

## TERMINOLOGY

### Abbreviations

- Terminal duct lobular unit (TDLU)
- Anterior mammary fascia (AMF)
- Posterior mammary fascia (PMF)
- Anterior suspensory ligaments (ASL) of Cooper
- Posterior suspensory ligaments (PSL)

## IMAGING ANATOMY

### Overview

- Breast
  - Conical, round, or hemispherical shape
  - Composed of 15-20 lobes, each encased in fascial sheath defined by AMF and PMF
  - Extends from 2nd or 3rd intercostal space to 6th or 7th intercostal space
  - Extends laterally to anterior axillary fold and medially to lateral sternum
  - Relationship to chest wall
    - Superior 2/3 overlies pectoralis major muscle
    - Lateral portion overlies serratus anterior muscle
    - Inferior-most margin overlies upper abdominal oblique muscles
  - Axillary tail of Spence
    - Extension of normal breast tissue toward axilla
  - Average breast size
    - Diameter: 10-12 cm
    - Thickness: 5-7 cm
    - Median: 5 cm thick with mammographic compression
  - Support and mobility relate to fascial attachments to skin and chest wall

### Internal Contents

- Glandular elements
  - Extralobular ducts
  - TDLUs
  - Extralobular ducts and TDLUs contain 2 cell layers
    - Outer myoepithelial cell layer
    - Inner epithelial cell layer
- Stroma/connective tissue
  - Fat, connective tissue
  - ASL (Cooper ligaments) and PSL
  - Nerves, blood vessels, and lymphatics
- Interlobular tissue
  - Higher in collagen content
  - Relatively lower in cellular elements and hyaluronic acid
- Intralobular tissue
  - Higher in cellular elements and hyaluronic acid
  - Relatively lower collagen content

### Zonal Anatomy

- Premammary (subcutaneous) zone
  - Most superficial zone
  - Anterior margin defined by skin, posterior margin defined by AMF
  - Contains subcutaneous fat, blood vessels, ASL
  - May contain ectopic ducts and TDLU
  - ASL
    - Formed from 2 leaflets of AMF inserting into dermis

- Provide support for breast
- Usually visible on mammograms and sonograms
- Mammary zone
  - Defined anteriorly by AMF and posteriorly by PMF
  - Contains fibroglandular tissue: Majority of ducts/TDLU, stromal fat, and stromal connective tissue
  - Subdivided haphazardly by interspersed ASL
- Retromammary zone
  - Most posterior of 3 zones
  - Defined anteriorly by PMF and posteriorly by chest wall
  - Contains fat and PSL, which attach PMF to chest wall

## ANATOMY IMAGING ISSUES

### Mammography

- Overall breast density reflects ratio between glandular elements (higher density) and fat (lower density)
  - Usually symmetric between breasts but wide range of normal
- Fatty involution typically begins in lower outer quadrant
  - Progresses with age to upper outer quadrant
- American College of Radiology Breast Imaging and Reporting and Database System (BI-RADS)
  - Density categories
    - A: Almost entirely fat
    - B: Scattered fibroglandular densities
    - C: Heterogeneously dense, which could obscure detection of small masses
    - D: Extremely dense, which lowers sensitivity of mammography
- ↑ fibroglandular density ↓ sensitivity of mammography and ↑ risk of developing breast cancer

