Granulomatous Diseases of the Breast: Radiologic Findings with Pathologic Correlation

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Learning objectives

1. Discuss the imaging appearances of a variety of granulomatous processes within the breast including: granulomatous infection, granulomatous mastitis, sarcoidosis, Sjögren's syndrome, foreign body and silicone granuloma and granulomatous inflammation involving axillary lymph nodes.

2. Demonstrate the imaging features of these disease processes across the multiple breast imaging modalities.

3. Provide correlation with pathology to aid the interpreting radiologist in pathology concordance following biopsy.

Background

Granulomatous reaction within the breast and axilla is uncommon and differential diagnosis includes infectious and non-infectious causes.

Differential diagnosis of granulomatous inflammation in the breast:

1. Infection - Etiologies include tuberculosis, atypical mycobacterium, fungal, bacterial or parasitic. Requires cultures and stains for organisms on the biopsy samples including Ziehl-Neelsen stains to exclude tuberculosis. Rarely tuberculosis can be culture negative. Imaging shows an ill-defined mass or abscess with sinus tracts and development of fistulae. [1, 2]

2. Granulomatous mastitis - Noncaseating granulomas are centered in lobules. Mammography may show an ill-defined mass. Axillary adenopathy and skin thickening may be present. On ultrasound, the mass is often hypoechoic and irregular or lobulated with associated architectural distortion and posterior acoustic shadowing. [2,3]

3. Sarcoidosis and sarcoid like reaction - May present as a developing asymmetric density or spiculated mass or masses suspicious for malignancy. [4,5]

4. Foreign body reaction - Post-surgical/post-biopsy, fat necrosis, suture granulomas or due to silicone following implant rupture.

5. Granulomatous lymphadenitis - Infectious and non-infectious etiologies. Imaging features include cortical thickening, enlargement and loss of the fatty hilum suspicious for metastatic lymphadenopathy. [14]

IRB approval was obtained for this study. The surgical pathology database was queried for the keyword "granulomatous" from January 2000-June 2013. There were 104 patients (103 females, 1 male; age range 32-86 years) with imaging available for review.
Findings and procedure details

Granulomatous Infection [1,2] (Fig. 1 on page 22)

- Most breast infections are bacterial secondary to skin contamination; granulomatous infections are rare
- High index of clinical suspicion for granulomatous infection is necessary
  - Gram, periodic acid-Schiff, Ziehl-Neelsen stains and cultures can be negative
- Clinical Presentation:
  - Painful and/or palpable breast mass
  - Axillary lymphadenopathy
- Imaging features are variable depending on type of infection
  - Fungal (Blastomycosis, Cryptococcosis, Histoplasmosis, Actinomycosis)
    - Lobulated, irregular mass or mass with well-defined margins; complex cystic mass
  - Bacterial (Corynebacterium, etc.)
    - Mass (+/- cystic), abscess, ill-defined area
  - Parasitic (Filarial, Schistosomiasis, Sparganosis, Echinococcosis)
    - Calcifications can occur, +/- mass
  - Mycobacterium (Tuberculous, Atypical)
    - Axillary lymphadenopathy, skin thickening, ill-defined mass with sinus tracts/fistulae
      - *Mycobacterium fortuitum* infection (Fig. 1 on page 22)
Fig. 1: Mycobacterium fortuitum Infection. 32 year old female with new tender, palpable left breast masses. Biopsy was performed 4 months earlier and was consistent with sarcoidosis with new purulent drainage from the needle tract. US guided biopsy of one of the left breast masses was performed and cultures were positive for Mycobacterium fortuitum, which was treated with antibiotics and the infections resolved. A. Left MLO: Multiple masses with prominent axillary lymph nodes

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US

Idiopathic Granulomatous Mastitis [1-3](Fig. 2 on page 24, Fig. 3 on page 24, Fig. 4 on page 25)

