23. You are shown bilateral mammograms (Figures 1-4) obtained on a 66-year-old man. What is the MOST LIKELY diagnosis?

A. Asymmetric gynecomastia
B. Invasive ductal carcinoma
C. Fibroadenoma
D. Invasive lobular carcinoma

**Rationale:**
A: The mass on the right has a rounded configuration and is not typical for gynecomastia.
B. Invasive ductal carcinoma is more likely than cysts or fibroadenoma or invasive lobular carcinoma
C: Males do not generally develop lobular units therefore fibroadenoma would be unlikely.
D: Males do not generally develop lobular units so this is much less likely.
24. You are shown ultrasound images (Figures 5 and 6) from a 55-year-old woman who has silicone implants and presents with a palpable lump. Which of the following statements BEST describes the imaging findings?

A. Intact implant with an adjacent mass
B. Intracapsular implant rupture
C. **Intracapsular and extracapsular implant rupture**
D. Extracapsular implant rupture

**Findings:**
Demonstrates the findings of extracapsular rupture with the "snow storm appearance" of extravasated silicone. Figure 6 - demonstrates the linguine sign with 'stair stepping' of the collapsed implant envelope.

**Rationale:**
A: The findings do not demonstrate a mass.
B: There is both intracapsular and extracapsular rupture of the implant.
C: There are findings of both intracapsular rupture (linguine sign) and extracapsular rupture (snow storm appearance).
D: Both intracapsular and extracapsular rupture are present on the ultrasound exam.
25. You are shown images from a diagnostic workup (Figures 7 and 8) of a 73-year-old patient. What is the MOST LIKELY diagnosis?

A. Mucinous carcinoma
B. Intramammary lymph node
C. Medullary carcinoma
D. Tubular carcinoma

**Findings:**
Spiculated mass in the right upper outer quadrant. Ultrasound demonstrates a spiculated mass with hyperechoic rim.

**Rationale:**
A: Mucinous is usually round and may resemble a complex cyst
B: Lymph nodes typically have a hilar notch which appears echogenic on ultrasound and are well defined, not spiculated.
C: These are usually well defined and rounded.
D: Tubular carcinoma is usually small and spiculated.
26. A 65-year-old woman presents with a complaint of left breast thickening. Based on the images (Figures 9-12), what is the MOST LIKELY diagnosis?

A. Inflammatory breast cancer
B. Invasive lobular carcinoma
C. Ductal carcinoma in situ
D. Mucinous carcinoma

Rationale:
A. Inflammatory breast cancer would present with trabecular thickening and skin thickening.
B. The appearance of focal asymmetric thickening and distortion with the clinical finding of breast thickening is a common appearance for invasive lobular.
C. DCIS usually presents as calcifications. DCIS can be associated with a mass but usually is a spiculated mass rather than distortion and focal asymmetry.
D. Mucinous carcinoma usually presents as a rounded mass.
27. You are shown bilateral CC views from a routine screening mammogram (Figures 13 and 14). What is the MOST LIKELY diagnosis?

A. Silicone granulomatata
B. Neurofibromatosis
C. Steatocystoma multiplex
D. Multiple fibroadenomata

**Findings:**
Bilateral multiple skin lesions

**Rationale:**
A: Direct silicone or paraffin injections result in multiple tiny round eggshell-type calcifications that obscure underlying breast tissue.
B: The skin lesions of neurofibromatosis may be multiple. Classically, they are outlined by air. The multiplicity of these lesions and presence along the inframammary fold make this appearance pathognomonic.
C: This rare autosomal dominant condition is characterized by multiple and extensive intradermal oil cysts bilaterally that may be palpable. Mammography shows extensive bilateral well-circumscribed radiolucent masses with a typical appearance of oil cysts, but these oil cysts are intradermal in location and are not associated with a history of trauma.
D: Fibroadenomas may be multiple and bilateral. However, they are only present within the breast tissue and will not be seen along the inframammary fold.
28. You are shown magnification views in the CC and straight lateral projections (Figures 15 and 16). What is the MOST LIKELY diagnosis?