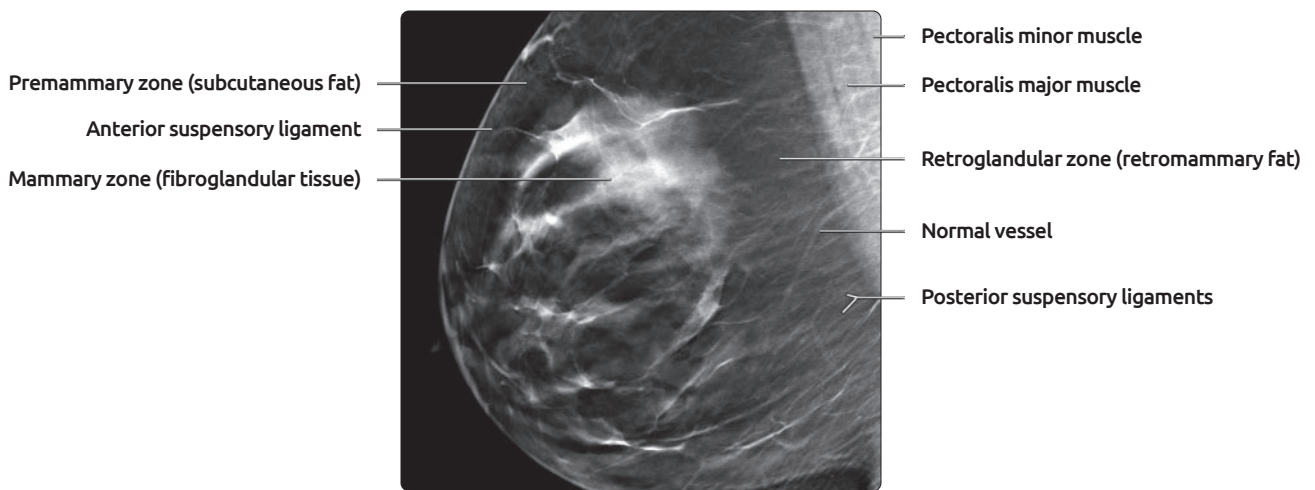
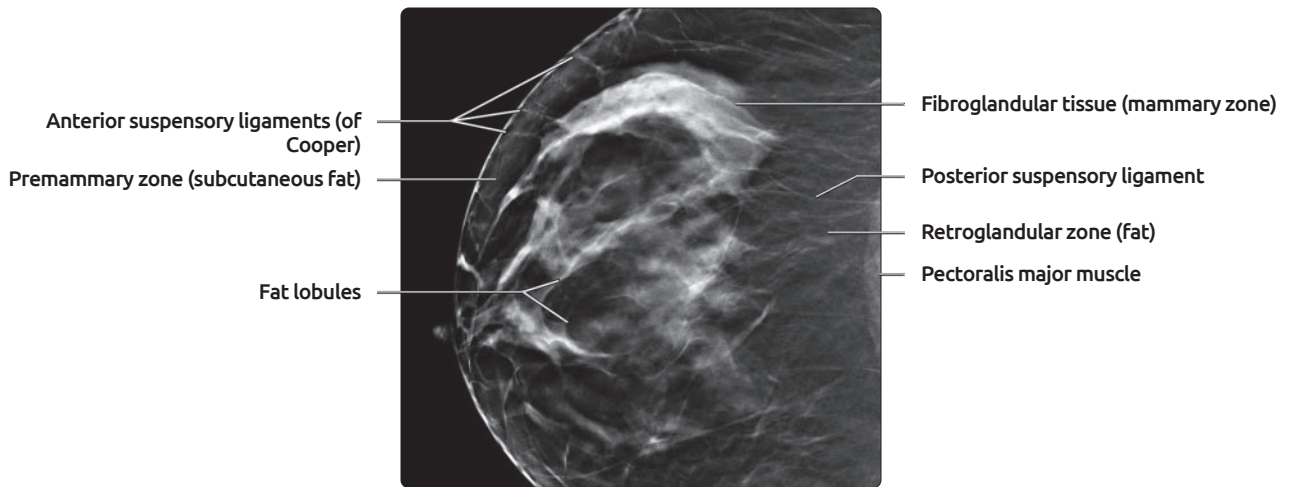
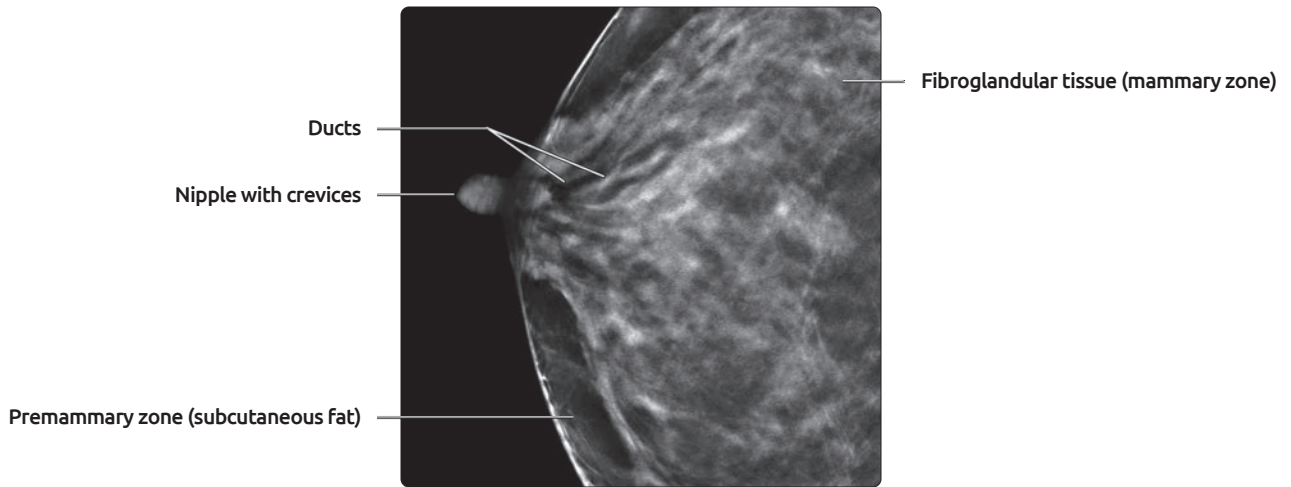
### US

