APPROACH TO
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The Patient with a Palpable Breast Mass

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ABSTRACT

A palpable breast mass is a common reason for presenting to the primary care, emergency, or obstetrics and gynecology clinical settings. Although most palpable masses are benign, patients may experience anxiety due to the risk of malignancy. To ensure a comprehensive evaluation, a systematic approach to history-taking, clinical breast examination, and imaging is crucial.

This article aims to provide medical students with a stepwise approach to the evaluation and diagnosis of palpable breast masses. Considering the wide spectrum of diseases associated with palpable masses, this paper does not cover the differential diagnosis and management. Nonetheless, we will touch upon the breast cancers most commonly associated with breast masses and briefly mention their respective treatments.

KEYWORDS
Breast Mass, Breast Lump, Breast Cancer

1 | QUESTION

A 29-year-old (y/o) African American woman presents to her family doctor after noticing a new left-sided breast lump during self-examination one month ago. The lump has been gradually increasing in size over time and she reports a new onset of bloody nipple discharge as of yesterday. She denies systemic symptoms such as weight loss, fever, or chills and her appetite is preserved. She has not experienced any abdominal pain, nausea, jaundice, dyspnea, cough, or bone pain.

Given her positive family history of breast cancer (both her mother and maternal aunt were diagnosed prior to menopause), she admits to being quite concerned. She is overall healthy, with a body mass index of 28 (i.e., overweight). She denies previous surgeries, smoking, alcohol consumption, or recreational drug use. Her age at menarche was 10y/o; she is nulliparous and has been on the oral contraceptive pill for the last seven years. Her last menstrual period was two weeks ago.

On physical exam, a 1.5cm rubbery, mobile, painless mass is observed above the patient's left nipple. There is no erythema, thickening, or dimpling of the overlying skin. The rest of her physical examination is unremark-

able.
The initial laboratory workup shows:

- Complete Blood Count (CBC) within normal limits
- C-Reactive Protein (CRP) within normal limits
- ß-HCG < 0.5 mIU/mL

What is the best next step for managing this patient?

A. Watchful waiting with clinical follow-up.
B. Ultrasound.
C. Mammography.
D. MRI.
E. PET scan.
F. Biospy.

2 | ANSWER

The correct answer is (**B**). For patients under 30 years of age, ultrasound is the preferred initial imaging modality. In fact, breasts tend to be denser with a lower proportion of fatty tissue, which decreases the accuracy and ability to detect microcalcifications in mammography (1). Ultrasound proves to be effective in distinguishing between cystic (i.e., benign finding) from solid masses while having no associated contraindications and being safe during pregnancy.

This patient's ultrasound reveals a hypoechoic well-circumscribed, round, macrolobulated mass, which, when considered alongside the clinical picture, suggests a diagnosis of fibroadenoma. Fibroadenomas are benign breast tumors most commonly found in women aged 20-30, composed of both glandular and connective tissue. The majority of fibroadenomas can be observed and typically regress over time. In cases where they become symptomatic or increase in size, treatment options such as lumpectomy or cryoablation may be considered.

3 | INITIAL APPROACH

3.1 | History and Physical Examination

A thorough history and physical examination are crucial for guiding clinical reasoning and level of suspicion for malignancy. Elements that should be elicited include:

3.1.1 | Onset and Fluctuations

Determining the onset of a patient's breast mass can be challenging; they are most frequently discovered incidentally upon routine screening as no established guidelines recommend self-examination or clinical breast screening for breast cancer detection (2). Moreover, it is essential to identify preceding events (such as blunt trauma, infection, menstruations, medications, etc.) and monitor fluctuations in mass size.

3.1.2 | Associated Symptoms

- **Pain**: Painful masses may suggest mastitis, cysts, abscesses, or a breast hematoma with fat necrosis secondary to trauma. Tenderness in fibrocystic breast changes is common but less localized (3). Malignant breast masses are less likely to be tender, although this finding should not rule out malignancy from the differential diagnosis.
- **Systemic symptoms**: The presence of systemic symptoms should raise suspicion of malignancy. The most common metastatic breast cancer sites are the bones, liver, and lungs. Symptoms including but not limited to weight loss, bone pain, dyspnea, cough, chest pain, abdominal pain, nausea, and jaundice may suggest disseminated disease with the presence of metastases (4).
- **Nipple discharge**: The risk of malignancy is higher in patients with unilateral spontaneous non-milky (i.e. clear or bloody) nipple discharge (5). However, benign papilloma and duct ectasia remain the leading causes of pathologic nipple discharge (6).

