Failure on clinical image quality criteria in digital mammography – how can radiographers do better?

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Outline

• Justification
• Objectives
• Methods
• Results & Discussion
• Conclusions
Breast cancer in numbers

4500 new cases per year

1500 deaths per year (female)

1% (male)

90% curable if diagnosed early

Image quality

Subtle X-ray attenuation properties between normal and abnormal tissues.

The EUREF protocol recommends the assessment of IQ provided by digital mammographic systems.

9 tests for assessing the quality of the acquired image including clinical IQ breast positioning criteria.

Objectives

- Evaluate clinical image quality criteria acquired with digital mammography (PGMI)
  - P (Perfect)
  - G (Good)
  - M (Moderate)
  - I (Inadequate)

- Assess density
Image Quality

• IQ assessed on the acquisition monitor (as radiographers do)

• P (Perfect) – all criteria achieved
• G (Good) – 1 failure
• M (Moderate) – 2 failures
• I (Inadequate) – 3 or + failures
Image Quality

Craniocaudal (CC) view

The medial border of the breast is shown;
As much as possible – outer quadrants;
If possible, the pectoral muscle shadow.

Adequate exposure parameters;
Both images should be symmetrical;
Nipple in profile;
Absence of skin folders;
Correct patient identification;
Absence of movement.

Image Quality

Mediolateral (MLO) view

All the breast tissue clearly shown;
Pectoral muscle to nipple level;
Inframammary angle clearly demonstrated.

Adequate exposure parameters;
Both images should be symmetrical;
Nipple in profile;
Absence of skin folders;
Correct patient identification;
Absence of movement.

Image Quality

<table>
<thead>
<tr>
<th>PGMI Classification - image quality</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR systems</td>
<td>13</td>
</tr>
<tr>
<td>Mammography images</td>
<td>3044</td>
</tr>
<tr>
<td>Perfect + Good</td>
<td>60%</td>
</tr>
<tr>
<td>Moderate + Inadequate</td>
<td>40%</td>
</tr>
</tbody>
</table>

- **Perfect**: 1236 images
- **Good**: 600 images
- **Moderate**: 932 images
- **Inadequate**: 276 images
Image Quality

Failed clinical criteria

Justification

Objectives

Methods

Results & Discussion

Conclusions

Failures

- Nipple
- Contralateral breast

Corrective Actions

- Patients help – remove CLB
- Compression technique
Failed clinical criteria

- Quadrants asymmetry
- Hair

Patients help – remove hair
Positioning technique
Failed clinical criteria

- Motion
- No inclusion of all tissue

Corrective Actions

- Compression force
- Positioning technique - puzzle
Image Quality

Failed clinical criteria

Justification

Objectives

Methods

Results & Discussion

Conclusions
Image Quality

Failed clinical criteria

- Movement artifacts
- IM angle

Corrective Actions
- Positioning technique
- Compression
Image Quality
Failed clinical criteria

Justification
Objectives
Methods
Results & Discussion
Conclusions

- MP & IM angle inclusion
- Nipple

Corrective Actions
- Compression
- Horizontalization of the breast
Image Quality

Failed clinical criteria

- Folders – MP & IM angle
- Stomach superimposition

Corrective Actions

- Positioning technique
- Compression
Image Quality
Failed clinical criteria

Failures
- IM angle inclusion
- Superimposition - finger

Corrective Actions
- Positioning technique
- Patients help

Justification
Objectives
Methods
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Conclusions
Image Quality

Failed clinical criteria

![Bar chart showing the number of images for different failed criteria in the MLO projection. The x-axis represents the failed criteria, and the y-axis shows the number of images. The criteria include: No pectoral muscle, Assymetric, Absence of all tissue, Skin folders, Desprojection of nipple, PM incomplete, Superposition of stomach, Folders IM, Absence of IM, Folders PM. The chart indicates that Folders PM has the highest number of failed images.]
Breast density

- Breast density - ACR[1,2]: fatty or with low density (25% < TG < 50%)
  - Typical breast characteristics in screening

Image Quality

• Inappropriate practice - incorrect radiographic techniques were frequently detected namely:
  – Skin folders
  – Movement
  – PM not included

• **WHY?**
  – Workload
  – Poor communication – Radiographer/Radiologist
Future work

• Correlate questionnaires data
  – Specific education and training
  – Experience in DM
  – Dedicated centers
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Thank you for your attention

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