# THYROID NODULE & MULTINODULAR GOITRE

**HIGH-YIELD POINTS:**

- Fine Needle Aspiration Cytology (FNAC) is the GOLD STANDARD for evaluating thyroid nodules
- Bethesda Classification (I-VI) guides management decisions
- Suspicious features (MITIGATE): Microcalcifications, Irregular margins, Taller than wide, Invasion, Growth (rapid), Age <20 or >60, Tachycardia/hyperthyroid symptoms, Exposure to radiation
- Total thyroidectomy preferred for MNG to prevent recurrence

## 1. MULTINODULAR GOITRE (MNG)

### A. Diagnostic Approach

**Clinical Presentation: Neck swelling, compressive symptoms, cosmetic concern**

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**HISTORY: Duration, growth rate, compressive symptoms (dysphagia, dyspnea, hoarseness), thyroid status, family history, radiation exposure**

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**EXAMINATION: Size, consistency, mobility, retrosternal extension, cervical lymph nodes, signs of compression (SVC syndrome, tracheal deviation)**

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**INVESTIGATIONS**

| Investigation | Purpose | Key Findings |
|---|---|---|
| **TSH** | Thyroid function status | Low TSH → Toxic MNG; Normal/High → Euthyroid/hypothyroid |
| **Thyroid Antibodies** | Exclude autoimmune thyroiditis | Anti-TPO, Anti-Tg |
| **USG Neck** | Nodule characterization | Size, number, echogenicity, calcification, vascularity, lymph nodes |
| **FNAC** | Rule out malignancy | For dominant/suspicious nodules (Bethesda classification) |
| **CT/MRI Neck-Thorax** | Retrosternal extension, tracheal compression | For large goiters with compressive symptoms |
| **Indirect Laryngoscopy** | Vocal cord assessment | Pre-operative evaluation of recurrent laryngeal nerve |
| **Radionuclide Scan** | Functional status of nodules | Hot (hyperfunctioning), warm, cold nodules |

🎯 **MNEMONIC - Indications for Surgery in MNG: "COMPRESS CANCER"**
**C**ompressive symptoms (dysphagia, dyspnea, SVC syndrome)
**O**bstruction of airway
**M**alignancy (suspected or proven)
**P**ressure symptoms
**R**etrosternal extension
**E**sthetic concerns (cosmesis)
**S**uspicious FNAC findings
**S**ymptomatic hyperthyroidism (failed medical Rx)
**C**ervical lymphadenopathy
**A**utoimmune thyroiditis with nodules
**N**on-compliance to medical therapy
**C**old nodules on scan
**E**ndemic goiter with complications
**R**apid growth

### B. Management

| Category | Management | Details |
|---|---|---|
| **Asymptomatic, Euthyroid** | Conservative | Regular follow-up (6-12 months), repeat USG, monitor thyroid function |
| **Toxic MNG** | Medical → Surgery/RAI | 1. Render euthyroid: Carbimazole/Methimazole + β-blocker<br>2. Definitive: Surgery (total/near-total thyroidectomy) OR Radioiodine ablation |

| | | |
|---|---|---|
| **Compressive/Large Goiter** | Surgical | Total thyroidectomy (preferred) or Near-total thyroidectomy |
| **Suspicious/Malignant** | Surgical | Total thyroidectomy ± neck dissection |
| **Retrosternal MNG** | Surgical (sternotomy if needed) | Total thyroidectomy via cervical approach ± median sternotomy |

## C. Surgical Complications

**EARLY COMPLICATIONS:**

| Complication | Incidence |
|---|---|
| Hemorrhage/Hematoma | 1-2% |
| RLN injury (transient) | 1-5% |
| RLN injury (permanent) | <1% |
| Transient hypocalcemia | 10-30% |
| Thyroid storm (if toxic) | Rare |
| Tracheomalacia | Rare |
| Wound infection | 1-2% |

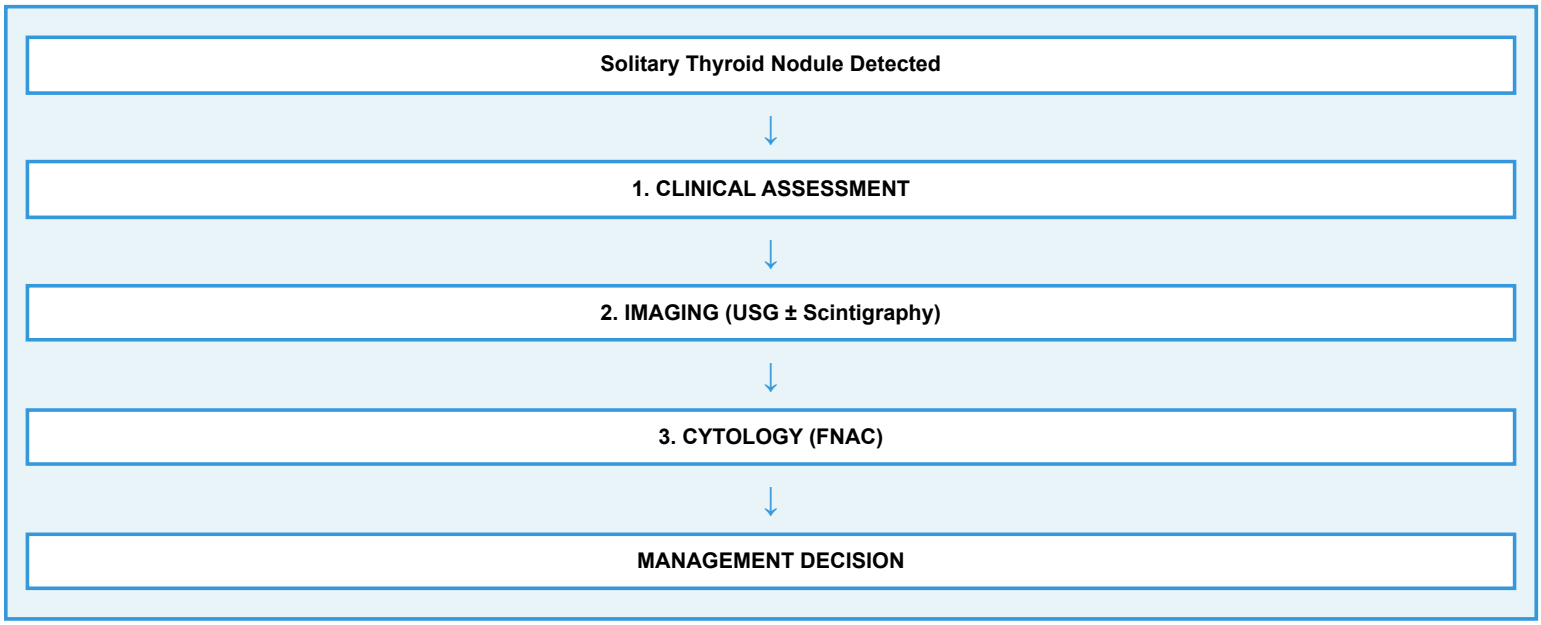
**LATE COMPLICATIONS:**

| Complication | Incidence |
|---|---|
| Permanent hypocalcemia | 1-3% |
| Hypothyroidism | 100% (total thyroidectomy) |
| Keloid/hypertrophic scar | Variable |
| Recurrence | 5-10% (subtotal) |

