Breast Disorders Related to Pregnancy and Lactation

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Breast Disorders Related to Pregnancy and Lactation

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Overview of Topics

- Physiologic Changes during Pregnancy and Lactation
- Radiologic Approach to a Pregnant and Lactating Patient
- Benign Disorders Related to Physiologic Change
- Infectious and Inflammatory Diseases
- Benign Tumors
- Malignant Tumors
Physiologic Changes during Pregnancy and Lactation

- During pregnancy
  - Marked ductular sprouting with branching and discrete lobular growth
  - Involution of the fibrofatty stroma
  - Increase in glandular vascularity
  - Lactogenesis I
    - Alveolar cells differentiate into a more specialized colostrum-cell epithelium and prolactin initiates protein synthesis
    - Colostrum does not yet contain milk because, during pregnancy, progesterone antagonizes the effect and synthesis of prolactin
Physiologic Changes during Pregnancy and Lactation

- After delivery
  - Lactogenesis II
    - Prolactin, in conjunction with other metabolic hormones, induces milk production the formation and secretion of fat, lactose, and proteins
    - Lactating breasts show marked distention of lobular glands and accumulation of secretion in ducts
  - Lactogenesis III
    - Maintenance of milk production during lactation, based on the release of oxytocin in the posterior pituitary gland stimulated by breastfeeding
    - US has been considered helpful in the assessment of the milk ejection process because it can be used to measure ductal diameter, and this assessment would be a useful clinical test in infants with consistently low milk intake

- Involution of the breast
  - Occurs over a period of about 3 months after lactation ceases
  - Characterized by marked lobular atrophy
Radiologic Approach to a Pregnant Patient

- Ultrasound is the most appropriate radiologic method for evaluating breast disorders in women during pregnancy
  - US has a greater sensitivity (nearly 100%) than mammography in the evaluation of patients with carcinoma

Breast US image obtained during gestation shows diffuse enlargement of the non-fatty glandular component and global hypoechogenicity
Radiologic Approach to a Pregnant Patient

- Mammography (basically for the staging of breast cancer)
  - Standard two-view mammography of each breast performed with abdominal shielding subjects the fetus to only 0.004 Gy of radiation
  - Malformations are believed to occur with exposure to more than 0.05 Gy of radiation
  - First 2 months of pregnancy (organogenesis), the fetus is the most susceptible to radiation-induced malformations
  - Current recommendations are to avoid mammography during the 1st trimester

- MRI
  - Use of magnetic resonance (MR) imaging in the evaluation and treatment of pregnant patients is not recommended
  - Contrast agents should not be routinely used in pregnant patients
Radiologic Approach to a Lactating Patient

- Ultrasound is the most appropriate radiologic method for evaluating breast disorders in lactating women.

US image reveals diffuse enlargement of the glandular component with diffuse hyperechogenicity, related to the production of milk which is rich in fat.

US image shows a prominent ductal system, a characteristic feature of lactation due to milk secretion.
Radiologic Approach to a Lactating Patient

- **Mammography**
  - Helpful in the assessment of tumors and should be performed if malignancy is suspected because it is particularly effective in the detection of microcalcifications or subtle distorting areas

- **MRI**
  - Controversial and difficult because lactational parenchyma, in contrast with normal nonlactational tissue, shows rapid enhancement following the intravenous administration of contrast material, followed by an early plateau of enhancement
  - Contrast material–enhanced MR imaging can be used during lactation, although given that a small amount of gadolinium is excreted into breast milk, it is prudent not to breastfeed for 24 hours after the examination, having previously actively expressed milk from each breast
Risks of Core Biopsy

- Risk of bleeding is slightly increased due to the increased vascularity associated with pregnancy and lactation.

- Increased risk of infection due to ductal dilatation, milk production, and breast-feeding traumas.

- Risk of milk fistula formation due to ductal dilatation.