- Rare inflammatory disease of the breast, unknown origin
- Usually women of child-bearing age
- Hovanessian Larsen et al. [3] reviewed imaging of 54 women
  - Clinical Presentation:
    - Breast mass (89%) with associated pain, erythema, inflammation
  - Radiologic Findings (Fig. 2 on page 24, Fig. 3 on page 24):
    - Mammography (N=45)
      - Large focal asymmetric density (44%); irregular or lobulated mass (16%)
      - Skin thickening (7%) or axillary lymphadenopathy (18%)
    - US (N=54)
      - Large, irregular hypoechoic mass with tubular extensions (59%); lobulated or irregular mass (33%)
      - Skin thickening (52%) or axillary lymphadenopathy (28%)
  - Pathology (Fig. 4 on page 25):
    - Nonnecrotizing (noncaseating), nonvasculitic granulomas centered in lobules
      - Inflammation can extend into adjacent perilobular & interlobular tissue
  - Potential Pitfalls:
    - Imaging features can mimic breast carcinoma
    - Must be differentiated from other chronic inflammatory breast diseases:
      - Fungal or tuberculous infection, sarcoidosis, carcinoma, fat necrosis, Wegner's granulomatosis, etc.
        - Clinical, radiologic, pathologic features overlap
      - Culture & stain to exclude bacteria, mycobacteria, fungus
    - US guided core biopsy
      - Better diagnostic accuracy compared to FNA or fluid aspiration
Fig. 2: Idiopathic Granulomatous Mastitis. 23 year old female with an enlarging left breast mass and history of a benign breast biopsy with new drainage through the skin. There has been no improvement despite antibiotic therapy. US guided biopsy of the left breast mass was performed. Pathology and clinical history were consistent with idiopathic granulomatous mastitis, which was treated successfully with steroids. A. Multiple sinus tracts to the skin with purulent drainage and a fluctuant mass at 11 o’clock on physical exam. B. Right and Left ML: Extremely dense breasts. C. US: Ill-defined hypoechoic area with a sinus tract extending to the skin. D. US: Oval fluid collection containing debris and a sinus tract extending to the skin. E. Axial postcontrast MIP MRI: Intense enhancement involving two large areas in the left breast. F. Axial postcontrast MRI: One of the areas of intense enhancement shows a lack of enhancement centrally compatible with central necrosis and a small fluid collection. References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 3: Idiopathic Granulomatous Mastitis. 27 year old female with a palpable right breast mass. US guided biopsy of the right breast mass was performed. Pathology and clinical history were consistent with idiopathic granulomatous mastitis, which was treated successfully with steroids. A. Right MLO: Regional asymmetry corresponding to the palpable mass. B. US: Ill-defined mixed echogenicity mass with variable posterior acoustic shadowing and through transmission. C. Color Doppler US: Significant internal blood flow within the mass. D. Axial postcontrast MIP MRI: Intense enhancement in the anterior depth of the right breast. E. Sagittal diffusion weighted imaging and corresponding ADC map: Marked restricted diffusion within the mass.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 4: Idiopathic Granulomatous Mastitis. Hematoxylin & Eosin 200X from case described in Fig 3. Granulomatous inflammation with focal microabscesses. Special stains were negative.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US

Sarcoidosis [2,4-6] (Fig. 5 on page 25, Fig. 7 on page 27)

• Breast involvement very rare (<1%)
  • Often other organs involved (lungs, lymph nodes, skin, eyes, etc.)
  • 20% of reported cases of sarcoidosis of the breast initial presentation was a breast mass
• Clinical Presentation:
  • Nontender, mobile mass
  • Other organ involvement
  • Elevated angiotensin convertin enzyme (ACE)
• Imaging Features:
  • Can resemble malignancy on all imaging modalities
• Mammography:
  • Single or multiple masses
  • Well-defined or spiculated margin
  • Intramammary lymph node or granuloma
• US:
  • Hypoechoic
  • Indistinct margins
  • Intramammary lymph node or granuloma
  • Calcifications typically absent
• MRI:
  • Inhomogeneous signal intensity
  • Irregular contours
  • Rapid enhancement and early "washout"
• Pathology
  • Noncaseating epithelioid granulomas with multinucleated giant cells
  • Negative stains & cultures for bacteria, mycobacteria & fungus
  • Must exclude other granulomatous diseases
Fig. 5: Sarcoidosis. 72 years old with skin biopsy and chest radiograph consistent with sarcoidosis. US guided biopsy of a spiculated mass in the left breast was consistent with sarcoidosis. Fungal and acid fast bacilli stains were negative. A. (Right) and B. (Left) CC and CC Magnification: Multiple spiculated masses in both breasts, which were stable for 5 years.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US

Sarcoid-like Reaction [2, 7-9, 14] (Fig. 6 on page 26, Fig. 7 on page 27)

- Numerous etiologies
Infection, tumor, immunocompromised status, connective tissue or autoimmune diseases (Sjögren’s syndrome (Fig. 6 on page 26, Fig. 7 on page 27), systemic lupus erythematosus, erythema nodosum, isolated oligoarthritis), chemicals, Wegener granulomatosis