⚠ **POST-OP EMERGENCY - Acute Airway Obstruction:**
**Causes:** Hematoma, bilateral RLN palsy, tracheomalacia
**Management:** Remove skin sutures at bedside, evacuate hematoma, secure airway, return to OT

## 2. SOLITARY THYROID NODULE (STN)

### A. Diagnostic Approach - The "TRIPLE ASSESSMENT"




### Clinical Risk Factors for Malignancy

🎯 **MNEMONIC - High Risk Features: "DANGER"**
**D**uration: Rapid growth
**A**ge: <20 or >60 years
**N**odal involvement (cervical lymphadenopathy)
**G**ender: Male > Female for cancer risk
**E**xposure: Radiation to head/neck in childhood
**R**ecurrent laryngeal nerve palsy (hoarseness)

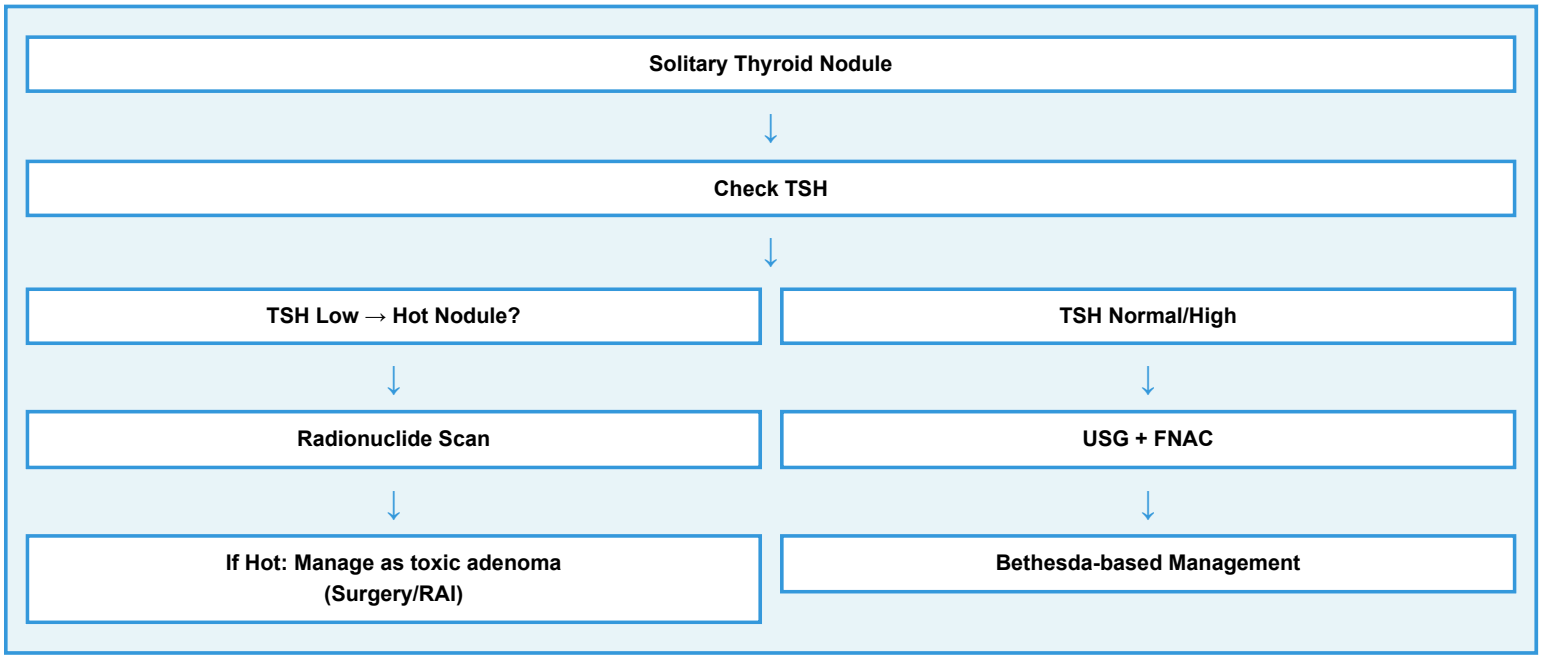
| Feature | Benign | Malignant |
|---|---|---|
| Age | 20-60 years | <20 or >60 years |
| Gender | Female predominance | Male (higher risk) |
| Growth | Slow | Rapid |
| Consistency | Soft/cystic | Hard, stony |
| Mobility | Mobile | Fixed to surrounding structures |
| Lymph nodes | Absent | Present (hard, matted) |
| Voice | Normal | Hoarseness (RLN involvement) |
| Family history | Negative | MEN 2, familial medullary thyroid cancer |

### B. Investigations

| Investigation | Findings & Interpretation |
|---|---|
| **TSH** | • Low TSH → Hyperfunctioning (likely benign) → Do radionuclide scan<br>• Normal/High TSH → Proceed with FNAC |
| **USG Neck** | **Benign features:** Hyperechoic, cystic, spongiform, well-defined margins<br>**Suspicious features (ACR TI-RADS):**<br>• Hypoechoic solid nodule<br>• Microcalcifications<br>• Taller-than-wide shape<br>• Irregular/lobulated margins<br>• Extra-thyroidal extension<br>• Abnormal vascularity (chaotic flow) |
| **FNAC (Gold Standard)** | **Bethesda Classification:**<br>I - Non-diagnostic (repeat FNAC)<br>II - Benign (follow-up)<br>III - AUS/FLUS (repeat FNAC/molecular testing/lobectomy)<br>IV - Follicular neoplasm (lobectomy)<br>V - Suspicious for malignancy (surgery)<br>VI - Malignant (total thyroidectomy) |

| | |
|---|---|
| **Radionuclide Scan (99mTc or 123I)** | • **Hot nodule:** Hyperfunctioning (rarely malignant, <5%)<br>• **Warm nodule:** Indeterminate (requires FNAC)<br>• **Cold nodule:** Non-functioning (15-20% malignant, needs FNAC) |
| **Serum Calcitonin** | If medullary thyroid cancer suspected (family history, MEN 2) |
| **Thyroglobulin** | Post-operative tumor marker (not diagnostic initially) |

## C. Management Algorithm




| Bethesda Category | Malignancy Risk | Management |
|---|---|---|
| I - Non-diagnostic | 5-10% | Repeat FNAC with USG guidance |
| II - Benign | 0-3% | Follow-up (USG at 6-12 months), no surgery unless symptomatic |
| III - AUS/FLUS | 10-30% | Repeat FNAC, molecular testing, or diagnostic lobectomy |
| IV - Follicular neoplasm | 25-40% | Diagnostic lobectomy (frozen section) ± completion thyroidectomy |
| V - Suspicious for malignancy | 50-75% | Near-total/Total thyroidectomy |
| VI - Malignant | 97-99% | Total thyroidectomy ± neck dissection |