- These risks can be minimized by having the patient discontinue breast-feeding prior to undergoing biopsy, achieving hemostasis, and performing the procedure with strict asepsia.

- Additionally use of a smaller biopsy needle, 16 or 18 gauge, can reduce the risk of cutaneous milk fistula.
Benign Disorders Related to Physiologic Change
Gestational and Secretory Hyperplasia

- Microcalcifications depicted on mammography
- Most commonly round, with a diffuse or focal distribution
  - Represent hyperplasia of the lobular acini
- Less commonly, they have an irregular appearance, a linear distribution, and a branching pattern closely resembling malignancy
  - Correspond to ductal hyperplasia
Spontaneous Bloody Nipple Discharge

- Usually appears in the 3rd trimester of pregnancy
  - Increased breast vascularity results in bleeding, probably related to minimal and often unnoticed trauma
- Occult blood has been demonstrated in up to 20% of women with nonhematic nipple discharge during pregnancy and in 15% of lactating women
- Usually ceases with the onset of nursing
- In lactating women, false bloody secretion due to an injured nipple caused by baby suction must first be excluded
- Galactography is recommended if bloody secretion is limited to one duct
- Nipple discharge is an uncommon manifestation of Pregnancy associated breast carcinoma
Galactocele

- Most common benign breast lesion in lactating women
- Frequently occur after cessation of breast-feeding, when milk is retained and becomes stagnant within the breast
- Cysts form as a result of duct dilatation and are frequently encompassed by a fibrous wall of varying thickness that can be associated with an inflammatory component
- Show a wide variation in the proportions of proteins, fat, and lactose
- Aspiration yields fluid milk when performed during lactation and more thickened milk fluid when obtained from older lesions after lactation has ended
**Galactocele**

- **Pseudolipoma**
  - Fat content is very high and appears as a completely radiolucent mass
  - Indistinguishable from a true lipoma

US image shows a circumscribed echogenic mass mimicking a solid lesion. Posterior enhancement (arrows), which suggests a cystic mass with a nonwater content (complicated cyst). In the appropriate clinical setting, galactocele can be suspected and can easily be confirmed with fine-needle aspiration.
Galactocele

- **Cystic Mass with Fat-Fluid Level**

  - A cystic mass with a fat-fluid level is a diagnostic sign that appears when galactoceles contain variable proportions of fat and water and the milk content is fresh.

  - The low density of the fat content and the low viscosity of fresh milk creates a fat-fluid level as the fat rises and the heavier water content remains in the lower portion.

  - Pathognomonic for galactocele in the appropriate clinical setting, it can also be seen in other pathologic processes involving adipose tissue, such as fat necrosis.
Galactocele

- **Pseudohamartoma**
  - Variable proportions of old milk and water
  - The high viscosity of old milk does not allow the physical separation of fat and water, and the mass shows a mixed content closely resembling the imaging features of hamartoma
  - The US appearance can mimic a benign solid tumor, manifesting as well-defined masses with posterior acoustic enhancement and highly echogenic material
  - Infection represents a relatively common and not unexpected complication of galactoceles due to their rich nutrient content
Gigantomastia

- One of every 100,000 pregnancies

- Characterized by massive enlargement of the breasts, resulting in tissue necrosis, ulceration, infection, and hemorrhage

- The diagnosis is based on clinical findings, and radiologic studies are not required if no associated disorders are present

- Pathologic procedures are not usually required and, if performed, yield findings that resemble those in fibroadenoma

- Treatment is based on bromocriptine administration, but surgical intervention is required if the disorder progresses
Infectious and Inflammatory Diseases
Puerperal Mastitis

- Uncommon during pregnancy but occurs relatively often during breastfeeding because the source is usually the nursing infant’s nose and throat.

- Most commonly caused by *Staphylococcus aureus*, followed by *Streptococcus*.