   A. Ductal carcinoma in situ  
   B. Lobular carcinoma in situ  
   C. Milk of calcium  
   D. Secretory disease

**Rationale:**
A: Calcifications of DCIS often vary in size and shape and frequently occur in a ductal distribution extending toward the nipple.
B: Lobular carcinoma in situ does not classically present with calcifications.
C: Milk of calcium tends to be amorphous or smudgy on the CC magnification view and layering on the lateral magnification view. The calcifications shown here do not change configuration, nor do they layer on the lateral view.
D: Secretory calcifications are coarse rod like calcifications extending toward the nipple. They are usually of uniform shape and density.
29. You are shown a spot-magnification view (Figure 17) from a diagnostic workup of a patient with a palpable lump. What is the MOST appropriate recommendation?

A. **Routine annual mammography**
B. Ultrasound
C. Stereotactic core biopsy
D. Breast MRI

**Rationale:**
A: Fat necrosis is benign (Birads 2). The appropriate management is 1 year follow up.
B: If the appearance of the palpable finding is diagnostic of fat necrosis, no further imaging is necessary. In fact, ultrasound may be confusing in that it may appear as a complex heterogeneous mass.
C: If the appearance of the palpable finding is diagnostic of fat necrosis, no further work up is necessary.
D: If the appearance of the palpable finding is diagnostic of fat necrosis, no further imaging is necessary.
30. You are shown a sagittal subtraction image from a breast MRI (Figure 18). Which of the following statements BEST describes the non-masslike enhancement in the inferior breast?

A. **Clumped ductal enhancement**
   B. Regional stippled enhancement
   C. Dendritic enhancement
   D. Segmental heterogeneous enhancement

**Rationale:**
A: This is worrisome for DCIS.
B: This refers to enhancement in a large volume of tissue not conforming to a ductal distribution.
C: This pattern is seen in women with involuted breasts, in which there are strands of parenchyma separated by fat. The abnormal enhancement pattern shows distorted trabecular thickening and angulation.
D: This refers to a triangular region or cone of enhancement with the apex pointing to the nipple, suggesting a duct or its branches.
31. You are shown a sagittal subtraction image from a breast MRI (Figure 19). Which of the following kinetic curve patterns is MOST LIKELY associated with this mass?

   A. Rapid initial rise with persistent late enhancement
   B. Rapid initial rise with plateau
   C. Delayed initial rise with delayed washout
   D. **Rapid initial rise with rapid washout**

**Rationale:**
A: This pattern is most frequently seen with benign findings, such as a fibroadenoma.
B: Typically, carcinomas enhance rapidly but also demonstrate rapid washout.
C: Delayed uptake is often seen in benign lesions.
D: This kinetic pattern is usually associated with malignant masses.
32. Core needle biopsy of the mass shown in the mammogram (Figure 20) yielded a fibrocystic change. What is the MOST appropriate management?

A. Follow-up imaging in 6 months
B. Routine annual mammography
C. Breast MRI
D. Surgical excision

**Rationale:**
A: FCC are a B9 discordant result as this is a BI-RADS 5 appearing mass. F/U is not appropriate.
B: FCC are a B9 discordant result as this is a BI-RADS 5 appearing mass. F/U is not appropriate.
C: Mastectomies are not performed in a patient without a proven cancer. Lumpectomy first is appropriate to confirm this patient has a malignancy.
D: B9 discordant results should be removed to confirm the histology was accurate. This was a BI-RADS 5 lesion with high suspicion of malignancy.
33. When digital mammograms are viewed on a soft-copy display workstation, which of the following problems MOST LIKELY would be caused by excess ambient light?

