Screening for the breast includes (US & mammography) is done for:

1. Certain age group usually (40-45Y old woman).
2. Woman with family history.
3. Follow up one sided breast cancer with mastectomy to see the other breast.
4. Nullipara (A woman who has never given birth to a child) or single (unmarried).

The reasons of selecting US for imaging the breast (sonomammography):

1. Mention all the US benefits.
2. Pregnant woman.
3. Dense thick glandular tissue breast such as (lactating & pubertal breast) because usually the lesion is dense.
4. Breast implants (silicon injection) some times it needs CT & MRI by using superficial coil.
5. Tender breast (painful breast not tolerate compression in mammography).

Soft tissue mammography is done for:
Fibro-fatty breast (old age) because its hypodense so the lesion can be easily detected.

Basic views in mammography:

+ medio-lateral
+ cranio-caudal (supero-inferior).

Additional views: oblique & axillary.

The technique during US examination:
The arm is raised, put the gel & press the probe (superficial-convex) to stretch the tissues & to see the arteries & veins.
The breast is divided in sonomammography for more localization of the lesion into:

Breast changes:
+ Externally by clinical examination (check changes which are seen from outside the body by clinician) to check the nipple,
  - The normal nipple should be everted if it is flat or inverted (retracted) so it means tumor which pulls the nipple inside because the copper ligament in areola when infiltrated it pulls the nipple & areola causing skin changes, depression & irregularity which is called (dimpling). This is also seen in mammography.

*N.B.: normally the umbilicus inverted if it is become everted so it means:
  ✷ ascites or
  ✷ increase intra-abdominal pressure for any reason or
  ✷ abdominal tumor

+ Internally
  ✷ Mass seen by US or mammogram.
  ✷ Calcification - in the past the mammography was more sensitive than US but now the new US machine is also sensitive.
  - The big (coarse) macro-calcifications with benign masses.
  - The small (fine) micro-calcification with malignant masses.

*The shapes of benign calcifications: rod, egg shell & pop corn.
Characterizations should be considered to define any focal mass:
1. Localization (site).
2. Size & shape.
3. Left or right breast.
4. Upper or lower quadrant medial or lateral & at which o'clock.
5. Echogenicity → homogenous or heterogeneous by US.
6. Calcification coarse or fine by mammography.
7. Doppler.
8. If abscess (fluid levels only with necrotic tissue) by US

9. Axillary tail: the upper part of breast near the axilla, in this area the diagnosis is easier because the thickness of breast become lesser.
10. Finally confirmed by biopsy (aspiration biopsy - stereotaxis needle - in the past frozen biopsy "opening by surgery").

*A case of lactating woman has a breast mass with fever this indicates benign & abscess because of that the feeding should be done by both breasts to prevent (congestion of milk).

- Congestion of milk causes inflammation & mastitis then converts into acute or chronic abscess.
- That’s why when the baby is dead her mother takes injection for dryness (stoppage) of milk production.

The most common benign tumor occurs in breast:
"Fibro-adenoma" → easy to diagnose called (breast mouse) clinically & by US.

The most common diffuse diseases occur in one breast or both:
1) Fibrocystic disease → mostly in middle age with pain, heavy breasts & relates to menses due to hormonal changes examined by US or mammography to exclude the disease.
2) Fibroadenosis disease
3) Mastitis
4) Ductectasia (malignant or pre-malignant process)
The differentiation between the benign & malignant tumors