- Thin, echogenic skin line: ≤ 2 mm
- ASL usually visible in subcutaneous zone
  - Subcutaneous fat lobule(s) surrounded by ligaments can present as palpable mass(es)
- Echogenicity defined relative to subcutaneous fat
- Interlobular stroma and glandular elements usually hyperechoic
  - Fibrotic tissue can be hyperechoic or hypoechoic
- Pectoral muscles and ribs visible as hypoechoic posterior structures

### MR

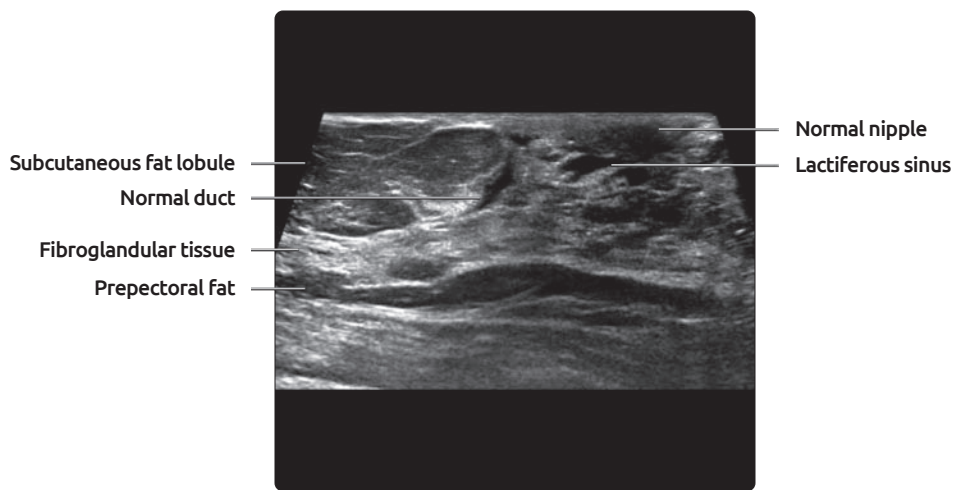
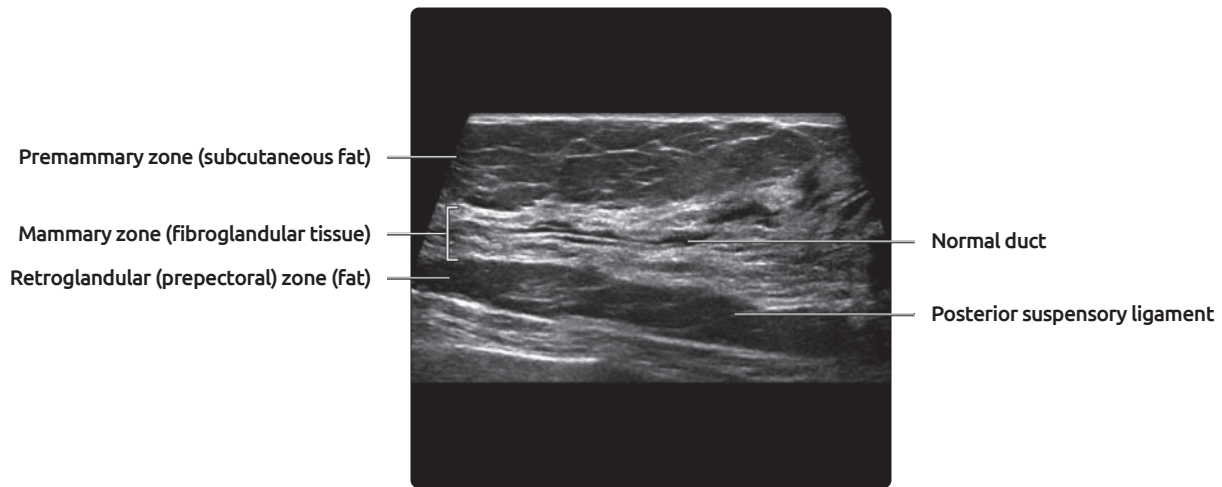
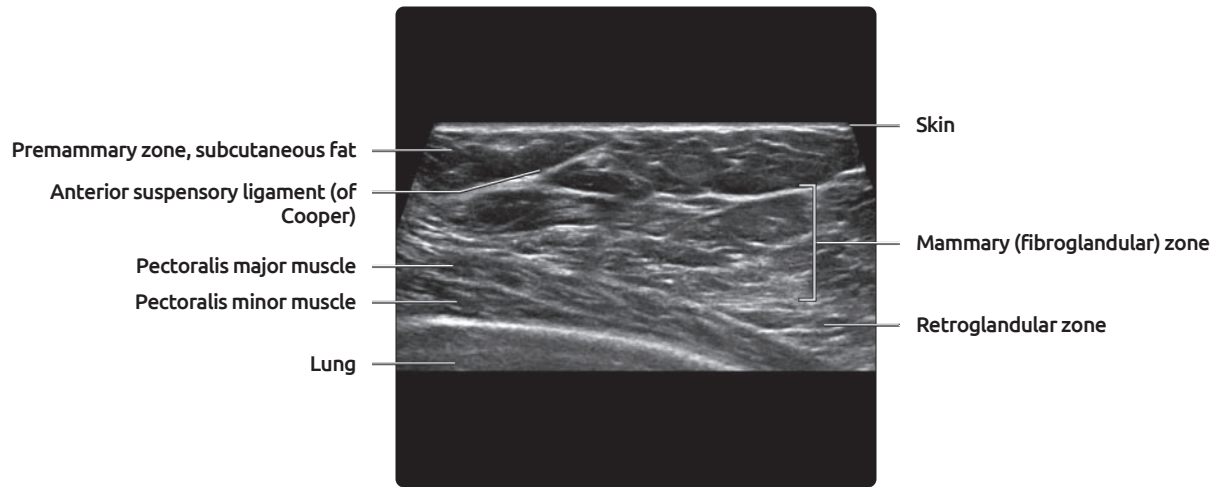
- Fibroglandular tissue/muscle often shows physiologic enhancement
- Density and enhancement features of parenchyma vary with patient age and phase of menstrual cycle
- Ideally performed during follicular phase menstrual cycle
  - Less dense stroma and lower breast water content
- Describe fibroglandular tissue: Fatty, scattered, heterogeneous, extreme
- Describe background parenchymal enhancement (BPE)
  - Minimal, mild, moderate, marked
  - ↑ BPE predicts ↑ risk of developing breast cancer
- ↑ false-positives, but sensitivity retained when BPE moderate or marked