3.1.3 | Medical History

Patient risk factors raising suspicion for breast cancer should be identified. For instance, a personal and/or family history of breast cancer, whether accompanied by genetic mutations or not, increases a patient's risk (7). Furthermore, it is essential to consider causes of in-

creased estrogen exposure, such as number of pregnancies, age at menarche and menopause, oral contraceptives, or hormonal therapy. In addition, radiation exposure and lifestyle habits, such as alcohol and smoking, should be explored as they are associated with a higher risk of breast cancer (8).

3.1.4 | Physical Examination

A thorough clinical breast examination should be performed (9) with a physical examination of other body systems if warranted by the clinical history. A chaperone is recommended to ensure patient comfort.

Inspect the breasts in an upright position for asymmetry, mass, skin dimpling, erythema, nipple retraction, inversion, or discharge. If discharge is not obvious upon inspection, consider asking the patient if they have noticed any on self-observation.

Skin changes, including erythema, warmth, and tenderness, may indicate an infectious etiology such as mastitis or cellulitis. Inflammatory breast cancer can present similarly, or with additional ridging and pitting (similar to an orange peel). Paget's disease of the breast should also be considered in cases presenting with persistent eczematous nipple changes.

Examine the patient supine with raised arms; palpate both breasts systematically for masses using either concentric circles, a radial approach, or vertical stripes. Then assess for lymphadenopathy in the nipples, the axillae, and the supraclavicular regions. If present, document the location, size, consistency, tenderness, mobility, and margins.

Benign masses typically exhibit smoothness, mobility, and well-defined margins, while malignant ones are often firm, non-mobile, and fixed to the surrounding skin and soft tissue with irregular margins. However, variations exist, and the physical examination cannot be used as a stand-alone diagnosis; for instance, mobile masses may be cancerous.

3.2 | Imaging

Ultrasound and mammography are the most commonly used imaging modalities for breast pathologies, often used in combination to improve accuracy. Moreover, MRI is significantly effective as an additional diagnostic tool for women with dense breasts.

3.2.1 | Patients < 30 y/o

Ultrasound is the preferred initial imaging modality for women under 30y/o and men presenting with a palpable breast mass (1). (Figure 1)

3.2.2 | Patients > 40 y/o

Mammography is the first line modality for women over 40 y/o presenting with a palpable breast mass (1). Mammography should be performed before biopsy to assess for other suspicious areas or calcifications in the breast. (Figure 1)

3.2.3 | Patients 30 < X < 40 y/o

Either ultrasound or mammography can be performed; oftentimes, both modalities will be needed to enhance accuracy (1). (Figure 1)

3.2.4 | Breat Imaging-Reporting and Data Systesm (BI-RADS)

The BI-RAD is a tool developed by the American College of Radiology to provide a unanimous reporting schema for breast imaging. It applies to ultrasound, mammography, and MRI (10). The radiology report assigns the scan results to one of the seven defined categories (Table 1), which guides the management plan.

3.3 | Pathology

Diagnostic breast imaging should always precede breast biopsy. Patients with concerning breast abnormalities on imaging (BI-RADS 4 or 5) should undergo breast