- Due to disruption of the epithelial interface of the nipple-areola complex causing a cracked nipple or skin abrasion resulting in retrograde dissemination of the organisms.

- Milk stasis is an important risk factor, since stagnant milk is an excellent culture medium.

- The administration of amoxicillin-clavulanate or cloxacillin is almost always effective.
Mammography is not usually required in lactational mastitis unless malignancy is suspected.

US plays an important role in the diagnosis and treatment of mastitis if abscess formation is suspected.

Abscesses can be treated successfully with needle aspiration or catheter drainage, both under US guidance.

Breast-feeding should be continued because it promotes drainage of the enlarged segment and helps resolve infection.

Breast-feeding is generally not harmful to the infant when appropriate antibiotic therapy is given.

Neoplasm should be suspected and rapidly excluded in patients whose condition does not improve with antibiotic therapy.
Granulomatous Mastitis

- Very rare inflammatory disease of unknown cause that has been closely tied to pregnancy and lactation
- Typically affects younger women, usually within 5 years of pregnancy
- Study from the early 2000’s isolated Corynebacterium in up to 75% of cases
- Diagnosis of granulomatous mastitis is based on exclusion
- The prognosis is often good
- Primary treatment has classically been based on excisional biopsy
- Close surveillance without surgery and corticotherapy has also proved adequate in the management of cases involving spontaneous resolution
- If Corynebacterium is isolated, antibiotic therapy based on the administration of penicillin and tetracycline should be effective
Granulomatous Mastitis

- Granulomatous mastitis generally manifests as a distinct firm to hard mass that may involve any part of the breast but tends to spare the subareolar regions.
- Mammographic features are variable, ranging from normal results in patients with dense breast tissue to masses with benign or malignant features and focal asymmetric density.
- US appearance of multiple clustered, often contiguous tubular hypoechogenic lesions—sometimes associated with a large, hypoechogenic mass.
Juvenile Papillomatosis of the Breast

- Rare benign clinical-pathologic entity that characteristically involves young patients
- On US, juvenile papillomatosis typically manifests as ill-defined hypoechoic masses that are clearly demarcated from the surrounding normal parenchyma and filled with multiple cysts of variable size
- Gross examination after surgical excision is usually required to establish the diagnosis, although can be suspected after core biopsy
- Treatment is based on surgical excision, with completely negative margins required to avoid local recurrence
- Reported to be associated with carcinoma in up to 15% of cases
- Strict follow-up of female relatives is mandatory, since carcinomas have been found in nearly 50% of cases.
Benign Tumors
Lactating Adenoma

- Benign breast lesion that occurs in response to the physiologic changes that characterize pregnancy and lactation

- Likely a variant of fibroadenoma, tubular adenoma, or lobular hyperplasia that has undergone certain histologic changes owing to the physiologic state

- At gross examination, they are well circumscribed but noncapsulated

- Secretory hyperplasia in the lesion is histologically similar to the physiologic changes found in the surrounding parenchyma

- Characteristically regress spontaneously after pregnancy and lactation
Lactating Adenoma

- Usually manifest radiologically as benign masses that are indistinguishable from fibroadenomas and can infarct like fibroadenomas
- Radiolucent or hyperechogenic areas representing the fat content of the milk secondary to lactational hyperplasia can be seen at mammography and US, respectively, and constitute a particularly useful diagnostic sign
- Can appear as irregular masses, microlobulated margins, posterior acoustic shadowing, pronounced hypoechogenicity, and structural heteroechogenicity
Fibroadenoma: Growing Fibroadenoma

- Tumor most commonly found during pregnancy or lactation
- Hormone-sensitive tumors and increased hormone levels associated with pregnancy and lactation can induce tumor growth
- Benign radiologic appearance of fibroadenoma during pregnancy usually does not differ from its appearance at the nonpregnant stage
- Large cysts, prominent ducts, and increased vascularity are sometimes found in gravidic fibroadenomas, resembling features of complex fibroadenomas
- The management of palpable fibroadenomas requires their cytologic confirmation
- Close follow-up is mandatory in nonpalpable fibroadenomas, with characteristic benign findings incidentally encountered at US
Fibroadenoma: Fibroadenoma with Infarction