## TOMOSYNTHESIS OF NORMAL ZONAL ANATOMY



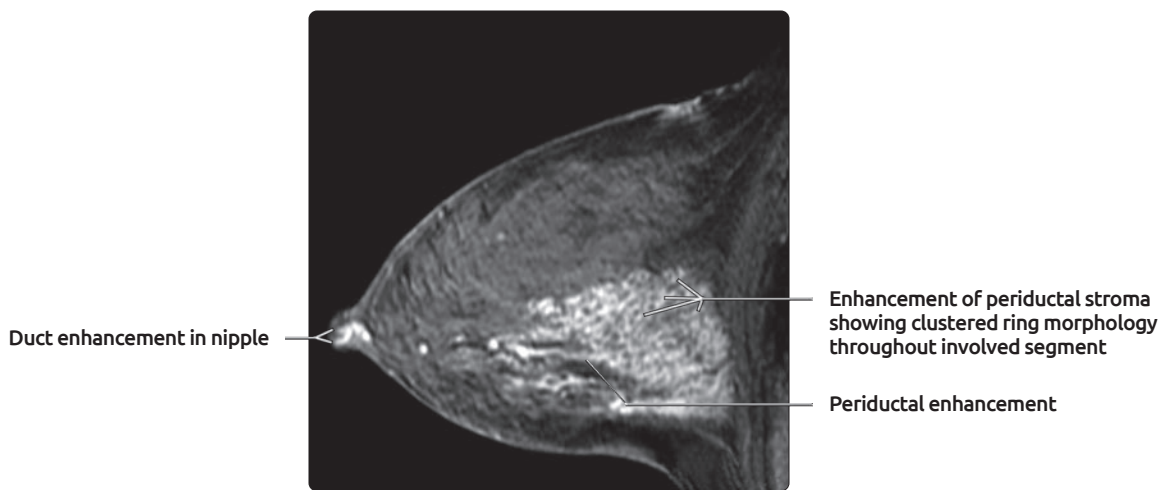
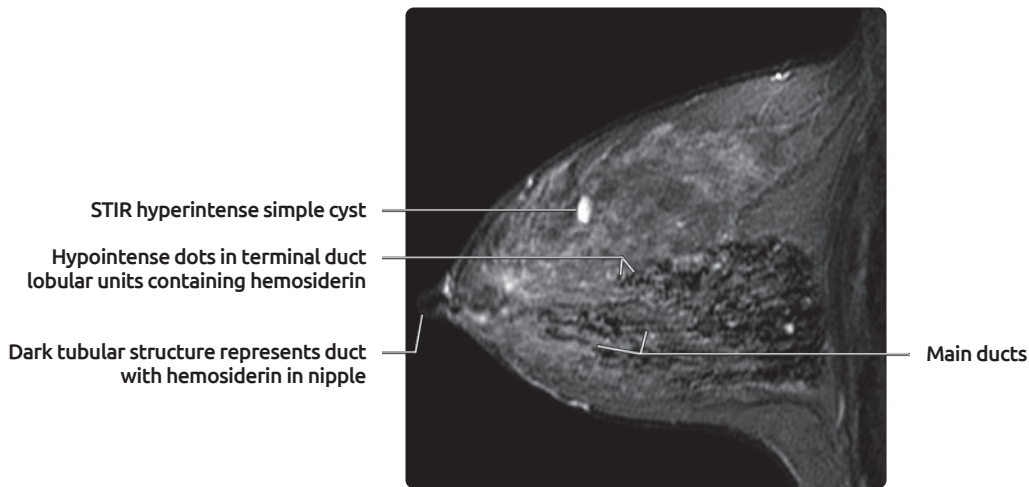
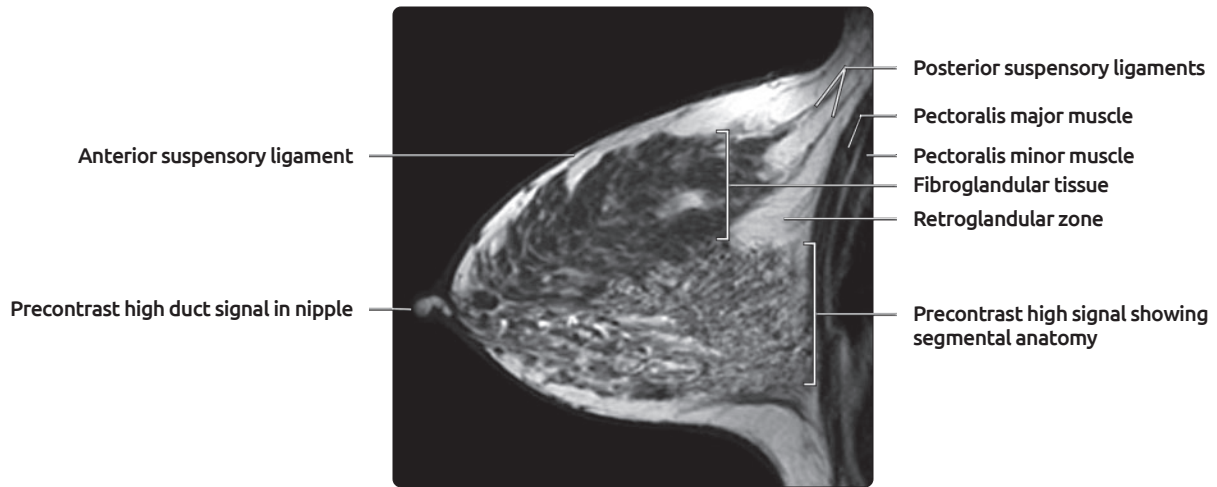
**(Top)** CC tomosynthesis of normal breast with scattered fibroglandular density shows radially arrayed ducts leading to the nipple. Approximately 15-20 lobes comprise the glandular portion of the breast, each leading to a duct. Some ducts may fuse before leading to an orifice in the nipple. **(Middle)** CC tomosynthesis shows scattered fibroglandular density and nicely depicts normal zonal anatomy. **(Bottom)** MLO tomosynthesis shows normal zonal anatomy of the breast.

## US OF ZONAL ANATOMY



**(Top)** Radial US in the axillary tail (fatty portion) of the breast shows position of breast anterior to pectoralis muscles. **(Middle)** Radial US of the right breast (same patient) along the orientation of the ducts at the 9:00 position near the nipple demonstrates the 3 zones of the breast: Premammary, mammary, and retromammary. **(Bottom)** Normal transverse US at the level of the nipple shows subareolar ducts.

MR OVERVIEW OF BREAST ANATOMY



**(Top)** Sagittal T1 MR prior to contrast injection shows extensive high duct signal due to blood in a woman with bloody nipple discharge. **(Middle)** Sagittal STIR MR (same patient) shows magnetic susceptibility artifacts due to hemosiderin in the blood in ducts throughout several segments involved by DCIS. An incidental cyst is seen. **(Bottom)** Sagittal T1 C+ FS MR (same patient) shows extensive segmental nonmass enhancement in a clustered ring/periductal pattern. Findings were due to extensive low nuclear grade DCIS.