Diagnostic imaging of DCIS

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Ductal Carcinoma in Situ (DCIS)

- DCIS incidence in the United States increased more than sevenfold from 1973 through the late 1990s and has since leveled off.
- The increase in rates of DCIS is highly and consistently associated with the concurrent increase in rates of mammography screening.

DCIS

• Rarely diagnosed before the advent of mammography
• 20-25% of newly diagnosed cases of breast cancer in USA
• 0.5-1‰ of screening detected cancers
• 16-34% of mammography-detected cancers

Data from Fribourg screening program
The natural history of DCIS is poorly understood.

Risk factors are the same as those for invasive breast cancer:
- High mammographic density
- Family history of breast cancer (e.g. BRCA positive)
- Increasing age
- Menopausal estrogen with progestin therapy
- Age at menopause
- Nulliparity (no births)
- Late age at first birth
- High postmenopausal body mass index.
Diagnosis of DCIS

- 80-85% of DCIS detected by mammography
- 15-18% detected as a lump
- Exceptionally detected at MRI
  - High risk screening
  - Suspicious lesion on mammography, invisible on ultrasound

Findings on Mammograms

- Calcifications
  - Macrocalcifications
  - Microcalcifications
- Mass
- Asymmetry of density
- Architectural distortion
- Duct ectasia, skin thickening, retraction

Mammography and DCIS

• Detected due to microcalcifications (93%)
  – Morphology
    • Amorphous 20% malignancy
    • Coarse
    • Fine pleomorphic
    • Fine linear
    • Fine linear branching 70% malignancy
  – Distribution
    • Linear
    • Segmental

Mammography and DCIS
Positive screening
Mammography and DCIS

• 25% of malignant microcalcifications demonstrated stability over 8-63 months
• Stability is unreliable for exclusion of malignancy

Stereotactic VABB
Stereotactic VABB
Stereotactic VABB, clip placement
Control of the specimens
VABB in Switzerland, 2014

Schwegler-Guggemos, D. MIBB Data, 2015
## Diagnostic performance of VABB

### Table 8: Comparison of the diagnostic performance of the two systems, considering B3 lesions as a positive prediction of cancer

<table>
<thead>
<tr>
<th></th>
<th>EnCor</th>
<th>Mammo[forme de caractére]</th>
<th><em>p</em> value</th>
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<tbody>
<tr>
<td></td>
<td>%</td>
<td>Lower–Upper 95% CIs</td>
<td>%</td>
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<tr>
<td>SN</td>
<td>100</td>
<td>(75.75–100)</td>
<td>100</td>
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<tr>
<td>SP</td>
<td>82.86</td>
<td>(72.38–89.91)</td>
<td>79.41</td>
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<tr>
<td>PPV</td>
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<td>(31.43–68.57)</td>
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<td>NPV</td>
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*SN* sensitivity, *SP* specificity, *PPV* positive predictive value, *NPV* negative predictive value, *AC* diagnostic accuracy, *CI* confidence interval, NA not applicable.

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Microcalcifications and cancer

- PPV Screening mammography 12.7%
- PPV Diagnostic mammography 24.1%


Wire localization
Wire localization
Immediate control
Pathological result

• DCIS, no invasive part
• High grade (G3)
• ER 0%, PR 0%
• Two foci, 1.8 cm and 3.0 cm
• Negative margins
Ultrasound
US and DCIS

- Low sensitivity for tumor detection
- Low sensitivity (73%) for microcalcifications detection
- No morphological analysis of micros
- Very low specificity


US and DCIS
US and DCIS
MRI and DCIS

• High sensitivity
  – 85% (58-100%) for DCIS
  – 100% for microinvasive DCIS

• Non-mass-like enhancement (NMLE)
  – Linear
  – Ductal
  – Segmental

MRI and DCIS

- Non detectable without contrast enhancement on T1w or T2w images
- PPV of ductal NMLE 26%
- PPV of segmental or linear NMLE 34%
- Dynamic behavior not relevant
- Emerging role of DWI


MRI and DCIS

2007
MRI and DCIS
MRI and DCIS
MRI and DCIS
MRI and DCIS
MRI and DCIS
MR guided biopsy
Stereotactic wire localization
Retroareolar IDC left
Retroareolar IDC left
MRI DCE
MRI DCE
MRI DWI
MR guided VABB

Extended high grade DCIS
MRI in Mammographic BI-RADS 3

- NPV of 100% in non-calcified lesions
- MRI useful in case of
  - Asymmetry
  - Architectural distortion
- NPV between 76 and 97% in « BI-RADS 3 » microcalcifications
- MRI cannot be used as problem-solving modality in microcalcifications

Screening mammography
Screening mammography
Ultrasound
MRI
Stereotactic VABB

Target 1

Target 2
Stereotactic VABB

Target 1

Target 2
Suspicious microcalcifications

- Likelihood of malignancy
  - Coarse heterogeneous 13%
  - Amorphous 21%
  - Fine pleomorphic 29%
  - Fine linear or branching 70%
  - Regional 26%
  - Grouped 31%
  - Linear 60%
  - Segmental 62%
Conclusion

• Undergoing mammography strongest risk factor for being diagnosed with DCIS
  – Microcalcifications
    • NEVER BI-RADS 3

• Risk factors similar to those of invasive cancer

• Natural history of DCIS unknown
  – Aggressive treatments
Conclusion

• No data demonstrating that detection of DCIS by mammography averts breast cancer deaths

• Detection and treatment of DCIS may be worthwhile in prevention of future invasive disease.

Thank you for your attention