Gestational breast cancer: Epidemiology and diagnosis

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INTRODUCTION

Gestational or pregnancy-associated breast cancer is defined as breast cancer that is diagnosed during pregnancy, in the first postpartum year, or any time during lactation. Breast cancer occurring during pregnancy presents a challenging clinical situation since the welfare of both the mother and the fetus must be taken into account in any treatment planning. In addition, prospective studies of breast cancer during pregnancy are very few, and much of the clinical evidence is limited to retrospective case series and case reports.

The epidemiology and diagnosis of pregnancy-associated breast cancer will be reviewed here. The treatment and prognosis of pregnancy-associated breast cancer is discussed separately. (See "Gestational breast cancer: Treatment".)

EPIDEMIOLOGY

Breast cancer is one of the most common cancers in nonpregnant and pregnant women [1]. Pregnancy itself may transiently increase an individual woman's risk of developing breast cancer, despite its long-term protective effect on the development of breast cancer [2-4]. (See "Factors that modify breast cancer risk in women".)

In women under age 30, as many as 20 percent of breast cancers are pregnancy associated; however, in women under age 50, fewer than 5 percent are pregnancy associated [5,6], given that the risk of nonpregnancy-associated breast cancer increases with age.

Pregnancy-associated (or gestational) breast cancer is a relatively uncommon event. The incidence of pregnancy-associated breast cancer (for the prenatal to postpartum period) is approximately 15 to 35 per 100,000 deliveries, with fewer breast cancer cases diagnosed during pregnancy than during the first postpartum year [7-10]. The incidence of pregnancy-associated breast cancer appears to be increasing as more women delay childbearing [9,11].

Women with a genetic predisposition to breast cancer may be overrepresented among pregnant women with cancer, although the available evidence is limited [12-14]. In women who inherit breast cancer susceptibility gene 2 (*BRCA2*; but not *BRCA1*) mutations, the protective effect of multiparity on breast cancer risk may be lost [15].

PATHOLOGIC FEATURES

The majority of breast cancers in pregnant women are infiltrating ductal adenocarcinomas, as in nonpregnant women. However, pregnancy-associated breast cancers are predominantly poorly differentiated and diagnosed at an advanced stage, particularly in those diagnosed while lactating [6,9,16,17]. In addition, women with pregnancy-associated breast cancer may have a higher incidence of inflammatory breast cancer than nonpregnant women of the same age group, but this has not been consistently observed [8,18].

Hormone receptor expression — Most series report a lower frequency of estrogen receptor and progesterone receptor expression in pregnancy-associated breast cancer compared with breast cancer in nonpregnant patients (approximately 25 versus 55 to 60 percent) [5,12,16-19]. (See "Hormone receptors in breast cancer: Clinical utility and guideline recommendations to improve test accuracy".)

HER2 overexpression — Whether or not there is a higher incidence of human epidermal growth factor receptor 2 (HER2) overexpression in pregnancy-associated breast cancer as compared with nonpregnant age-matched controls is unclear [17,20]. HER2-positivity should be evaluated just as in nonpregnant patients. (See "HER2 and predicting response to therapy in breast cancer".)

DIAGNOSIS AND STAGING

Making the diagnosis of breast cancer and performing a staging work-up are more difficult for pregnancy-associated breast cancer due to the physiologic changes in the breast that accompany pregnancy and lactation and the desire to limit radiation exposure to the fetus. (See "Breast development and morphology", section on 'Pregnancy and lactation'.)

Breast cancer is classified according to the Tumor, Node, Metastasis staging system developed by the American Joint Committee on Cancer (AJCC) and the Union for International

Cancer Control. Where clinical guidance is provided in this topic, the anatomic staging system set forth in the eighth edition of the AJCC Staging Manual is used (table 1); however, it is recognized that the studies cited may have used previous editions of the staging system, which is a limitation of existing data. (See "Tumor, node, metastasis (TNM) staging classification for breast cancer".)