   A. Contrast reduction at low luminance levels
   B. Contrast reduction at high luminance levels
   C. Increased veiling glare
   D. Increased luminance noise

**Rationale:**
A: Reflected luminance from ambient light reduces image contrast by reducing the luminance difference between different areas in an image. The contrast reduction is most pronounced at low luminance levels, where the percentage added luminance has the greatest relative impact.
B: Reflected luminance from ambient light reduces image contrast by reducing the luminance difference between different areas in an image. The contrast reduction is most pronounced at low luminance levels, where the percentage added luminance has the greatest relative impact.
C: Veiling glare is caused by various characteristics of the display components and is not affected by ambient light.
D: Luminance noise is caused by random spatial fluctuations in pixel luminance and is not affected by ambient light.

34. Concerning complex sclerosing lesions (CSL), which of the following statements is TRUE?

   A. MRI is used to distinguish between CSL and carcinoma.
   B. It commonly presents as a palpable mass.
   C. Patients with CSL are at increased risk for invasive lobular carcinoma.
   D. When found at biopsy, it is frequently incidental.

**Rationale:**
A: CSL does not demonstrate significant enhancement on MRI. Low signal on T1. May be spiculated
B: Usually not palpable even up to 2 cm in size.
C: CSL may be associated with ADH or low grade DCIS. Some pathologists believe that CSL may be a precursor to tubular carcinoma.
D: Most CSL can be small and are usually incidental and unrelated to the finding that prompted the biopsy.
35. Which of the following mammographic projections would be MOST helpful in evaluating a cluster of calcifications in the upper inner quadrant of the right breast?

   A. Cleavage view
   B. CC magnification view
   C. Tangential magnification view
   D. Lateral magnification view

36. When a digital image is viewed, which of the following items is MOST LIKELY to indicate that the image may be overexposed?

   A. Image appears dark
   B. Contrast is decreased
   C. Resolution is decreased
   D. Exposure index value

Rationale:
A: Image processing will adjust image density to the same level regardless of exposure level.
B: Image processing will adjust image contrast to the same level regardless of exposure level, though very excessive overexposure will increase scatter levels which may decrease contrast.
C: Spatial resolution depends on detector or CR reader characteristics and focal spot blur.
D: The amount of radiation incident on the detector is quantified by an exposure index value. The target exposure index range differs depending on the manufacturer.

37. Which of the following is a requirement of the Mammography Quality Standards Act (MQSA)?

   A. Each facility is required to send a written summary of the mammography report to the patient in lay terms.
   B. Patients may not be self-referred for screening studies.
   C. The written mammography report must be provided to the patient’s healthcare provider within 10 days.
   D. Each interpreting physician must have interpreted or multi-read at least 960 mammograms over a 12-month period.

Rationale:
A: MQSA requires that every facility send patients a written summary of findings in terms easily understood by a layperson.
B: Patients may be self-referred for screening mammography. However, the facility is then responsible to have a system in place whereby the patient receives the actual report and can be referred to a clinician for further treatment.
C: Incorrect as the correct answer is within 30 days.
D: Incorrect as the correct answer is 960 in 24 months.
38. Concerning inflammatory breast carcinoma, which of the following statements is TRUE?
   A. It accounts for 10% of all breast cancer cases.
   B. Radiation therapy should be administered prior to definitive surgical intervention.
   C. MRI may be helpful in evaluating the patient's response to treatment prior to surgery.
   D. The involved breast may appear orange on physical examination.

   **Rationale:**
   A: Inflammatory breast cancer accounts for 1-4% of breast cancer cases.
   B: Chemotherapy before surgery or radiation therapy is the current standard treatment of inflammatory breast cancer.
   C: MRI may assist in evaluation of response to therapy.
   D: Patients often present with peau d'orange due to the skin edema and thickening. The breast may be red and swollen.