**SURGICAL INDICATIONS FOR STN:**

- Bethesda IV, V, VI
- Bethesda III with high-risk USG features
- Compressive symptoms
- Cosmetic concerns
- Patient preference (after counseling)
- Growing nodule on serial imaging
- Unable to exclude malignancy (inadequate FNAC, non-compliant patient)

# PEDIATRIC THYROID DISORDERS

## 1. NEONATAL SCREENING FOR HYPOTHYROIDISM

**HIGH-YIELD POINTS:**

- Congenital hypothyroidism affects 1:2000-4000 live births
- Screening done at 48-72 hours of life (before discharge)
- Primary screening: TSH (most countries) or T4 + TSH (some programs)
- Treatment started by 2 weeks of life prevents irreversible brain damage
- Most common preventable cause of intellectual disability

### A. Why Screen?

| Reason | Explanation |
|---|---|
| **Common disorder** | 1:2000-4000 births (more in areas of iodine deficiency) |
| **Asymptomatic at birth** | Only 5-10% show clinical signs in neonatal period |
| **Preventable damage** | Early treatment prevents mental retardation and growth failure |
| **Critical window** | First 2-3 years crucial for brain development |
| **Effective treatment** | Simple, inexpensive (levothyroxine) |
| **Cost-effective** | Screening saves healthcare costs and improves outcomes |

### B. Screening Protocol

**TIMING: 48-72 hours after birth (before hospital discharge)**

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**SAMPLE: Heel prick blood on filter paper (Guthrie card)**

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**PRIMARY SCREENING: TSH (or T4 + backup TSH)**

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**If Abnormal → RECALL for confirmatory testing**

| Screening Strategy | Method | Cut-offs & Interpretation |
|---|---|---|
| **Primary TSH**<br>(Most common globally) | Measure TSH on dried blood spot | • TSH >20 mU/L → Recall immediately<br>• TSH 10-20 mU/L → Repeat test<br>• TSH <10 mU/L → Normal |
| **Primary T4 + backup TSH**<br>(Used in North America) | Measure T4 first, then TSH if T4 low | • T4 in lowest 10th percentile → Check TSH<br>• If TSH elevated → Recall |
| **T4 + TSH simultaneously** | Both measured on all samples | Detects both primary and central hypothyroidism |

⚠ **SPECIAL SITUATIONS REQUIRING MODIFIED SCREENING:**
**Preterm/VLBW infants:** TSH surge may be delayed → Screen at 2 weeks + repeat at 2-6 weeks
**Sick neonates in NICU:** Repeat at discharge or 2 weeks
**Multiple births:** Ensure each baby screened individually
**Early discharge (<24 hours):** Repeat screen at 1-2 weeks

### C. Confirmatory Testing (If Screen Positive)

| Test | Normal Values (Neonate) | Interpretation |
|---|---|---|
| **Serum TSH** | <10 mU/L | >20 mU/L confirms primary hypothyroidism |
| **Free T4** | 0.8-2.0 ng/dL | Low in hypothyroidism |
| **Total T4** | 6-16 µg/dL | Low in hypothyroidism |

| | | |
|---|---|---|
| **Thyroid antibodies** | Negative | If positive → maternal autoimmune disease |
| **USG Thyroid** | Normal size/position | Assess for agenesis, dysgenesis, ectopia |
| **Radionuclide scan** | Normal uptake | Differentiates dyshormonogenesis from dysgenesis (done later, not urgent) |
| **Bone age (X-ray)** | Age-appropriate | Delayed in severe/prolonged hypothyroidism |

## D. Management Algorithm

**Positive Newborn Screen (TSH >20 mU/L)**

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**URGENT: Recall within 24-48 hours**

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**Confirmatory Tests: Serum TSH, Free T4, Total T4**

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**If Confirmed (TSH >10, Low T4) → START TREATMENT IMMEDIATELY**

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**Goal: Treatment by 2 weeks of age**

| Aspect | Details |
|---|---|
| **Drug** | Levothyroxine (L-thyroxine) sodium |
| **Dose** | **Initial:** 10-15 µg/kg/day (usually 37.5-50 µg/day)<br>**Higher doses (12-17 µg/kg/day):** For severe hypothyroidism (T4 <5 µg/dL) |
| **Administration** | • Crushed tablet in breast milk/formula<br>• Give on empty stomach (30 min before feeding) for best absorption<br>• Avoid soy formula (interferes with absorption) |
| **Monitoring** | • TSH & T4 at 2 and 4 weeks after starting<br>• Then every 1-2 months in first year<br>• Every 3-4 months from 1-3 years<br>• Every 6-12 months after 3 years<br>• Also after any dose change |
| **Target Levels** | • T4: Upper half of normal range (10-16 µg/dL)<br>• TSH: 0.5-2.0 mU/L (normalize within 1 month) |
| **Duration** | **Permanent CH:** Lifelong<br>**Transient CH:** Reassess at 3 years (trial off therapy) |

## 2. CRETINISM

**HIGH-YIELD POINTS:**

- Cretinism = Severe untreated congenital hypothyroidism causing irreversible mental retardation
- Two types: Endemic (iodine deficiency) and Sporadic (dysgenesis/dyshormonogenesis)
- Classic triad: Mental retardation + Growth retardation + Delayed bone maturation
- Prevention is key: Newborn screening and salt iodization

### A. Etiology & Classification

| Type | Cause | Features | Prevention |
|---|---|---|---|
| **ENDEMIC CRETINISM** (80% of cases in iodine-deficient areas) | • Severe maternal & fetal iodine deficiency<br>• Inadequate thyroid hormone in utero | **Neurological type:**<br>• Severe mental retardation<br>• Deaf-mutism<br>• Spastic diplegia<br>• Strabismus<br>• Normal or near-normal thyroid function<br><br>**Myxedematous type:**<br>• Mental retardation (less severe)<br>• Hypothyroid features<br>• Short stature<br>• Delayed sexual maturation | • Universal salt iodization<br>• Maternal iodine supplementation during pregnancy |
| **SPORADIC CRETINISM** (20% of cases) | • Thyroid dysgenesis (agenesis, ectopia, hypoplasia)<br>• Dyshormonogenesis (enzyme defects)<br>• TSH receptor defects<br>• Transplacental passage of maternal antibodies | • Depends on severity and timing of treatment<br>• Features of congenital hypothyroidism (if untreated) | • Newborn screening<br>• Early treatment |

