ESMO PRECEPTORSHIP ON BREAST CANCER

Breast imaging

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DISCLOSURE OF INTEREST

Speaker fees from Siemens Healthineers
Symptoms | Screening finding

Diagnosis

Staging

Preoperative assessment

Postoperative assessment and surveillance
Symptoms of breast cancer

In the screening age group: >60% of the cancers are detected in screening
Other imaging techniques:

- Tomosynthesis
- Magnetic resonance imaging (MRI)
- Contrast enhanced mammography
- Elastography
- Breast-CT…
Mammography

- One of the most common x-ray examination
- Measures the attenuation differences of tissues with different densities (radiolucent/radiodense = non dense/dense tissue)
- Tumour = high cellular density
Breasts are a heterogeneous organ

The sensitivity of mammography is affected by:

- Exam technique – compression, positioning, image quality
- Tumour size and growth pattern (inv. lobular cancer)
- Experience of the radiologist (5000/year)
- Breast density (fatty vs fibroglandular and stromal tissue)

- Reduced sensitivity in dense breasts due to masking effect:
  - Non-dense breasts >70% sensitivity
  - Dense breasts <50% sensitivity
- Increased risk of breast cancer in extremely dense breasts vs fatty breasts (x5)

Standard views

- Mediolateral oblique (MLO)

  \[ \text{MLO + CC = screening} \]

- Craniocaudal (CC)

  \[ \text{MLO + CC + LM = clinical} \]

- Lateral (ML eller LM)

- Additional views:
  - Magnification
  - Axilla
Breast compression

- Reduces scattered radiation/secondary radiation – lowers the radiation dose
- Reduces image noise
- Separates the structures in the breast – improves visualization
- Breast compression can be painful
- Influences the participation rate in screening (25–46% of those who chooses not to re-attend screening say that compression pain is the reason)

One mammogram = 3 months exposure to background radiation
Carcinogenic effect of irradiation is age dependent

- All symptomatic women >30 y.o.
- Women 25–30 y.o. only with a clinical suspicion of malignancy
- <25 y.o. only with a strong suspicion of malignancy

Adapted from Baral et al Cancer 1977
Features of cancers

- Soft tissue lesion
- Architectural distortion
- Asymmetry
- Microcalcifications
- Associated findings

The most common appearance of an invasive cancer = a spiculated mass
Soft tissue lesion

**Signs of malignancy**
- Spiculations
- Irregular margin
- High density
- Eccentric localization

**Signs of benignity**
- Round/oval
- Circumscribed
- Smooth margin
- Isodense/low density
- Halo

- 10–20% have benign features
- Often fast growing triple negative breast cancers
- Medullar och mucinous cancer

**Diagnosis**

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Architectural distortion

Distortion of the breast parenchyma without a visible mass

Can be caused by:

- Invasive cancer (lobular type)
- Benign lesions (radial scar, complex sclerosing adenosis)
- Postoperative distortion

Manisha Bahl et al. AJR (2015)
Microcalcifications

- Typical benign calcifications:
  - Punctate or coarse
  - Diffuse or isolated group
  - Bilateral

- Typical malignant calcifications:
  - New
  - Thin, pleomorphic
  - Linear, branching (ductal pattern)
  - Isolated group or segmental
  - Unilateral
Associated findings

- Lymphadenopathy
- Skin retraction
- Unilateal oedema/skin thickening

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Classification of imaging findings

Breast Imaging Reporting and Data System (BI-RADS)

<table>
<thead>
<tr>
<th>Category</th>
<th>Management</th>
<th>Likelihood of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Need additional imaging or prior examinations</td>
<td>Recall for additional imaging and/or await prior examinations</td>
<td>n/a</td>
</tr>
<tr>
<td>1 Negative</td>
<td>Routine screening</td>
<td>Essentially 0%</td>
</tr>
<tr>
<td>2 Benign</td>
<td>Routine screening</td>
<td>Essentially 0%</td>
</tr>
<tr>
<td>3 Probably Benign</td>
<td>Short interval-follow-up (6 month) or continued</td>
<td>&gt;0 % but ± 2%</td>
</tr>
<tr>
<td>4 Suspicious</td>
<td>Tissue diagnosis</td>
<td>4a. low suspicion for malignancy (&gt;2% to ≤ 10%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4b. moderate suspicion for malignancy (&gt;10% to ≤ 50%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4c. high suspicion for malignancy (&gt;50% to &lt;95%)</td>
</tr>
<tr>
<td>5 Highly suggestive of malignancy</td>
<td>Tissue diagnosis</td>
<td>≥95%</td>
</tr>
<tr>
<td>6 Known biopsy-proven</td>
<td>Surgical excision when clinical appropriate</td>
<td>n/a</td>
</tr>
</tbody>
</table>

ACR BI-RADS 5th ed.
High-frequency sound waves are reflected in various degrees on different types of tissues.