Primary tumor — The physiologic changes in the breast that accompany pregnancy (eg, engorgement and hypertrophy) make physical examination more challenging, interpretation of findings more difficult, and may limit the utility of mammography [21]. As a result, diagnostic delays of two months or longer may be common in women with gestational breast cancer [22,23].

Pregnant or postpartum women with breast cancer usually present similarly to nonpregnant women, with a mass or thickening in the breast. Rarely, a nursing infant has refused a breast that harbors an occult carcinoma, leading to an early diagnosis of breast cancer; this has been named the milk rejection sign [24,25].

The index of suspicion for cancer must be high in pregnant women with a breast mass. A breast mass that persists for more than two weeks should be investigated, although the majority (80 percent) of breast biopsies performed in pregnant women will prove to be benign [26,27]. The differential diagnosis of a breast mass in a pregnant or lactating woman includes epithelial breast cancer, a lactating adenoma, plugged ducts, lactational mastitis, fibroadenoma, cystic disease, lobular hyperplasia, milk-retention cyst (galactocele), abscess, lipoma, hamartoma, and rarely, leukemia, lymphoma, phyllodes tumors, sarcoma, neuroma, or tuberculosis [8]. (See "Clinical manifestations, differential diagnosis, and clinical evaluation of a palpable breast mass".)

Mammography — Mammography is not contraindicated in pregnancy as the average glandular dose to the breast for a two-view mammogram (200 to 400 millirad) provides a negligible radiation dose to the fetus as long as abdominal shielding is used [28]. Abdominal shielding is recommended, although there are no data regarding fetal outcomes when mammography has been performed with or without shielding. (See "Breast imaging for cancer screening: Mammography and ultrasonography", section on 'Radiation dose'.)

Mammographic sensitivity is altered by the increased water content, higher density, and loss of contrasting fat in the pregnant or lactating breast. Nevertheless, data suggest that mammography is sufficiently sensitive to diagnose breast cancer during pregnancy and lactation [12,29-31].

Ultrasonography — Breast ultrasonography can determine whether a breast mass is a simple or complex cyst or a solid tumor without the risk of fetal radiation exposure and may be used to guide the diagnostic biopsy. A focal solid mass is observed in the majority of

cases of gestational breast cancer [29,31,32]. (See "Diagnostic evaluation of suspected breast cancer", section on 'Ultrasonography'.)

Breast MRI — Magnetic resonance imaging (MRI) has not been systematically studied for the diagnosis of breast masses in pregnant or lactating women and may be challenging to interpret in the setting of gestational changes to the breast. (See "Diagnostic imaging in pregnant and lactating patients", section on 'Magnetic resonance imaging'.)

Gadolinium-enhanced MRI appears to be more sensitive than mammography for detecting invasive breast cancer, particularly in women with dense breast tissue. Studies demonstrate potential fetal harm with gadolinium exposure in the first trimester [33]. Gadolinium should therefore be avoided during pregnancy if possible [33].

Gadolinium-enhanced breast MRI may be considered in women who are postpartum at the time of diagnosis if the mammogram and/or ultrasound are equivocal. The typical MRI appearance of the normal lactating breast has been described [34].

Biopsy — A clinically suspicious breast mass requires biopsy for definitive diagnosis, regardless of whether or not a woman is pregnant and despite negative mammographic or ultrasound findings. Core, incisional, or excisional biopsies can be performed relatively safely during pregnancy, preferably under local anesthesia [27,35]. Needle core biopsy is the preferred method. (See "Breast biopsy".)

If cancer is identified, hormone receptor status is determined. (See "Clinical features, diagnosis, and staging of newly diagnosed breast cancer", section on 'Breast cancer receptor testing'.)