### B. Clinical Features - The "CRETINISM" Presentation

🎯 **MNEMONIC - Features of Cretinism: "CRETIN'S PROBLEMS"**
**C**oarse facial features
**R**etarded growth (dwarfism)
**E**nlarged tongue (macroglossia)
**T**hick skin, dry
**I**ntellectual disability (mental retardation)
**N**avel hernia (umbilical hernia)
**'S**tupor (lethargy, somnolence)
**P**rotuberant abdomen
**R**espiratory difficulty
**O**pen fontanelles (delayed closure)
**B**road nasal bridge
**L**ow hairline
**E**piphyseal dysgenesis (delayed bone age)
**M**uscular hypotonia, Myxedema
**S**hort stature, Slow reflexes

| System | Clinical Features |
|---|---|
| **General** | Short stature, proportionate dwarfism, delayed milestones |
| **Neurological** | • Mental retardation (IQ <70)<br>• Developmental delay<br>• Hypotonia<br>• Delayed reflexes<br>• Deafness (endemic type)<br>• Spasticity (endemic neurological type) |
| **Craniofacial** | • Coarse facies<br>• Puffy face<br>• Macroglossia (protruding tongue)<br>• Broad flat nasal bridge<br>• Hypertelorism<br>• Low-set hairline<br>• Periorbital puffiness |

| | |
|---|---|
| **Skin & Hair** | • Dry, thick, cold skin<br>• Myxedema<br>• Carotenemia (yellowish skin)<br>• Sparse, coarse hair |
| **Skeletal** | • Delayed bone age<br>• Epiphyseal dysgenesis<br>• Delayed fontanelle closure<br>• Wormian bones in skull |
| **Abdomen** | • Protuberant abdomen<br>• Umbilical hernia<br>• Constipation |
| **Cardiovascular** | • Bradycardia<br>• Cardiomegaly<br>• Pericardial effusion (rare) |

## C. Diagnostic Approach

**Suspected Cretinism: Delayed milestones, Growth failure, Characteristic facies**

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**HISTORY: Birth history, neonatal screening done?, family history, maternal iodine status, geographic area**

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**EXAMINATION: Anthropometry, developmental assessment, dysmorphic features, thyroid palpation**

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**INVESTIGATIONS**

| Investigation | Findings in Cretinism | Purpose |
|---|---|---|
| **Thyroid Function Tests** | • ↑↑ TSH (>100 mU/L)<br>• ↓↓ T4 and T3<br>• Normal in neurological endemic cretinism | Confirm hypothyroidism |
| **Bone Age (X-ray wrist)** | Markedly delayed (may be 2-5 years behind) | Assess skeletal maturation |
| **X-ray Knee** | Epiphyseal dysgenesis (stippled epiphyses) | Specific finding in congenital hypothyroidism |
| **Skull X-ray** | Wide fontanelles, wormian bones, delayed closure | Skeletal effects |
| **USG Thyroid** | Absent, ectopic, or hypoplastic gland | Identify etiology (dysgenesis) |
| **Radionuclide Scan** | No uptake (agenesis) or ectopic uptake | Differentiate causes |
| **Urinary Iodine** | <100 µg/L (deficient) | For endemic cretinism |
| **Developmental Assessment** | IQ testing, Denver scale | Quantify mental retardation |
| **Serum Cholesterol** | Elevated | Reflects hypothyroid state |

## D. Management

⚠ **CRITICAL POINT:** Mental damage is largely IRREVERSIBLE if treatment not started within first 2-3 months of life. Growth can be improved even with late treatment, but intellectual disability is permanent.

| Aspect | Management Strategy |
|---|---|
| **Pharmacological** | **Levothyroxine:**<br>• Dose: 10-15 µg/kg/day<br>• Start immediately upon diagnosis<br>• Monitor TSH & T4 every 1-2 months initially<br>• Adjust dose to normalize TSH and maintain T4 in upper normal range<br>• Lifelong therapy in most cases |
| **Growth Monitoring** | • Plot on growth charts<br>• Catch-up growth expected with treatment<br>• Monitor bone age periodically<br>• Final height may still be compromised if treatment started late |

| | |
|---|---|
| **Neurodevelopmental** | • Early intervention programs<br>• Special education<br>• Speech therapy<br>• Occupational therapy<br>• Physiotherapy (for spasticity in endemic type)<br>• Hearing aids if deaf |
| **Nutritional** | • Adequate calories and protein<br>• Iodine supplementation (if deficient)<br>• Monitor for over-nutrition (obesity risk with treatment) |
| **Multidisciplinary** | • Endocrinologist<br>• Pediatrician<br>• Developmental pediatrician<br>• Speech therapist<br>• Physiotherapist<br>• Special educator<br>• Audiologist (if deaf) |
| **Family Support** | • Counseling about prognosis<br>• Genetic counseling if familial<br>• Support groups<br>• Education about medication compliance |

## E. Prevention Strategies

| Level | Strategy | Implementation |
|---|---|---|
| **PRIMARY PREVENTION** | • Universal salt iodization<br>• Maternal iodine supplementation<br>• Public health education | • Ensure 15-40 ppm iodine in salt<br>• 150 µg/day iodine for pregnant women<br>• WHO/UNICEF programs in endemic areas |
| **SECONDARY PREVENTION** | • Newborn screening<br>• Early detection | • Screen all newborns at 48-72 hours<br>• Confirmatory testing if positive<br>• Start treatment by 2 weeks |
| **TERTIARY PREVENTION** | • Early treatment<br>• Rehabilitation | • Prompt levothyroxine therapy<br>• Developmental support<br>• Prevent complications |

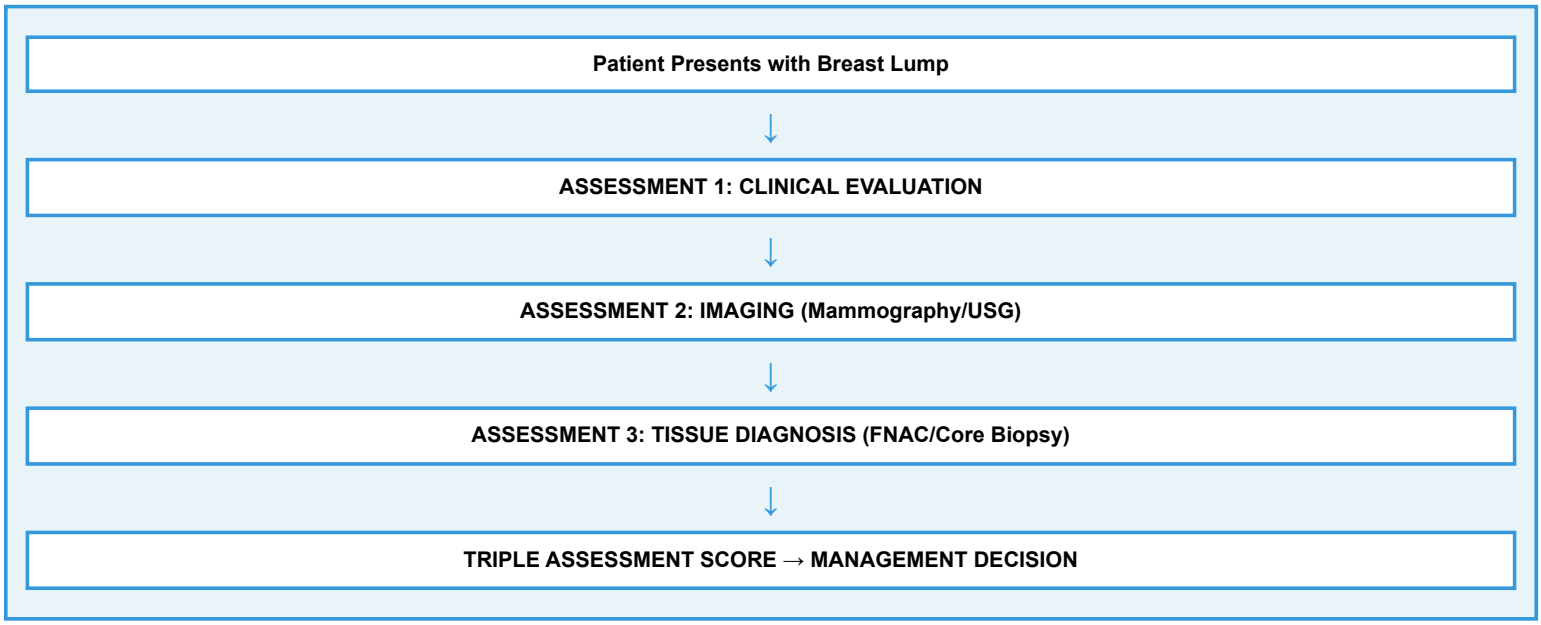
🎯 **Prevention of Endemic Cretinism: "IODINE"**
**I**odized salt (universal)
**O**il supplementation (in endemic areas)
**D**iet fortification
**I**njectable iodine (severely deficient populations)
**N**ewborn screening
**E**ducation (public awareness)