- Collagen vascular diseases
  - Lymphadenopathy, usually bilateral
  - Subcutaneous calcifications, skin thickening
  - Irregular/ill-defined masses, fat necrosis
  - Granulomatous mastitis

- Autoimmune diseases (Fig. 6 on page 26)
  - Granulomatous or lymphocystic mastitis

- Wegener granulomatosis
  - Ill-defined or irregular masses suspicious for malignancy

**Fig. 6:** Sjögren’s Syndrome. 61 year old female with a right breast asymmetry on screening mammogram. US guided biopsy demonstrated non-necrotizing granulomatous inflammation. Fungal and acid fast bacilli stains negative. Clinical history and pathology were consistent with Sjögren’s syndrome involving the breast. The mass was no longer present on a 6 month follow-up diagnostic exam.

A. Right CC and Right CC and MLO Spot Compression: Mass with ill-defined margins at 3 o’clock. B. US with and without Color Doppler: Oval hyperechoic mass with ill-defined margins. C. CT Chest with IV Contrast: Ill-defined soft tissue mass in the right inner breast.

**References:** Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 7: Sjögren’s Syndrome. Hematoxylin & Eosin 100X from the case described in Fig. 6 shows well-demarcated, non-necrotizing granulomas. The pathology findings are consistent with sarcoidosis. However, when combined with the clinical history, this was felt to be due to a sarcoid-like reaction secondary to Sjögren’s syndrome.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US

Foreign Body Reaction [10-13] (Fig. 8 on page 28, Fig. 9 on page 29, Fig. 10 on page 30, Fig. 11 on page 31, Fig. 12 on page 32, Fig. 13 on page 33)

- Post-surgical/biopsy changes (Fig. 8 on page 28, Fig. 9 on page 29, Fig. 10 on page 30, Fig. 11 on page 31)
• Architectural distortion
• Fat necrosis
• Calcifications
• Suture calcification: curvilinear, form loops & knots (cat gut suture)
• Silicone granulomas (Fig. 12 on page 32, Fig. 13 on page 33)
• Secondary to extracapsular implant rupture
• Imaging Features:
  • Mammogram:
    • High density masses outside implant margins
    • High density foci within lymph nodes or extremely dense lymph nodes
    • Less specific signs: implant asymmetry, irregular implant contour
  • US:
    • "Snowstorm" appearance
      • Well-defined echogenicity anteriorly with dirty posterior acoustic shadowing
    • Hypoechoic or anechoic masses with posterior shadowing
    • Echogenic lymph nodes with dirty shadowing
  • MRI:
    • Low T1, high T2 signal foci separate from the implant
    • High signal foci on silicone sensitive sequences
      • Globular masses or linear collections separate from implant in breast tissue or axilla
    • Irregular contour of the implant
    • Enhancement if active inflammation/granuloma formation
• Pathology:
  • Foreign body type giant cells containing silicone
  • Foam cells, lymphocytes
Fig. 8: Foreign Body Granulomatous Reaction. 53 year old female with history of a left breast excisional biopsy 6 month earlier. She presents with a new painful, palpable abnormality in the left breast. There were biopsy changes on the imaging exams without suspicious findings for malignancy. Surgical excision was performed and pathology demonstrated a foreign body type granulomatous reaction and scarring. A. Left MLO and ML Spot Compression: Post biopsy changes at the palpable marker. B. US: Hypoechoic area at the palpable abnormality consistent post biopsy changes. C. MBI (molecular breast imaging) MLO: Mildly increased uptake at the prior biopsy site (yellow arrow).

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 9: Foreign Body Granulomatous Reaction. Hematoxylin & Eosin 100X from the case in Fig. 8 shows that the breast parenchyma is involved by granulomatous inflammation with foreign body-type giant cells.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 10: Fat Necrosis with Granulomatous Inflammation. 62 year old female with history of right breast cancer post breast conservation therapy 2 years earlier. New mass adjacent to the lumpectomy site on the diagnostic imaging. A. Right CC and MLO and ML Spot Compression: Small mass along the margin of the lumpectomy scar, which is best seen on the MLO and ML views (yellow arrow). B. Radial and antiradial with and without power Doppler: Ill-defined hypoechoic mass with significant posterior shadowing with vascular flow along the periphery.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 11: Fat Necrosis with Granulomatous Inflammation. Hematoxylin & Eosin 100X from case in Fig. 10 demonstrates fat necrosis characterized by foamy histiocytes and chronic inflammation.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US
Fig. 12: Silicone Granuloma. 63 year old female with a new palpable abnormality in the left breast. She has a history of left breast cancer 10 years earlier treated with breast conservation therapy and a history of prepectoral silicone implants removed 4 years ago. A. Inverted left CC (5 years ago): Bulge in the medial contour of the prepectoral left breast implant. Silicone Sensitive Axial Left and Coronal Bilateral Breast MRI (5 years ago): Left extracapsular and right intracapsular implant ruptures. B. Left CC, MLO and CC Spot Compression: High density, spiculated mass in the inner lower breast. C. US: Echogenic mass with dirty posterior acoustic shadowing ("snowstorm") appearance. E. Axial Bilateral and Sagittal Left breast Postcontrast MRI: Minimally enhancing, spiculated mass in the lower left breast, which was T2 hyperintense.

