Imaging appearances of stromal fibrosis

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Learning objectives

· To illustrate the different imaging appearances of stromal fibrosis depicted by Mammography, Ultrasound, and MRI.

· To describe the histopathological features of stromal fibrosis

· To recognize stromal fibrosis as a potential benign concordant diagnosis after biopsy.

Background

Etiology:

Stromal fibrosis in the breast is a benign histopathologic entity characterized by abundance of fibrous tissue that results in obliteration of the mammary acini and ducts (1). It was first characterized by Haagensen as fibrous disease of the breast (2). Pathologists have described this entity by various terms which include "fibrosis of the breast", "focal fibrosis of the breast", "fibrous mastopathy", and "fibrous tumor of the breast" (3). The exact etiology remains unknown. However, it has been speculated that it may be related to several conditions such as estrogen related fibroblastic proliferation, end stage of inflammatory processes, or a type of breast involution (4).

Clinical presentation:

Stromal fibrosis may present with a clinical manifestation such as a palpable lump or be detected as an incidental imaging abnormality during routine screening (5). A typical clinical presentation is that of a firm-to-hard, distinct mass measuring 2-5cm with the absence of any evident skin retraction or dimpling. Due to the common clinical presentation as a distinct mass, many pathologists prefer the term "fibrous tumor" in order to differentiate it from nonspecific and involutorial stromal changes (2).

Stromal fibrosis affects predominantly premenopausal women but may occur at any age between the third and eighth decades (5-7). As for the cases presented here, the age ranged from 32 to 76 with a mean of 50.
**Imaging features:**

Stromal fibrosis has an eclectic variety of imaging appearances whether be it on mammography, ultrasound, or MRI

- **Mammography findings** (3, 5-8):

  1. Mass:

     - Shape may be either round or oval.

     - Margins may be circumscribed or non-circumscribed.

     - Calcifications may occasionally be seen within masses

  2. Focal asymmetry

  3. Architectural distortion

- **Ultrasound findings** (3, 5-8):

  1. Mass:

     - Shape may be either oval, round or irregular

     - May be hypoechoic, isoechoic or show heterogeneous internal echotexture.

     - May exhibit posterior acoustic enhancement or shadowing.

     - May present as a hypoechoic mass with a cystic cleft or hyperechoic centered masses with a hypoechoic rim.

- **MRI findings** (9):

  1. Mass:
- Shape may be either round, oval, lobular, or irregular

- Margins may be smooth, irregular, or spiculated

- Internal enhancement pattern may be homogeneous, heterogeneous, or rim enhancing.

- May present with variable kinetics of contrast enhancement: Type 1, 2, or 3 curve.

2. Non-mass enhancement

3. Enhancing Foci

**Histopathological features:**

In order to ensure that those various terms describe the same entity, we will describe the typical microscopic finding. Stromal fibrosis "consists of collagenous stroma that contains markedly decreased or absent ductal and lobular elements, which are atrophic. Capillaries, other vascular structures, and nerves are very sparse; perivascular and perilobular inflammatory infiltrates are absent." Entrapped adipose tissue may be present but is markedly decreased. In addition, there is absence of sclerosing adenosis, apocrine metaplasia, or duct hyperplasia (2).

**Clinical relevance:**

In this era of screening mammography, stromal fibrosis has become a common diagnosis in percutaneous image-guided breast biopsy. Collectively, it has been reported to represent as high as 9% of the lesions biopsied (5). It is evident that this condition may occasionally manifest with imaging characteristics of a suspicious lesion. Therefore, it raises the concern of discordance after a biopsy is made and the tissue diagnosis is benign. This may prompt more invasive procedures such as resection of the lesion in question for fear of missing a cancer. However, reassuringly the rate of missed cancer is low and has been reported to be around 2.7% (7). Therefore, it is of utmost importance that the radiologist be familiar with the different imaging appearances of stromal fibrosis, and recognizes that it may potentially present with suspicious features in order to avoid unnecessary interventions. Nevertheless, it remains crucial to adhere to a short term follow up protocol for documentation of stability and confirmation of benignancy.
Findings and procedure details

We will present here a variety of biopsy proven cases of stromal fibrosis as demonstrated on mammography, ultrasound, and MRI. Most lesions were followed up and were stable confirming their benign nature.