# 🎀 BREAST DISEASES - APPROACH TO BREAST LUMP

**HIGH-YIELD POINTS:**

- TRIPLE ASSESSMENT is mandatory: Clinical + Imaging + Tissue diagnosis
- Age is the most important risk factor for breast cancer
- BI-RADS classification guides management
- Core needle biopsy preferred over FNAC for tissue diagnosis
- Most breast lumps are benign, but all need proper evaluation

## 1. APPROACH TO BREAST LUMP - THE TRIPLE ASSESSMENT




### A. CLINICAL EVALUATION (Assessment 1)

🎯 **MNEMONIC - Risk Factors for Breast Cancer: "BREAST CANCER"**
**B**RCA mutations (genetic)
**R**adiation exposure (chest)
**E**arly menarche (<12 years)
**A**ge >50 years
**S**moking, alcohol
**T**all height, obesity
**C**hildless (nulliparity)
**A**dvanced age at first birth (>30 years)
**N**o breastfeeding
**C**ontraceptive pills (prolonged use)
**E**strogen excess (HRT)
**R**elative with breast/ovarian cancer

| Component | Details |
|---|---|

| | |
|---|---|
| **HISTORY** | **Lump characteristics:**<br>• Duration, rate of growth<br>• Pain (cyclical vs non-cyclical)<br>• Relationship to menstrual cycle<br>• Changes in size<br><br>**Associated symptoms:**<br>• Nipple discharge (color, spontaneous vs expressed, single/multiple ducts)<br>• Nipple retraction/inversion<br>• Skin changes<br>• Axillary swelling<br><br>**Risk factors:**<br>• Age<br>• Family history (BRCA, first-degree relatives)<br>• Reproductive history (menarche, menopause, parity, breastfeeding)<br>• Hormonal exposure (OCP, HRT)<br>• Previous breast disease/biopsy<br>• Radiation exposure |
| **EXAMINATION** | **Inspection (arms by side, raised, hands on hips):**<br>• Asymmetry<br>• Skin changes: Peau d'orange, erythema, ulceration, satellite nodules<br>• Nipple: Retraction, inversion, eczema (Paget's disease)<br>• Visible lump<br><br>**Palpation:**<br>• Site, size (measure with calipers)<br>• Shape, consistency<br>• Surface (smooth vs irregular)<br>• Margins (well-defined vs ill-defined)<br>• Mobility (mobile vs fixed to skin/chest wall)<br>• Tenderness<br>• Axillary lymph nodes (number, size, consistency, fixity)<br>• Supraclavicular & infraclavicular nodes<br>• Opposite breast examination<br>• Liver (hepatomegaly - metastasis) |

| Feature | Benign | Malignant |
|---|---|---|
| **Age** | Younger (<40) | Older (>40) |
| **Number** | Multiple | Solitary |
| **Consistency** | Soft, firm, rubbery | Hard, stony |
| **Surface** | Smooth | Irregular, nodular |
| **Margins** | Well-defined | Ill-defined, infiltrative |
| **Mobility** | Mobile | Fixed (skin/chest wall) |
| **Skin** | Normal | Dimpling, peau d'orange, ulceration |
| **Nipple** | Normal | Retracted, inverted, Paget's disease |
| **Lymph nodes** | Absent/small, mobile | Hard, matted, fixed |

🎯 **MNEMONIC - Signs of Advanced Breast Cancer: "SKIN DISEASE"**
**S**kin dimpling
**K**nuckle deformity (nodes)
**I**nversion of nipple
**N**odules (satellite)
**D**ischarge (bloody)
**I**nflammatory changes (erythema)
**S**atellite nodules
**E**dema (peau d'orange)
**A**xillary nodes (fixed)
**S**upraclavicular nodes
**E**rosion/ulceration

## B. IMAGING EVALUATION (Assessment 2)

| Age/Indication | Recommended Imaging | Rationale |
|---|---|---|
| **<30 years** | USG breast (first-line) | Dense breast tissue, radiation avoidance, better for cysts |
| **30-40 years** | USG ± Mammography | Transition age, individualized approach |

| | | |
|---|---|---|
| **>40 years** | Mammography + USG | Gold standard for screening and diagnosis |
| **Palpable lump (any age)** | USG + Mammography (>40) | Characterization of lump |
| **Nipple discharge** | Mammography + Ductography | Evaluate intraductal pathology |
| **Screening (high risk)** | MRI breast | BRCA carriers, >20% lifetime risk |

## Ultrasonography (USG) Features

| Feature | Benign | Malignant |
|---|---|---|
| **Shape** | Oval, round | Irregular |
| **Orientation** | Wider than tall | Taller than wide |
| **Margin** | Circumscribed | Spiculated, angular, microlobulated |
| **Echo pattern** | Anechoic (cyst), hyperechoic | Hypoechoic, heterogeneous |
| **Posterior features** | Enhancement (cyst) | Shadowing |
| **Vascularity** | Minimal or absent | Increased (chaotic) |

## Mammography & BI-RADS Classification

| BI-RADS | Category | Malignancy Risk | Management |
|---|---|---|---|
| **0** | Incomplete | - | Additional imaging needed |
| **1** | Negative | 0% | Routine screening |
| **2** | Benign | 0% | Routine screening |
| **3** | Probably benign | <2% | Short-term follow-up (6 months) |
| **4** | Suspicious | 2-95% | **4A:** Low suspicion (2-10%) → Biopsy<br>**4B:** Moderate (10-50%) → Biopsy<br>**4C:** High (50-95%) → Biopsy |
| **5** | Highly suggestive of malignancy | >95% | Biopsy & appropriate oncologic management |
| **6** | Proven malignancy | 100% | Oncologic management |