- Fibroadenomas can develop foci of infarction during pregnancy
- Usually detected in the 3rd trimester or after delivery and can be clinically suspected if sudden pain occurs in a previously painless fibroadenoma
- The architectural and pathologic appearance of fibroadenoma varies depending on the severity of infarction. The radiologic features of fibroadenomas can change, with more lobulated margins, a heterogeneous echotexture, and acoustic shadowing
- If large infarcts occur, the tumor may show suspicious findings requiring histologic analysis
Fibroadenoma: with Secretory Hyperplasia or Lactational Change

- Secretory hyperplasia sometimes develops in fibroadenomas during pregnancy
- Closely resemble lactating adenomas, and pathologic differentiation is difficult. Lactating adenomas usually lack the marked myoepithelial proliferation found in fibroadenomas
- These fibroadenomas with secretory hyperplasia may change in appearance at US, showing discrete heterogeneity in their echotexture with hyperechogenic areas, dilated ducts, and cysts, thereby resembling complex fibroadenomas
- Microcalcifications may be found at mammography, making fibroadenomas with secretory hyperplasia more conspicuous
Malignant Tumors
Pregnancy-associated Breast Carcinoma

- Breast cancer that occurs during pregnancy or within 1 year of delivery
- One out of every 3000 –10,000 pregnancies
- Represents up to 3% of all breast malignancies
- Prevalence of malignancy during pregnancy is exceeded only by carcinoma of the uterine cervix
- Expected to increase as more women defer childbearing into the 4th and 5th decades of life
- Tend to have larger, more advanced neoplasms at diagnosis and a poorer outcome than do other women of the same age with breast carcinoma
- Worse prognosis likely results from a combination of delayed diagnosis and a more aggressive growth pattern due to the biologic effects of pregnancy
- More than 50% of patients present with high-grade tumors and more than 50% of patients present with lymph node involvement
Pregnancy-associated Breast Carcinoma

- Almost always present with a palpable mass
- Swelling, erythema, and diffuse breast enlargement are less common features that suggest locally advanced carcinoma
- Radiologic features of PABC do not differ from those of non-PABC
- US constitutes the most appropriate radiologic method for assessing PABC and is useful in assessing axillary nodes and monitoring the response to neoadjuvant chemotherapy
- Mammography can demonstrate features such as malignant microcalcifications, multifocality, multicentricity, or bilaterality that may not be suspected at US alone
Pregnancy-related Burkitt Lymphoma of the Breast

- Endemic or African type is seen in young Africans in close association with Epstein-Barr virus and malaria
- Sporadic type is seen in Europe and the United States
- A third type occurs in HIV-positive patients
- Very rare clinical manifestation of the disease that usually affects pregnant or postpartum patients with massive enlargement of both breasts
- Characterized by rapid spread and a poor prognosis
- At mammography, manifests with a bilateral and diffuse marked increase in parenchymal density, a finding that correlates well with the aggressive and infiltrative nature of the tumor
- Massive bilateral involvement of the ovaries is common, and tumors may develop in any of the abdominal organs, especially the liver, spleen, and kidneys
- Peripheral lymph node involvement is rare
- Mucosal B lymphocytes migrate to the breasts during late pregnancy and lactation, which might explain why massive breast involvement by the tumor
Resources

- https://www.researchgate.net/figure/a-Normal-lactating-tissue-showing-diffuse-rapid-enhancement-on-dynamic-contrast-enhanced_fig15_251569652
- https://pubs.rsna.org/doi/pdf/10.1148/rg.27si075505
- https://radiopaedia.org/articles/lactating-adenoma?lang=us
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3473596