
13. Terry MB, Liao Y, Kast K, Antoniou AC, McDonald JA, Mooij TM, et al. The influence of number and timing of pregnancies on breast cancer risk for women with BRCA1 or BRCA2 mutations. JNCI Cancer Spectr 2018;2:pky078.
14. Callihan EB, Gao D, Jindal S, Lyons TR, Manthey E, Edgerton S, et al. Postpartum diagnosis demonstrates a high risk for metastasis and merits an expanded definition of pregnancy-associated breast cancer. Breast Cancer Res Treat 2013;138:549–59.
15. Johansson AL, Andersson TM, Hsieh CC, Cnattingius S, Lambe M. Increased mortality in women with breast cancer detected during pregnancy and different periods postpartum. Cancer Epidemiol Biomarkers Prev 2011;20:1865–72.
16. Borges VF, Schedin PJ. Pregnancy-associated breast cancer: an entity needing refinement of the definition. Cancer 2012;118:3226–8.
17. Hendrick RE. Radiation doses and cancer risks from breast imaging studies. Radiology 2010;257:246–53.
18. Administration of contrast media to women who are breastfeeding. In: ACR committee on drugs and contrast media. American College of Radiology manual on contrast media,

version 10.3. 11th ed. Reston, VA: American College of Radiology; 2018:99–100.

19. Vashi R, Hooley R, Butler R, Geisel J, Philpotts L. Breast imaging of the pregnant and lactating patient: physiologic changes and common benign entities. AJR Am J Roentgenol 2013;200: 329–36.
20. Vashi R, Hooley R, Butler R, Geisel J, Philpotts L. Breast imaging of the pregnant and lactating patient: imaging modalities and pregnancy-associated breast cancer. AJR Am J Roentgenol 2013;200:321–8.
21. Sabate JM, Clotet M, Torrubia S, Gomez A, Guerrero R, de las Heras P, et al. Radiologic evaluation of breast disorders related to pregnancy and lactation. Radiographics 2007;27(suppl 1): S101–24.
22. Mercado CL, Koenigsberg TC, Hamele-Bena D, Smith SJ. Calcifications associated with lactational changes of the breast: mammographic findings with histologic correlation. AJR Am J Roentgenol 2002;179:685–9.
23. Oh SW, Lim HS, Moon SM, Kim JW, Shin SS, Heo SH, et al. MR imaging characteristics of breast cancer diagnosed during lactation. Br J Radiol 2017;90:20170203.
24. Espinosa LA, Daniel BL, Vidarsson L, Zakhour M, Ikeda DM, Herfkens RJ. The lactating breast: contrast-enhanced MR imaging of normal tissue and cancer. Radiology 2005; 237:429–36.

PEER REVIEW HISTORY

Received July 30, 2019. Received in revised form August 30, 2019. Accepted October 3, 2019. Peer reviews and author correspondence are available at http://links.lww.com/AOG/B643.