🎯 **MNEMONIC - Mammographic Features of Malignancy: "MASS CALC"**
**M**icrocalcifications (clustered, pleomorphic)
**A**rchitectural distortion
**S**piculated margins
**S**tellar/irregular mass
**C**lusters of calcifications
**A**symmetric density
**L**ymphatic invasion
**C**asting-type calcifications (ductal)

## C. TISSUE DIAGNOSIS (Assessment 3)

| Method | Technique | Advantages | Disadvantages | Indications |
|---|---|---|---|---|
| **Fine Needle Aspiration Cytology (FNAC)** | • 23-25G needle<br>• Aspirate cells<br>• Smear on slide | • Quick<br>• OPD procedure<br>• Cheap<br>• Minimal discomfort | • Cannot distinguish invasive from in-situ<br>• No receptor status<br>• Lower sensitivity<br>• Inadequate samples common | • Cystic lesions<br>• Obvious cancer (confirmation)<br>• Resource-limited settings |
| **Core Needle Biopsy (CNB)** | • 14-16G needle<br>• USG/stereotactic guided<br>• Multiple cores (3-5) | • Histological diagnosis<br>• Distinguishes invasive/in-situ<br>• Receptor status (ER, PR, HER2)<br>• Higher sensitivity & specificity | • Requires expertise<br>• More expensive<br>• Small risk of bleeding | • **GOLD STANDARD**<br>• All solid lesions<br>• BI-RADS 4 & 5<br>• Pre-operative diagnosis |
| **Vacuum-Assisted Biopsy (VAB)** | • 7-11G needle<br>• Multiple large samples<br>• Stereotactic/USG guided | • Larger tissue samples<br>• Complete excision of small lesions<br>• Good for microcalcifications | • Expensive<br>• Requires special equipment<br>• Risk of hematoma | • Microcalcifications<br>• Small lesions<br>• Radial scars<br>• Papillary lesions |
| **Excision Biopsy** | • Surgical removal<br>• Entire lump excised<br>• Wide local excision | • Entire lesion examined<br>• Therapeutic + diagnostic | • Surgical procedure<br>• Anesthesia required<br>• Cosmetic issues<br>• Not recommended as first-line | • Failed CNB/FNAC<br>• Discordant triple assessment |

| | | | | |
|---|---|---|---|---|
| | | | | • Phyllodes tumor<br>• Some benign conditions |

**TRIPLE ASSESSMENT SCORING:**
Each component scored 1-5:
• **1** = Normal
• **2** = Benign
• **3** = Uncertain/suspicious
• **4** = Probably malignant
• **5** = Malignant

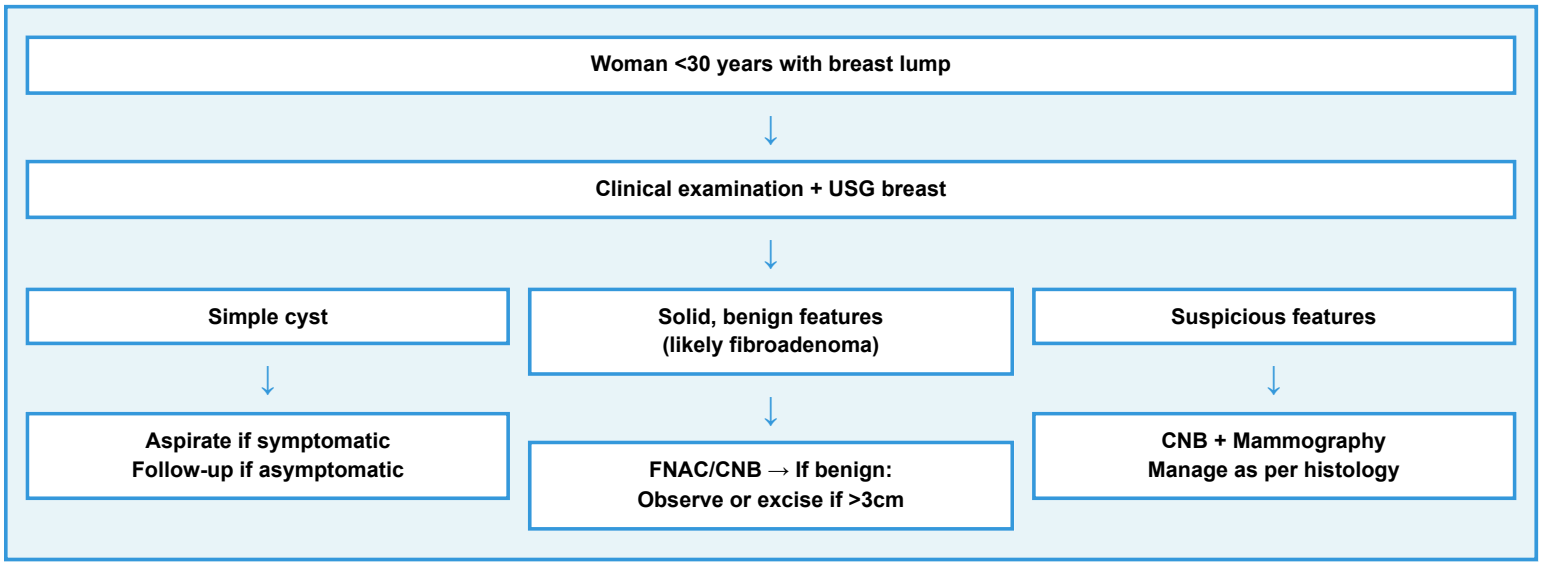
**Concordance:** All 3 scores should agree (e.g., all 2s = benign, all 5s = malignant)
**Discordance:** If scores don't match → Repeat assessment or proceed to excision biopsy