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Fig. 13: Silicone Granuloma. Hematoxylin & Eosin 100X from case in Fig. 12 exhibits cystic spaces associated with histiocytes and foreign body-type giant cells. Index Hematoxylin & Eosin 400X demonstrates that some of the vacuoles contain refractile, colorless material, consistent with silicone (black arrow).

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Granulomatous Lymphadenitis [14-16] (Fig. 14 on page 34, Fig. 15 on page 36)

- Classification:
  - Noninfectious
    - Sarcoidosis
    - Sarcoid-like
    - Hodgkin's and Non-Hodgkin's lymphoma
  - Infectious
    - Suppurative
      - Tularemia, Cat-scratch, Yersinia, Lymphogranuloma venereum, Fungal
    - Non-suppurative
• TB, Atypical Mycobacterial, BCG, Toxoplasma, Lepra, Syphilis, Brucellosis, Fungal

• Imaging Findings:
  • Cortical thickening
  • Lymph node enlargement
  • Loss of the fatty hilum
  • Findings suspicious for metastatic lymphadenopathy

• Cat-scratch (Bartonella henselae) [15-16] (Fig. 14 on page 34, Fig. 15 on page 36)
  • Clinical Presentation:
    • Regional lymphadenopathy (85%)
      • Neck (33%), axilla (27%), inguinal (18%)
    • Fever, headache, malaise (77%)
  • 5 cases of breast involvement in the literature
    • 4/5 cases worrisome for malignancy on imaging
      • 3 cases: palpable breast mass & enlarged nodes in axilla
      • 1 case: new 3 cm mass inferior axilla
    • 1 case abscess in 14 year old
Fig. 14: Cat-scratch (Bartonella henselae). 59 year old female with 1 month history of a left axillary mass. Pathology from the US guided biopsy demonstrated follicular hyperplasia with non-necrotizing epithelioid granulomas. Her Bartonella henselae titer was >1:1024, consistent with recent infection. A. Left MLO and MLO Magnification: New lobulated mass in the left axilla. B. US with and without Color Doppler: Multiple round masses in the left axilla with lobulated margins and increased vascular flow. C. CT Chest with IV Contrast: Enlarged level I and level II left axillary lymph nodes.

References: Department of Radiology, Mayo Clinic, Mayo Clinic - Rochester/US

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Images for this section:
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![Histological images demonstrating follicular hyperplasia with non-necrotizing epithelioid granulomas.](image-url)

**Fig. 15:** Cat-scratch (Bartonella henselae). Hematoxylin & Eosin from case in Fig. 14 demonstrates follicular hyperplasia with non-necrotizing epithelioid granulomas.
Conclusion

Granulomatous diseases of the breast vary in clinical presentation, imaging appearance, pathology and treatment. Knowledge of the different granulomatous processes affecting the breast as well as the imaging appearances is important for interpreting radiologists to understand to allow for appropriate pathologic concordance and treatment.

Personal information

Allison J. Clapp, M.D.
Department of Radiology, Mayo Clinic, Rochester, MN, USA

Katrina N. Glazebrook, M.B.,Ch.B.
Associate Professor of Radiology, Department of Radiology, Mayo Clinic, Rochester, MN, USA

Samar Said, M.D.
Department of Anatomic Pathology, Mayo Clinic, Rochester, MN, USA

Sejal S. Shah, M.D.
Assistant Professor of Laboratory Medicine/Pathology, Department of Anatomic Pathology, Mayo Clinic, Rochester, MN, USA

Robert T. Fazzio, M.D., Ph.D.
Instructor of Radiology, Department of Radiology, Mayo Clinic, Rochester, MN, USA

References