39. A patient undergoes a biopsy for indeterminate calcifications. The result is lobular carcinoma in situ (LCIS). What is the MOST appropriate NEXT step in management?
   A. Surgical resection of the biopsy site
   B. Mastectomy
   C. Breast conservation with radiation therapy
   D. Follow-up imaging in 6 months

   **Rationale:**
   A: It is appropriate to refer patients for surgical excision following a CNB demonstrating LCIS. There is a significant risk of upgrades to DCIS or invasive cancer at final pathology (15-20%). Too high for short-term follow up, where we accept <2% risk.
   B: It is true that women with history of LCIS are at increased risk for future malignancy, but as for management specific to the current diagnosis lumpectomy is adequate for LCIS. Mastectomies should be reserved for women with known cancer, unless prophylactic.
   C: Currently LCIS is not treated as a cancer (unlike DCIS). Therefore no radiation is necessary.
   D: As stated above, the risk of cancer is above our threshold for short term follow up.
40. Concerning a staging ultrasound of the axilla in a woman with newly diagnosed breast cancer, which of the following statements is TRUE?

A. Overall lymph node size is the most sensitive feature for detecting metastatic disease.
B. Ultrasound can identify the sentinel lymph node.
C. Normal lymph node morphology excludes metastatic disease.
D. Asymmetric cortical thickening is an indication for an ultrasound-guided biopsy.

Rationale:
A: This is useful but not the most sensitive (Az of 0.68-0.70).
B: A normal ultrasound does not exclude disease.
C: Morphology is more accurate (Az of 0.75-0.87) than size but normal findings do not exclude disease.
D: Abnormal lymph nodes have a thickened or eccentrically bulging cortex and a diminished hilum. The thickened cortex should be the target at biopsy.

41. Concerning spontaneous bloody nipple discharge, which of the following statements is TRUE?

A. The most common cause is ductal carcinoma in situ.
B. MRI may be more sensitive than galactography for the detection of carcinoma.
C. If galactography is unsuccessful, a 6-month follow-up mammogram should be performed.
D. Ultrasound of the subareolar region should be the initial imaging test of choice.

Rationale:
A: Not true (less than 10%)
B: MRI may be more sensitive than galactography for the detection of carcinoma. However, no specific MRI features of papillomas have been described to allow them to be distinguished from carcinomas.
C: If galactography is unsuccessful, either MRI or surgical duct excision is suggested.
D: Mammography is the primary imaging modality for women with bloody or serous nipple discharge.

42. Concerning tumor recurrence after breast conservation therapy, which of the following statements is TRUE?

A. The risk of local recurrence is 5% per year.
B. An extensive intraductal component increases the risk of recurrence.
C. New calcifications at the lumpectomy site, regardless of morphology, warrant biopsy.
D. Breast irradiation increases the risk of recurrence.

Rationale:
A: The risk of local regional recurrence is approximately 1% per year.
B: EIC puts a patient at high risk for recurrence.
C: New calcifications often form at the biopsy site and frequently represent fat necrosis. If they are morphologically indicative of fat necrosis, follow up may be obtained, rather than immediate biopsy.
D: Breast irradiation does not lead to an increased incidence of tumor recurrence and is necessary following breast conservation therapy.
43. Which of the following tests MUST be assessed by the technologist on a daily basis?

   A. Darkroom cleanliness
   B. Screen-film contact
   C. Repeat analysis
   D. Phantom images

**Rationale:**
A. Dark room cleanliness
B. Screen film contact
C. Repeat analysis
D. Phantom images

44. Concerning the imaging of a lactating patient, which of the following statements is TRUE?

   A. The breast tissue demonstrates decreased vascularity on ultrasound.
   B. The radiographic breast density decreases.
   C. **Ultrasound is more sensitive than mammography for masses.**
   D. Return to baseline after cessation of lactation takes at least 6 months.

**Rationale:**
A. Increased vascularity is noted on ultrasound during lactation.
B: The radiographic density increases during pregnancy.
C: Ultrasound has a greater sensitivity (nearly 100%) than mammography in the evaluation of patients with carcinoma. Ultrasound also helps to differentiate whether the palpable area represents a true mass or normal parenchyma.
D: Return to baseline after lactation takes about 3 months. It is advisable to wait three months prior to performing mammography to allow resolution of lactation changes and decrease in breast density.