Lymph nodes — Areas at risk (eg, axillary nodes) and/or clinically suspicious for nodal disease should be further evaluated with ultrasound and fine needle aspiration biopsy for cytologic confirmation. The safety and efficacy of sentinel lymph node biopsy in patients with pregnancy-associated breast cancer is debated. (See "Gestational breast cancer: Treatment", section on 'Management of the axilla'.)

Systemic staging — As noted above, pregnancy-associated breast cancer tends to be diagnosed at an advanced stage [6,12]. As in nonpregnant women, locally advanced-stage disease and/or suspicious symptoms should prompt a complete radiographic staging evaluation. By contrast, women who are asymptomatic and have clinically node-negative, early-stage breast cancer may not require formal evaluation of lung, liver, bone, or brain since the incidence of unsuspected metastases is quite low.

The staging evaluation in breast cancer is discussed separately, as is diagnostic imaging in pregnancy. (See "Clinical features, diagnosis, and staging of newly diagnosed breast cancer" and "Diagnostic imaging in pregnant and lactating patients".)

However, modifications of the standard staging work-up may be implemented to protect the fetus [36,37], and are reviewed in the following sections. Postpartum, staging occurs as per usual guidelines.

Chest evaluation — Chest radiographs to evaluate for lung metastases should be performed with appropriate fetal shielding. Abdominal shielding is recommended, although there are no clinical data comparing fetal radiation exposure with or without shielding. The estimated dose to the fetus with chest radiograph is 0.06 millirad. However, the ability to evaluate the lower lung parenchyma using chest radiography may be limited late in gestation when the gravid uterus is pressing against the diaphragm.

Computed tomography (CT) scans should be avoided whenever possible during pregnancy, because of the large cumulative radiation dose when multiple slices are obtained (table 2). If they are absolutely necessary, radiology should be consulted for further recommendations for radiation-reducing options. However, an MRI of the thorax is typically preferred. As noted above, use of contrast agents such as gadolinium is avoided during pregnancy.

Liver and brain evaluation — Abdominal ultrasound for the evaluation of liver metastases is a safe procedure in pregnant women but is significantly less sensitive than CT or MRI [38]. CT scanning of the abdomen or pelvis is generally not performed during pregnancy because of fetal radiation exposure (table 2). Thus, MRI without contrast is preferred if further visceral organ evaluation is required. The National Radiological Protection Board advises that MRI be avoided in the first trimester if possible since there is limited experience assessing safety during organogenesis [39].

Should brain metastases be suspected, MRI is the most sensitive way to scan the brain, although, as noted above, the safety of contrast agents such as gadolinium may have adverse effects to the fetus. Information regarding the safety and efficacy of positron emission tomography in pregnancy is limited. (See "Diagnostic imaging in pregnant and lactating patients", section on 'Magnetic resonance imaging'.)

Bone evaluation — Radionuclide bone scans are reported to be safe during pregnancy. A "low-dose" bone scan has been described that exposes the fetus to 0.08 rad as compared with the standard 0.19 rad for a conventional bone scan [40]. Fetal exposure to radiation may also result from proximity to radionuclides excreted into the maternal bladder; maternal hydration and frequent voiding or Foley placement can reduce this exposure. Bone scans are not recommended for evaluation of bone disease in the absence of signs or symptoms of bone abnormality.

As an alternative, skeletal MRI may be considered (without contrast). Since breast metastases are deposited in the red marrow, imaging of the axial skeleton (spine, pelvis, ribs, and sternum) will include approximately 80 percent of all metastatic sites [41]. Alternatively,

screening MRI of just the thoracic and lumbar spine may be considered if there are no complaints suggestive of extraspinal bony metastases [40].

The safety of plain skeletal radiographs is unclear. Although these films result in less than 1 rad exposure to the fetus, even low levels of ionizing radiation may increase the risk of childhood leukemia (table 2).

Alkaline phosphatase increases markedly during pregnancy due to placental production and cannot be used as an indicator of bone metastases. Even bone-specific alkaline phosphatase is not a reliable measure of bone disease.