## D. Common Breast Pathologies - Differential Diagnosis

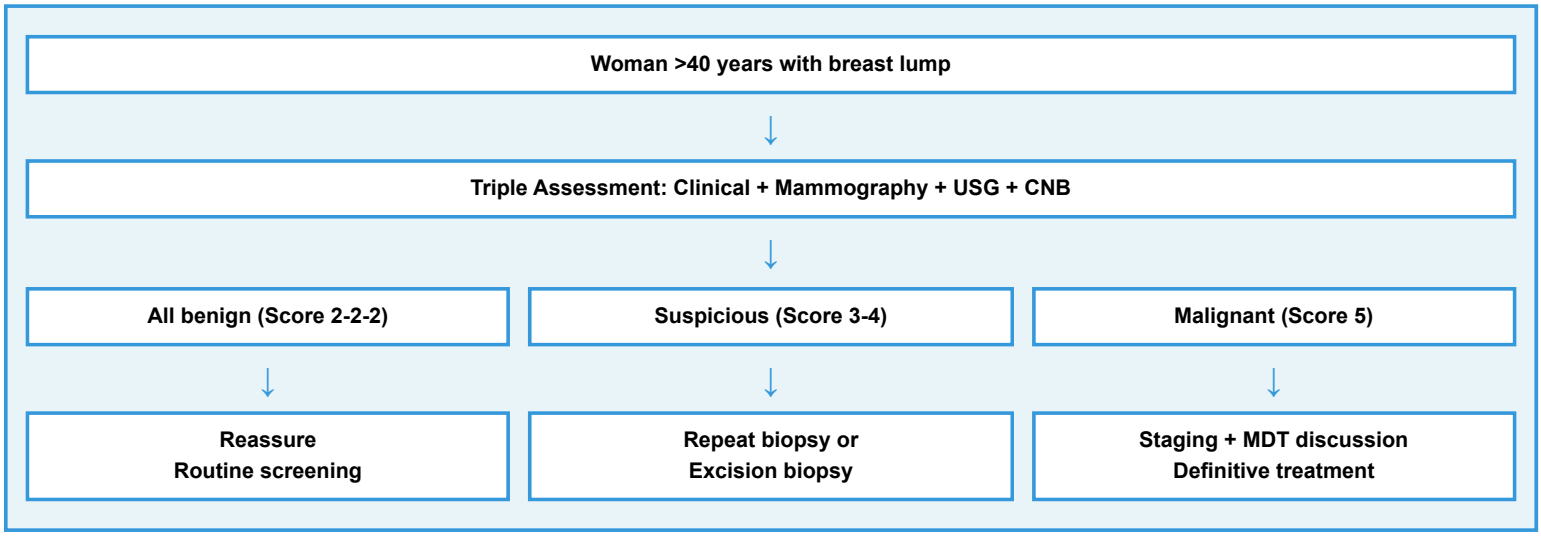
| Condition | Age | Clinical Features | Imaging | Management |
|---|---|---|---|---|
| **FIBROADENOMA**<br>(Benign) | 15-35 years | • Breast mouse (highly mobile)<br>• Firm, rubbery<br>• Smooth, well-defined<br>• Non-tender<br>• 1-3 cm size | • USG: Well-defined, oval, homogeneous<br>• Mammography: Round, circumscribed<br>• FNAC: Benign epithelial cells | • <3 cm: Observation<br>• >3 cm, growing, or symptomatic: Excision<br>• Giant fibroadenoma (>5 cm): Excision |
| **FIBROCYSTIC DISEASE**<br>(Benign) | 30-50 years | • Cyclical mastalgia<br>• Multiple lumps<br>• Bilateral<br>• Fluctuant, tender<br>• Worse premenstrually | • USG: Multiple cysts<br>• Mammography: Dense tissue, cysts<br>• FNAC: Cyst fluid (straw-colored) | • Reassurance<br>• NSAIDs, Evening primrose oil<br>• Aspiration of symptomatic cysts<br>• Danazol (severe cases)<br>• Avoid caffeine |
| **BREAST ABSCESS**<br>(Infection) | Lactational: 20-40<br>Non-lactational: Any age | • Painful, red, hot swelling<br>• Fever<br>• Fluctuant<br>• Nipple discharge (purulent) | • USG: Hypoechoic collection, thick wall<br>• Clinical diagnosis | • Antibiotics (flucloxacillin/amoxicillin-clavulanate)<br>• Drainage: Needle aspiration or I&D<br>• Continue breastfeeding<br>• Treat underlying duct ectasia/periductal mastitis |
| **FAT NECROSIS**<br>(Benign) | 40-60 years | • History of trauma<br>• Firm, irregular lump<br>• Skin dimpling possible<br>• Can mimic cancer | • Mammography: Oil cyst, calcification<br>• USG: Variable appearance<br>• CNB: Fat necrosis, no malignancy | • Reassurance<br>• Excision if uncertain diagnosis |
| **PHYLLODES TUMOR**<br>(Borderline) | 40-50 years | • Rapidly growing lump<br>• Large (>5 cm)<br>• Firm<br>• Resembles fibroadenoma but larger | • USG: Large, heterogeneous<br>• Mammography: Large, well-defined<br>• CNB: Stromal hypercellularity | • Wide local excision (1 cm margin)<br>• No axillary dissection<br>• Mastectomy if large<br>• Monitor for recurrence |
| **INVASIVE DUCTAL CARCINOMA**<br>(Malignant - 80%) | >50 years | • Hard, irregular lump<br>• Fixed<br>• Skin dimpling<br>• Nipple retraction<br>• Axillary nodes | • Mammography: Spiculated mass, microcalcifications<br>• USG: Hypoechoic, irregular, shadowing<br>• CNB: Invasive carcinoma, receptor status | • Surgery: BCS or mastectomy + axillary staging<br>• Adjuvant chemotherapy<br>• Radiotherapy<br>• Hormonal therapy (ER+)<br>• Targeted therapy (HER2+) |
| **INVASIVE LOBULAR CARCINOMA**<br>(Malignant - 10-15%) | >50 years | • Diffuse thickening (not always lump)<br>• Bilateral (20-30%)<br>• Less distinct clinically | • Mammography: Often subtle<br>• MRI: Better detection<br>• CNB: Invasive lobular pattern | • Similar to IDC<br>• Often ER/PR positive<br>• Mastectomy more common (multifocal) |
| **DUCTAL CARCINOMA IN SITU (DCIS)**<br>(Pre-invasive) | 50-60 years | • Often asymptomatic<br>• Nipple discharge (rare)<br>• Palpable mass (if large) | • Mammography: Clustered microcalcifications<br>• USG: Often normal<br>• CNB: DCIS, no invasion | • BCS + radiotherapy<br>• Mastectomy (extensive/multifocal)<br>• No axillary dissection<br>• Hormonal therapy (ER+) |
| **PAGET'S DISEASE OF NIPPLE**<br>(Malignant) | 50-60 years | • Eczematous nipple rash<br>• Erosion, crusting<br>• Nipple discharge<br>• ± Underlying mass | • Mammography: Underlying DCIS/IDC<br>• Nipple biopsy: Paget cells | • Mastectomy (usually)<br>• Treat underlying cancer<br>• Axillary staging if invasive |