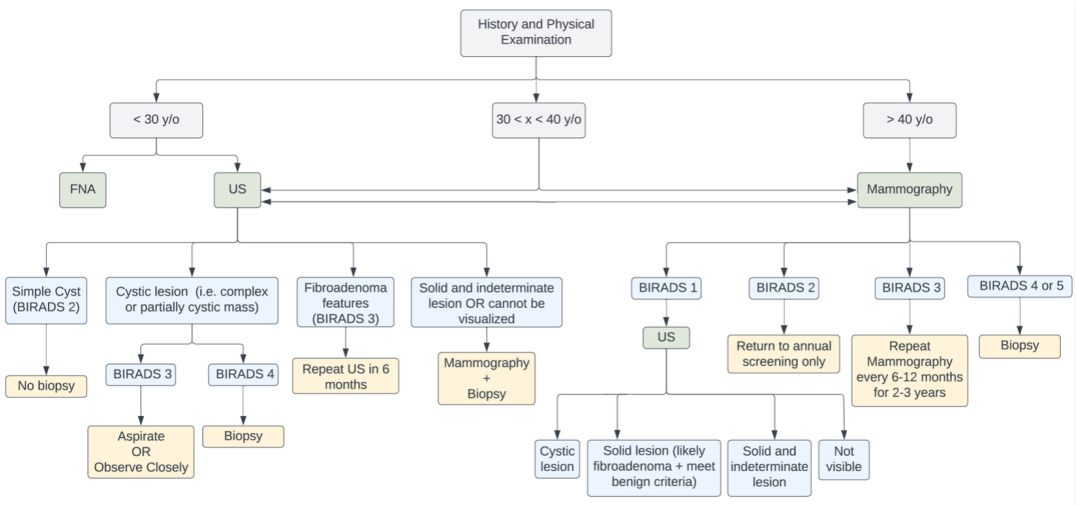


FIGURE 1 Approach to adrenal mass flowchart

Abbreviations used: y/o, years old; US, ultrasound; BIRADS, Breast Imaging Reporting and Data System.

Information provided above is based on Esserman LJ, Joe BN. Diagnostic Evaluation of Suspected Breast Cancer. In: UpToDate. Post TW (Ed), UpToDate, Waltham, MA. (Accessed on January 06, 2023.)

biopsy. However, a biopsy may be needed despite negative imaging in patients with a clinically suspicious palpable breast mass (11).

3.3.1 | Biopsy Methods

Most biopsies are performed under image guidance. Core needle biopsy (CNB) is the preferred initial approach due to its ability to provide larger tissue samples, offering more accurate histopathological information and reducing false-negative outcomes compared to fine needle aspiration (FNA) (12). Though FNA with intraprocedural cytopathology may expedite patient management (providing an immediate preliminary diagnosis), it risks non-diagnostic or inconclusive results due to smaller samples and limited architecture preservation. Surgical biopsy is rarely a first-line approach but may investigate unclear or inconclusive percutaneous biopsy results (13) and is typically performed under conscious sedation or general anesthesia. For anticoagulated patients, radiologists should be informed; if feasible, suspend anticoagulation for CNB or consider FNA or open biopsy for bleeding control (14).

3.4 | Additional Investigations

Other investigations are available for breast mass analysis, depending on the likely differential and available resources. Baseline blood tests, typically suggested for surgical patients, encompass hemoglobin, bone profile, and liver function tests for suspected hepatic metastases. Inflammatory markers and blood cultures should be considered when a breast abscess is suspected. Tumor markers such as Ca27.29 and Ca15-3 have limited screening and diagnostic utility but are used for prognostication and monitoring for recurrence (15).

Alongside these tumor markers, hormone receptor status assessment (ER, PR, HER2) is crucial for directing treatment strategies, such as hormonal or targeted therapies (16), and determining prognosis as well as specific treatment response.

Nuclear medicine scanning assists in staging, while genetic testing caters to individuals with hereditary breast and ovarian cancer risk factors (17).

Category	Recommended action	Likelihood of cancer
BI-RADS 0: incomplete (need additional imaging evaluation: mammographic views or ultrasound and/or for mammography, obtaining previous images not available at the time of the study)	Additional imaging required	N/A
BI-RADS 1: negative (symmetrical and no masses, architectural distortion, or suspicious calcifications)	Routine screening	Essentially 0% probability of malignancy
BI-RADS 2: benign	Routine screening	Essentially 0% probability of malignancy
BI-RADS 3: probably benign	Short interval follow-up suggested	-<2% probability of malignancy
BI-RADS 4: suspicious for malignancy	Biopsy should be considered	2-94% probability of malignancy For mammography and ultrasound, these can be further divided into: ▪ BI-RADS 4A: low suspicion for malignancy (2-9%) ▪ BI-RADS 4B: moderate suspicion for malignancy (10-49%) ▪ BI-RADS 4C: high suspicion for malignancy (50-94%)
BI-RADS 5: highly suggestive of malignancy	Appropriate action should be taken	>95% probability of malignancy
BI-RADS 6: known biopsy-proven malignancy	Appropriate action should be taken	N/A

TABLE 1 The Breast Imaging Reporting Data System (BI-RADS)

Abbreviations used: N/A; not applicable

Information provided above is based on Eghtedari M, Chong A, Rakow-Penner R, Ojeda-Fournier H. Current status and future of BI-RADS in multimodality imaging, from the AJR special series on radiology reporting and data systems. Am J Roentgenol. 2021;216(4):860–873. https://doi.org/10.2214/AJR.20.24894

4 | BEYOND INITIAL APPROACH

This section discusses common malignant causes of breast masses in more detail (Table 2).