MONITORING OF THE PREGNANCY

The pregnant woman with breast cancer requires careful coordination between her obstetrician (often a specialist in maternal and fetal medicine) and her oncologist. Confirmation of gestational age and expected date of delivery are important as both are significant factors in treatment planning.

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Breast cancer".)

SUMMARY AND RECOMMENDATIONS

Gestational or pregnancy-associated breast cancer is defined here as breast cancer that is diagnosed during pregnancy, in the first postpartum year, or any time during lactation.

- Although breast cancer is one of the most common cancers associated with pregnancy, pregnancy-associated breast cancer is a relatively uncommon event. The incidence of pregnancy-associated breast cancer appears to be increasing as more women delay childbearing. (See 'Epidemiology' above.)
- Pregnancy-associated breast cancers are predominantly poorly differentiated and diagnosed at an advanced stage, particularly those diagnosed in lactating women. (See 'Pathologic features' above.)
- The index of suspicion for cancer must be high in pregnant women with a breast mass. Breast ultrasound and mammography should be used to evaluate any suspicious breast masses. A clinically suspicious breast mass requires biopsy for definitive

diagnosis, regardless of whether or not a woman is pregnant and despite negative mammographic or ultrasound findings. (See 'Primary tumor' above.)

- Locally advanced-stage disease (stage III or IV) and/or suspicious symptoms should prompt a complete radiographic staging evaluation. Modifications of the standard staging work-up may be required to protect the fetus and are reviewed in detail. (See 'Systemic staging' above.)

- The pregnant woman with breast cancer requires careful and continuous monitoring of her pregnancy by her obstetrician (often a specialist in maternal and fetal medicine) and her oncologist. (See 'Monitoring of the pregnancy' above.)

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REFERENCES

1. Antonelli NM, Dotters DJ, Katz VL, Kuller JA. Cancer in pregnancy: a review of the literature. Part I. Obstet Gynecol Surv 1996; 51:125.
2. Albrektsen G, Heuch I, Kvåle G. The short-term and long-term effect of a pregnancy on breast cancer risk: a prospective study of 802,457 parous Norwegian women. Br J Cancer 1995; 72:480.
3. Lambe M, Hsieh C, Trichopoulos D, et al. Transient increase in the risk of breast cancer after giving birth. N Engl J Med 1994; 331:5.
4. Wohlfahrt J, Andersen PK, Mouridsen HT, Melbye M. Risk of late-stage breast cancer after a childbirth. Am J Epidemiol 2001; 153:1079.
5. Wallack MK, Wolf JA Jr, Bedwinek J, et al. Gestational carcinoma of the female breast. Curr Probl Cancer 1983; 7:1.
6. Anderson BO, Petrek JA, Byrd DR, et al. Pregnancy influences breast cancer stage at diagnosis in women 30 years of age and younger. Ann Surg Oncol 1996; 3:204.
7. Smith LH, Danielsen B, Allen ME, Cress R. Cancer associated with obstetric delivery: results of linkage with the California cancer registry. Am J Obstet Gynecol 2003; 189:1128.
8. Woo JC, Yu T, Hurd TC. Breast cancer in pregnancy: a literature review. Arch Surg 2003; 138:91.