Indications:
- Included in the standard diagnostic assessment
  - Characterize lesions seen on mammography
  - Lymph node assessment
- Guidance at interventional procedures
- Single modality for assessment of young women (<30)
38-y.o. woman with a lump

Multifocal IDC
Characteization of mammography findings

Mucinous cancer

Benign cyst

Mammography

Ultrasound

Case courtesy of Dr Mark Holland
Feature analysis

**Malignant signs**
- Irregular shape
- Indistinct margins
- Non-parallel to the skin
- Hypo- or heteroechogetic
- Through transmission shadow
- Non-compressable

**Benign signs**
- Round or oval
- Distinct margins
- Parallel to the skin
- Homogeneous echogenicity
- Through transmission enhancement
- Compressable

IDC Cyst

"Taller than wide"
Cancer or not?

IDC

Fibroadenoma

TNBC
Needles

Fine needle aspiration
- Evacuate cysts
- Lymphnode

Core needle biopsy
- Histological diagnosis
- Receptor status

Vacuum assisted biopsy
- Sparse microcalcifications
- MR-guided biopsy

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Symptoms

Screening finding

Diagnosis

Size, multifocality
Lymph node assessment
Metastasis screening

Staging

Mammography
Ultrasound
Biopsy

+ physical examination =
Triple assessment

Multidisciplinary conferences

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Breast MRI

- Affects and measures the nuclear-magnetic resonance of water molecules
- Enables analysis of contrast dynamics (tumours = fast uptake + fast wash-out)
- Not affected by breast density
- High sensitivity (90%), lower specificity (72%)
56-y.o. woman with a family history of breast cancer
Palpable lump left breast
Bilateral cancer?
Breast MRI

Indications

- An MRI of the breast is not routinely recommended, but should be considered in cases of:
  - familial breast cancer associated with BRCA mutations [I, A];
  - lobular cancers [I, A];
  - dense breasts [II, B];
  - suspicion of multifocality/multicentricity (particularly in lobular breast cancer) [I, A];
  - large discrepancies between conventional imaging and clinical examination [III, B];
  - before neoadjuvant systemic therapy, and to evaluate the response to this therapy [II, A]; and
  - when the findings of conventional imaging are inconclusive (such as a positive axillary lymph node status with an occult primary tumour in the breast) [III, A] [14].
  - It may also be considered in case of breast implants.
Preoperative assessment with MRI

- Preoperative MRI is clinical practice in many countries
- Tumour size can be underestimated with mammography and ultrasound, especially invasive lobular carcinoma
- MRI is accurate in estimating tumour extension (multifocality)
- A meta-analysis showed that the risk for recurrent disease was not reduced using preoperative MRI, but the risk of mastectomies increased
- COMICE-trial: RCT evaluating the effect on reoperation rates with and without preoperative MRI. No effect on reoperation rates (19% vs. 19%, OR 0.96)
- MONET-trial: RCT of nonpalpable cancers with and without preoperative MRI. No difference in mastectomy frequency. Paradoxal higher rate of women with MRI that underwent reoperation (45% vs. 28%)

"Breast MRI should not be used routinely for preoperative work-up of patients with nonpalpable breast cancer."

Invasive lobular cancer can be considered as an acceptable indication to preoperative MRI

Houssami N et al J Clin Oncol (2014)

EUSOMA guidelines, Eur J Cancer (2010)
Lymph node assessment

- Majority of sentinel lymph nodes are located in the lower part of the axilla (Level 1)

- Morphology and cortical thickness (>4 mm)

- Negative axillary US excludes advanced nodal disease with a NPV of 96%

- 1/3 of patients with normal lymph node morphology have nodal metastases

- Biopsy or cytology (+ clip marking)

Schipper RJ et al., Breast (2013)
Screening for distant metastasis

- Incidence of metastatic disease in early-stage BC <2%

- Whole body screening (CT) justified:
  - clinically positive axillary nodes;
  - large tumours (e.g. ≥5 cm);
  - aggressive biology; and
  - clinical signs, symptoms or laboratory values suggesting the presence of metastases [III, A].

- PET-CT (FDG) can be considered for inconclusive CT, for high-risk patients, inflammatory BC

- Less sensitive for lobular and low-grade cancers

Symptoms → Screening finding

Diagnosis
- Mammography
- Ultrasound
- Biopsy
  + physical examination = Triple assessment

Staging
- Size, multifocality
- Lymph node assessment
- Metastasis screening

Preoperative assessment
- Localization procedures
- Assessment of neoadjuvant therapy

Postoperative assessment

Multidisciplinary conferences

Specimen radiography

Surveillance
Preoperative assessment

76-y.o. woman with pain in her left breast after a trauma

5 mm invasive tubular cancer
Preoperative assessment

Non-palpable lesions

Postoperative assessment

Margins?
Assessment of neoadjuvant therapy

• Tumour size before, during and after treatment (longest diameter)

• Before treatment: radiopaque marker

• MRI is the most accurate method to evaluate treatment response (but depends on baseline appearance)
Surveillance after treatment

- Follow-up vary
- Yearly mammography +/- US (later routine screening)
- MRI may be indicated for young patients (dense breasts, hereditary risk)
- US can also be considered in the follow-up of lobular invasive carcinomas
Breast imaging

Summary

- **Assessment of primary tumour:** Triple assessment = physical examination + imaging (mammography + US) + biopsy
- MRI has high sensitivity and is a valuable tool in selected cases
- **Assessment of regional lymph nodes:** Physical examination + US + biopsy/cytology if suspicious
- **Assessment of metastatic disease:** Imaging only if high tumour burden or indicative symptoms
Thank you for your attention!

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