4.1 | Non-invasive Breast Cancer

Ductal Carcinoma in Situ (DCIS) is caused by the proliferation of epithelial cells contained within breast ducts. DCIS may present as a palpable breast mass, although most cases are non-palpable and detected on screening mammography (18). Treatment includes lumpectomy with wide excision margins and radiation therapy or simply mastectomy if a larger area of disease is present. Lobular Carcinoma in Situ (LCIS) is another benign breast cancer in which neoplastic cells are contained within the breast lobule. However, LCIS does not present as a palpable mass.

4.2 | Invasive Breast Cancer

The most common malignant palpable breast mass is invasive ductal carcinoma (IDC) in which neoplastic cells originating from the ductal epithelium infiltrate the supporting stroma. Conversely, invasive lobular carcinoma (ILC) usually presents as a diffuse thickening rather than a discrete mass (19). Finally, approximately half of patients with Paget's disease of the breast may present

with a palpable lump.

Treatment of invasive breast cancer is complex and depends on factors such as molecular subtype, tumor size, nodal status, and presence or absence of metastases. Therapeutic approaches can be classified into general categories: endocrine therapy, targeted therapy (e.g., Herceptin), chemotherapy, immunotherapy (in triple-negative breast cancer), and radiation therapy.

In early-stage breast cancer, regardless of molecular subtype, locoregional treatment involves surgery (lumpectomy or mastectomy) and axillary lymph node management. Postoperative therapies rely on tumor size and molecular expression. For instance, estrogen receptor (ER)-positive patients receive endocrine treatment, while those at high risk undergo chemotherapy. Triple-negative breast cancers or those with human epidermal growth factor receptor 2 (HER2)-overexpressing cancers are administered neoadjuvant systemic therapy tailored to the specific subtype before surgery. Intensified systemic treatment may be considered if a pathological complete response (pCR) is not achieved (20).

In locally advanced and metastatic cancer, locoregional and systemic therapies are combined. Treatment

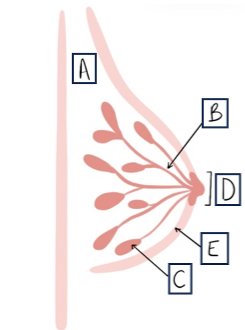
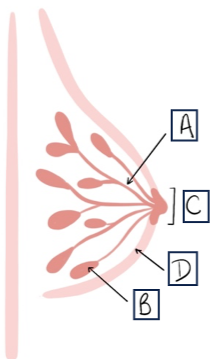
	Breast Anatomy	Pathology
Benign Breast Conditions 	**A** | Breast Tissue, Connective Tissue, Fat Tissue	Fibroadenoma Fibrocystic breast changes Cyst Lipoma Abscess Fat necrosis (trauma)
	B | Ducts	Galactocele Usual ductal hyperplasia
	C | Lobules	Sclerosing adenosis Atypical lobular hyperplasia
	D | Nipple and Areola	Nipple adenoma
	E | Blood Vessels	Haemangioma
Malignant Breast Conditions 	**A** | Ducts	Ductal Carcinoma in Situ Invasive Ductal Carcinoma
	B | Lobules	Invasive Lobular Carcinoma
	C | Nipple and Areola	Paget Disease of the nipple

TABLE 2 Benign and malignant breast conditions leading to palpable breast masses (non-exhaustive list).

for invasive breast cancer should be tailored to individual disease characteristics and preferences. More specifically, in luminal-like conditions, endocrine therapy, sometimes combined with targeted treatment, precedes chemotherapy. Consecutive monotherapy is advised upon chemotherapy initiation. Chemotherapy remains the primary treatment for triple-negative diseases; however, PD-L1-expressing tumors may qualify for initial immunotherapy. In HER2-positive cases, a series of anti-hHER2 agents and chemotherapy are used; ER-positive, HER2-positive diseases may also benefit from endocrine and anti-HER2 therapy combinations, preferably as maintenance therapy. Germline BRCA mutation carriers may consider PARP inhibitors as an additional treatment option.

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