9. Stensheim H, Møller B, van Dijk T, Fosså SD. Cause-specific survival for women diagnosed with cancer during pregnancy or lactation: a registry-based cohort study. J Clin Oncol 2009; 27:45.
10. Andersson TM, Johansson AL, Hsieh CC, et al. Increasing incidence of pregnancy-associated breast cancer in Sweden. Obstet Gynecol 2009; 114:568.
11. Ventura SJ. First births to older mothers, 1970-86. Am J Public Health 1989; 79:1675.
12. Ishida T, Yokoe T, Kasumi F, et al. Clinicopathologic characteristics and prognosis of breast cancer patients associated with pregnancy and lactation: analysis of case-control study in Japan. Jpn J Cancer Res 1992; 83:1143.
13. Shen T, Vortmeyer AO, Zhuang Z, Tavassoli FA. High frequency of allelic loss of BRCA2 gene in pregnancy-associated breast carcinoma. J Natl Cancer Inst 1999; 91:1686.
14. Johannsson O, Loman N, Borg A, Olsson H. Pregnancy-associated breast cancer in BRCA1 and BRCA2 germline mutation carriers. Lancet 1998; 352:1359.
15. Cullinane CA, Lubinski J, Neuhausen SL, et al. Effect of pregnancy as a risk factor for breast cancer in BRCA1/BRCA2 mutation carriers. Int J Cancer 2005; 117:988.
16. Middleton LP, Amin M, Gwyn K, et al. Breast carcinoma in pregnant women: assessment of clinicopathologic and immunohistochemical features. Cancer 2003; 98:1055.
17. Reed W, Hannisdal E, Skovlund E, et al. Pregnancy and breast cancer: a population-based study. Virchows Arch 2003; 443:44.
18. Bonnier P, Romain S, Dilhuydy JM, et al. Influence of pregnancy on the outcome of breast cancer: a case-control study. Societe Francaise de Senologie et de Pathologie Mammaire Study Group. Int J Cancer 1997; 72:720.
19. Berry DL, Theriault RL, Holmes FA, et al. Management of breast cancer during pregnancy using a standardized protocol. J Clin Oncol 1999; 17:855.
20. Elledge RM, Ciocca DR, Langone G, McGuire WL. Estrogen receptor, progesterone receptor, and HER-2/neu protein in breast cancers from pregnant patients. Cancer 1993; 71:2499.
21. King RM, Welch JS, Martin JK Jr, Coulam CB. Carcinoma of the breast associated with pregnancy. Surg Gynecol Obstet 1985; 160:228.
22. Lethaby AE, O'Neill MA, Mason BH, et al. Overall survival from breast cancer in women pregnant or lactating at or after diagnosis. Auckland Breast Cancer Study Group. Int J Cancer 1996; 67:751.
23. BUNKER ML, PETERS MV. Breast cancer associated with pregnancy or lactation. Am J Obstet Gynecol 1963; 85:312.
24. Saber A, Dardik H, Ibrahim IM, Wolodiger F. The milk rejection sign: a natural tumor marker. Am Surg 1996; 62:998.

25. Goldsmith HS. Milk-rejection sign of breast cancer. Am J Surg 1974; 127:280.
26. BYRD BF Jr, BAYER DS, ROBERTSON JC, STEPHENSON SE Jr. Treatment of breast tumors associated with pregnancy and lactation. Ann Surg 1962; 155:940.
27. Collins JC, Liao S, Wile AG. Surgical management of breast masses in pregnant women. J Reprod Med 1995; 40:785.
28. Behrman RH, Homer MJ, Yang WT, Whitman GJ. Mammography and fetal dose. Radiology 2007; 243:605; author reply 605.
29. Liberman L, Giess CS, Dershaw DD, et al. Imaging of pregnancy-associated breast cancer. Radiology 1994; 191:245.
30. Samuels TH, Liu FF, Yaffe M, Haider M. Gestational breast cancer. Can Assoc Radiol J 1998; 49:172.
31. Yang WT, Dryden MJ, Gwyn K, et al. Imaging of breast cancer diagnosed and treated with chemotherapy during pregnancy. Radiology 2006; 239:52.
32. Ahn BY, Kim HH, Moon WK, et al. Pregnancy- and lactation-associated breast cancer: mammographic and sonographic findings. J Ultrasound Med 2003; 22:491.
33. Ray JG, Vermeulen MJ, Bharatha A, et al. Association Between MRI Exposure During Pregnancy and Fetal and Childhood Outcomes. JAMA 2016; 316:952.
34. Talele AC, Slanetz PJ, Edmister WB, et al. The lactating breast: MRI findings and literature review. Breast J 2003; 9:237.
35. Dominici L, Kuerer H, Babiera G, et al. Wound complications from surgery in pregnancy-associated breast cancer. American Society of Breast Surgeons Annual Meeting 2009.
36. Vashi R, Hooley R, Butler R, et al. Breast imaging of the pregnant and lactating patient: imaging modalities and pregnancy-associated breast cancer. AJR Am J Roentgenol 2013; 200:321.
37. Vashi R, Hooley R, Butler R, et al. Breast imaging of the pregnant and lactating patient: physiologic changes and common benign entities. AJR Am J Roentgenol 2013; 200:329.
38. Nicklas AH, Baker ME. Imaging strategies in the pregnant cancer patient. Semin Oncol 2000; 27:623.
39. Shellock FG, Crues JV. MR procedures: biologic effects, safety, and patient care. Radiology 2004; 232:635.
40. Baker J, Ali A, Groch MW, et al. Bone scanning in pregnant patients with breast carcinoma. Clin Nucl Med 1987; 12:519.
41. Rosenthal DI. Radiologic diagnosis of bone metastases. Cancer 1997; 80:1595.