Images for this section:

Fig. 1: 38 year old woman presenting for evaluation of a palpable left breast mass. Cropped CC view (a) shows a circumscribed mass with coarse calcifications. Ultrasound image (b) shows a circumscribed oval hypoechoic nodule with parallel orientation. The lesion appears rather soft on elastography evaluation (c). Microscopic findings (d) show dense fibrosis and rare entrapped acini with microcalcifications (purple concretion in small duct at the edge). No microcalcifications are identified in the fibrous stroma proper. (H&E, 100X). Patient was followed up 7 months later with no change.
**Fig. 2:** 37 year old woman with essential thrombocytosis presenting for evaluation of a new palpable mass. Cropped MLO view of the left breast (a) shows a largely circumscribed mass (arrow) with obscured margins anteriorly. Ultrasound evaluation (b) shows a round circumscribed hypoechoic mass. Patient was followed up 5 months later with no change.
Fig. 3: 64 year old woman status post bilateral reduction mammoplasty presenting for screening. Ultrasound shows an irregularly shaped and marginated mass underneath the periareolar scar. This lesion remained stable on several follow up examinations obtained up to 5 years later.

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Fig. 4: 36 year old woman with a positive family history of breast cancer. She has had a previous biopsy of microcalcifications in the right breast with a benign pathology. Ultrasound examination obtained during screening (several months after biopsy). At the site of the biopsy there is a spiculated isoechoic mass. Colour Doppler evaluation (b) shows no inner vascularity. Elastography evaluation (c) shows the mass to be rather soft. Patient was followed up for a period of 5 years and remained stable.

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Fig. 5: 53 year old woman presenting for screening. Cropped MLO view of the left breast (a) shows a developing density (prior not shown). Ultrasound (b) shows the density to correspond to an oval heterogeneous hypo and hyperechoic nodule with indistinct margins. The nodule appears stiff on elastography (c).

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Fig. 6: 49 year old woman presenting for screening. Ultrasound (a) shows an irregular hypoechoic nodule with indistinct margins and posterior shadowing. Colour Doppler evaluation (b) shows significant vascularity. Microscopic findings (c) show dense fibrosis without ductal elements and with rare entrapped adipocytes. (H&E, 100X)

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Fig. 7: 76 year old woman with a previous history of right breast cancer treated by surgery and radiotherapy. Follow up ultrasound shows a new oval mass with parallel orientation exhibiting microlobulated margins.

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**Fig. 8:** 51 year old woman presenting for screening. Ultrasound (a) shows a round echogenic intracystic mass. Image obtained during biopsy (b) showing the biopsy needle going through the mass. Microscopic findings (c) show dense stromal fibrosis. There is no evidence of a cystic structure by microscopy (H&E, 100X). Patient was followed up 6 months later.

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**Fig. 9:** 38 year old woman presenting for severe breast pain. Ultrasound shows a complex cystic and solid mass.

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Fig. 10: 32 year old woman with previous history of radiation to the chest for Hodgkin's lymphoma. She also has a positive family history of breast cancer in her mother and maternal aunt. Axial subtracted image of the right breast at 1 minute and half following administration of gadolinium shows a patch of non mass enhancement. Patient was followed up 6 months later by MRI.

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Fig. 11: 44 year old woman with a strongly positive family history of breast cancer presenting for screening MRI. Coronal subtracted image of the right breast at 1 minute and half following administration of gadolinium shows a mass with irregular rim and enhancing internal septations. Patient was followed up for a period of 14 months.

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Fig. 12: Spot tomosynthesis view obtained in the CC position of the right breast demonstrating a subtle architectural distortion in the retroareolar region. Patient was followed up 6 months later.

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Conclusion

Stromal fibrosis may be considered a concordant result even when imaging shows suspicious features. Such lesions should be followed up by imaging to document stability and confirm benignity.

Images for this section:

Mammography findings

- Mass
  1. Margin:
     a. Circumscribed
     b. Obscured
  2. Calcifications:
     a. Coarse

- Architectural distortion

Fig. 13

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Ultrasound findings

- Mass:
  1. Shape:
     a. Oval
     b. Round
     c. Irregular
  2. Orientation:
     a. Parallel
  3. Margin:
     a. Circumscribed
     b. Spiculated
     c. Indistinct
     d. Microlobulated

Fig. 14

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Ultrasound findings (cont.)

4. Echo pattern:
   a. Hypoechoic
   b. Isoechoic
   c. Heterogeneous
5. Posterior features:
   a. Shadowing
6. Elastography:
   a. Soft
   b. Stiff

➢ Special cases:
   a. Intracystic mass
   b. Complex cystic and solid mass

Fig. 15

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MRI findings

- Mass
  1. Margin:
     a. Irregular
  2. Internal enhancement characteristics
     a. Enhancing internal septations
     b. Rim enhancement

- Non-mass enhancement

Fig. 16

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Personal information

References