<table>
<thead>
<tr>
<th>Malignant</th>
<th>Benign</th>
</tr>
</thead>
<tbody>
<tr>
<td>-heterogeneous</td>
<td>-homogenous</td>
</tr>
<tr>
<td>-irregular outlines &amp; ill defined border</td>
<td>-regular outlines &amp; smooth</td>
</tr>
<tr>
<td>-Micro-calcification smaller than 0.2mm seen by magnification lens in mammography.</td>
<td>-Macro-calcification without lens by mammography or high resolution US machine.</td>
</tr>
<tr>
<td>-not free, fixed, hard (firm), infiltrated</td>
<td>-free, running looks like the mouse but not infiltrated</td>
</tr>
<tr>
<td>-The longest diameter (AP diameter or the axis) of the lesion is vertical - perpendicular to the skin.</td>
<td>-The longest diameter (axis) of the lesion is horizontal - parallel to the skin.</td>
</tr>
<tr>
<td>-by mammography: 1. high density lesion.</td>
<td>-by mammography: 1. low density lesion.</td>
</tr>
<tr>
<td>2. thick hollow zone (surrounding the lesion)</td>
<td>2. thin hollow zone.</td>
</tr>
<tr>
<td>Speculation</td>
<td>Well define</td>
</tr>
<tr>
<td>-Intra-ductal carcinoma which is seen by ductography or galactography</td>
<td>-Intra-ductal papilloma also seen by ductography or galactography</td>
</tr>
<tr>
<td>-Ductectasia: dilatation of lactiferous ducts (mammary ducts) which is pre-malignant &amp; best seen by US</td>
<td></td>
</tr>
</tbody>
</table>

*N.B: Paget’s disease is a type of superficial breast cancer disease causing changes in the breast skin & around the nipple.

*US is the best choice to see the fluid inside the abscess while by mammography is not clear seen because it appears as white opacity, so you think there is a serious problem while is not.

Axillary lymph adenopathy can be either:
- Inflammatory (acute or chronic abscess, mastitis)
- Malignant tumor (primary lymphoma or secondary)
There is hilum in lymph node seen by Doppler US or mammography
-if inflammatory enlarged L.N → preserved hilum in situ
-if malignant enlarged L.N → hilum infiltration + haziness of centre

The tumor could be transported from the breast to the axillary lymph nodes by lymphatic vessels "secondaries" also abscess & metastasis can cause axillary lymphadenopathy so in case of suspected axillary lymphadenopathy (enlargement of lymph nodes in axilla) check the axilla clinically, by US & axillary view in mammography.

There is also intramammary lymph nodes within the breast appear as well defined white (hyperdense) dots in mammogram.

*N.B: the breast cancer in female & the prostate cancer in male mostly they send metastasis to the bone.

Breast or prostate metastasis may be:
- Osteoblastic (osteosclerotic) → bone forming tumor (whitening the bone)
- Osteolytic → rarely happen
- mixed
-First the metastases destroy the pedicles in the spine (eyes in AP lumbosacral view) if it's seen in AP do lateral, CT & MRI to indicate the primary or any cause such as breast/prostate tumors

The most common physiological cause of nipple discharge is milk while the pathological discharges are:
1) pus discharge → so it's abscess & easy to diagnose because occurring with constitutional symptoms (always occur with inflammation & abscesses) such as fever, tenderness & heavy breast.
2) sanguineous (blood) discharge → with malignancy such as intra-ductalcarcinoma, it can be seen by ductography or galactography which includes the injection of C.M throw the cannula into the nipple (collects branches of mammary ducts) then the C.M appears in the affected duct as filling defect.
Apical groups

anterior or pectoral groups

posterior or scapular groups

*M.B: the cooper's ligaments (which hold the breast) surround all breast tissues not only the areolar area.

-Mediolateral view
-Lesion in the Rt. breast at upper quadrant mostly malignant because the long axis is vertical

-Cranio-caudal view of the same breast
-Lesion in the Rt. breast in upper medial quadrant malignant mass because long axis is vertical
- Breast US by high frequency linear transducer.  
- Shows: sonolucent simple cyst with posterior acoustic enhancement on the wall.  
- The long axis is horizontal so most likely benign.

- Breast US by high frequency linear transducer.  
- Shows: homogenous soft-tissue mass with smooth outline.  
- The longest diameter is horizontal so most likely benign.  
- Assess the mobility (mouse like) if "fibroadenoma" & it could be multiple because the multiplicity more with benign.

- Breast US by high frequency linear transducer.  
- Shows: heterogeneous malignant lesion because the longest diameter is vertical with irregular outline.
N.B: invasive ductal carcinoma is proved by biopsy not by US nor Mammography.

- Breast US by high frequency linear transducer.
  - shows: lesion most likely malignant because the longest diameter is vertical.
  - also irregular, ill defined wall

- Soft tissue mammography
  Mammogram shows:
  - rod like calcification ↑ with nodulation or irregularity in the wall
  - skin changes with skin thickening ↑
  - this indicates ➔ malignancy