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GRAPHICS

Breast carcinoma TNM anatomic stage group AJCC UICC 8th edition

When T is...	And N is...	And M is...	Then the stage group is...
Tis	N0	M0	0
T1	N0	M0	IA
T0	N1mi	M0	IB
T1	N1mi	M0	IB
T0	N1	M0	IIA
T1	N1	M0	IIA
T2	N0	M0	IIA
T2	N1	M0	IIB
T3	N0	M0	IIB
T0	N2	M0	IIIA
T1	N2	M0	IIIA
T2	N2	M0	IIIA
T3	N1	M0	IIIA
T3	N2	M0	IIIA
T4	N0	M0	IIIB
T4	N1	M0	IIIB
T4	N2	M0	IIIB
Any T	N3	M0	IIIC
Any T	Any N	M1	IV

- The anatomic stage group table should only be used in global regions where biomarker tests are not routinely available.

- Cancer registries in the US must use the prognostic stage group table for case reporting.

TNM: tumor, node, metastasis; AJCC: American Joint Committee on Cancer; UICC: Union for International Cancer Control.

Graphic 110848 Version 8.0

Fetal radiation doses associated with common radiologic examinations

Type of examination	Fetal dose* (mGy)
Very low-dose examinations (<0.1 mGy)	
Cervical spine radiography (anteroposterior and lateral views)	<0.001
Radiography of any extremity	<0.001
Mammography (two views)	0.001 to 0.01
Chest radiography (two views)	0.0005 to 0.01
Low- to moderate-dose examinations (0.1 to 10 mGy)	
Radiography	
Abdominal radiography	0.1 to 3.0
Lumbar spine radiography	1.0 to 10
Intravenous pyelography	5 to 10
Double-contrast barium enema	1.0 to 20
CT	
Head or neck CT	1.0 to 10
Chest CT or CT pulmonary angiography	0.01 to 0.66
Limited CT pelvimetry (single axial section through the femoral heads)	<1
Nuclear medicine	
Low-dose perfusion scintigraphy	0.1 to 0.5
Technetium-99m bone scintigraphy	4 to 5
Pulmonary digital subtraction angiography	0.5
Higher-dose examinations (10 to 50 mGy)	
Abdominal CT	1.3 to 35
Pelvic CT	10 to 50
^{18}F PET/CT whole-body scintigraphy	10 to 50

Annual average background radiation = 1.1 to 2.5 mGy.

CT: computed tomography; PET: positron emission tomography; ^{18}F: 2-[fluorine-18]fluoro-2-deoxy-D-glucose.

* Fetal exposure varies with gestational age, maternal body habitus, and exact parameters.

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for use of medical imaging during pregnancy and lactation. Radiographics 2012; 32:897. Copyright © 2012 RSNA.

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