## 2. DIAGNOSTIC WORK-UP FLOWCHARTS

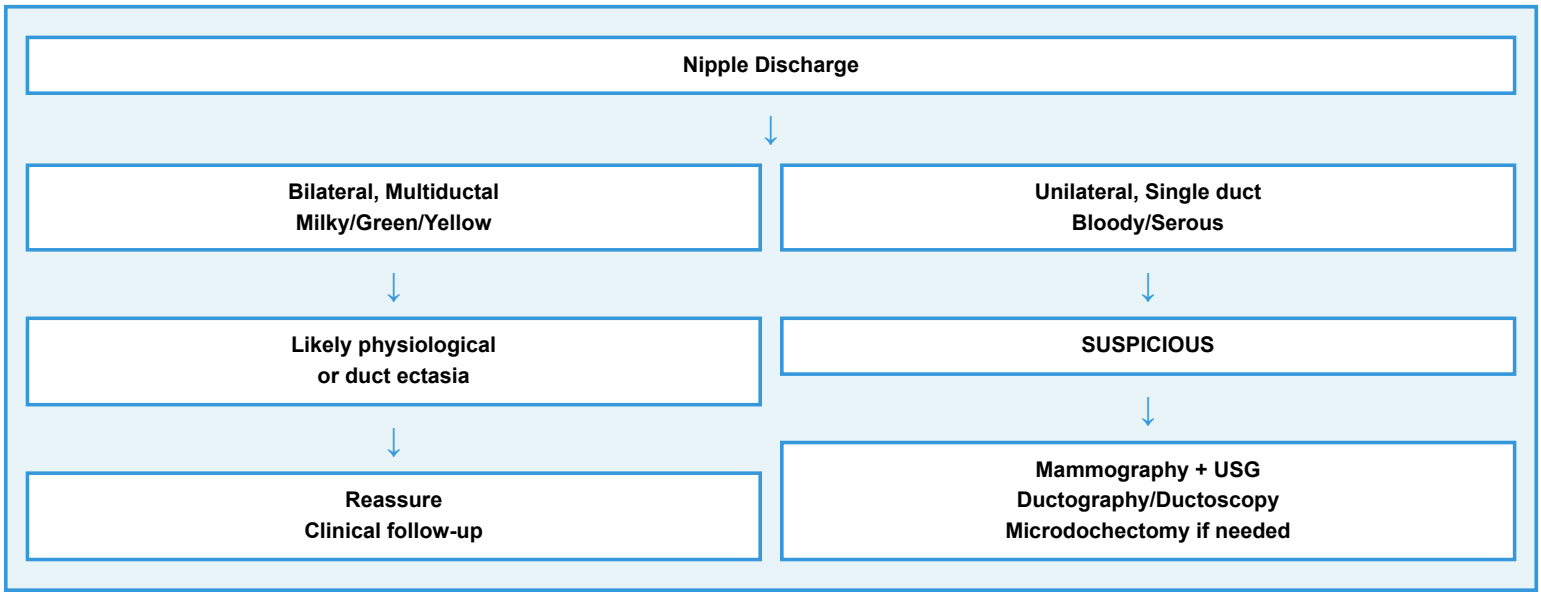
### A. Young Woman (<30 years) with Breast Lump




### B. Woman >40 years with Breast Lump




### C. Nipple Discharge Work-up




🎯 **MNEMONIC - Causes of Bloody Nipple Discharge: "PIED"**
**P**apilloma (intraductal) - Most common benign cause
**I**ntraductal carcinoma (DCIS)
**E**ctasia (duct ectasia with inflammation)
**D**uct carcinoma (invasive)

## D. Staging Work-up for Breast Cancer

**Confirmed Breast Cancer (CNB)**

↓

**BASELINE INVESTIGATIONS**

| Investigation | Purpose | Indication |
|---|---|---|
| **Complete Blood Count** | Baseline, anemia | All patients |
| **Liver Function Tests** | Metastasis, pre-chemotherapy | All patients |
| **Renal Function Tests** | Pre-chemotherapy | All patients |
| **Alkaline Phosphatase, Calcium** | Bone metastasis screening | All patients |
| **Chest X-ray** | Lung metastasis | All patients |
| **USG Abdomen** | Liver metastasis | Stage IIA and above |
| **Bone Scan** | Skeletal metastasis | Stage IIA and above, or bone pain, elevated ALP |
| **CT Chest/Abdomen/Pelvis** | Staging, metastasis | Locally advanced (Stage III) or suspected metastasis |
| **PET-CT** | Whole-body staging | Selected cases (equivocal findings, recurrence) |
| **MRI Breast** | • Extent of disease<br>• Multifocality<br>• Contralateral breast<br>• Lobular carcinoma | • Young patients (<40)<br>• Dense breasts<br>• ILC<br>• BRCA carriers<br>• Breast conservation candidates |
| **Tumor Markers** | Baseline (for follow-up) | CA 15-3, CEA (not diagnostic, for monitoring) |
| **Genetic Testing (BRCA1/2)** | Hereditary cancer risk | • Age <45<br>• Family history<br>• Triple-negative<br>• Male breast cancer<br>• Bilateral cancer |

## E. Important Breast Imaging Procedures

| Procedure | Indication | Technique | Findings |
|---|---|---|---|
| **Ductography (Galactography)** | • Bloody nipple discharge<br>• Single duct discharge | • Cannulate discharging duct<br>• Inject contrast<br>• Mammography | • Intraductal filling defect (papilloma, DCIS)<br>• Duct ectasia<br>• Abrupt duct cutoff |
| **Ductoscopy** | • Pathological nipple discharge<br>• Ductography abnormality | • Endoscopic visualization of ducts<br>• Can take biopsy | • Direct visualization of papilloma<br>• DCIS<br>• Duct ectasia |
| **MRI Breast** | • Pre-operative planning<br>• Screening high-risk<br>• Assess response to neoadjuvant therapy<br>• Implant integrity | • IV contrast (gadolinium)<br>• Dynamic imaging | • Extent of disease<br>• Multifocality/multicentricity<br>• Contralateral cancer<br>• Recurrence |

⚠ **RED FLAGS - Immediate Referral to Breast Surgeon:**

- New lump in woman >30 years
- Lump in male patient (any age)
- Unilateral bloody nipple discharge
- Skin changes (peau d'orange, ulceration, satellite nodules)
- Nipple retraction/inversion (new onset)
- Palpable axillary lymph nodes
- Previous breast cancer with new lump
- Strong family history (BRCA) with any breast complaint

**EXAM PEARLS - BREAST DISEASES:**

- Triple assessment is GOLD STANDARD - never operate on imaging/FNAC alone
- Core biopsy > FNAC for solid lesions (gives histology + receptor status)

- Fibroadenoma = Breast mouse (highly mobile, <3 cm → observe)
- Any male with breast lump → Rule out cancer (higher malignancy rate than women)
- Bloody discharge from single duct = Papilloma or DCIS until proven otherwise
- Peau d'orange + erythema = Inflammatory breast cancer (poor prognosis)
- Most common breast cancer: Invasive ductal carcinoma (80%)
- BI-RADS 4 & 5 → Always biopsy
- Phyllodes tumor → Wide excision (can recur if inadequate margin)
- Fat necrosis can mimic cancer → History of trauma is key

**FINAL EXAM TIPS:**

1. **For MCQs:** Age is often the key discriminator (Fibroadenoma <35, Cancer >50)
2. **For OSCEs:** Always mention Triple Assessment when examining breast lump
3. **For Viva:** Know BI-RADS classification, Bethesda classification (thyroid), and management algorithms
4. **For Long Cases:** Complete systematic examination, risk stratification, and staging work-up
5. **Remember:** Most breast lumps are BENIGN, but all require proper evaluation to exclude malignancy