Opto-acoustics as a potential new diagnostic technology in breast care:
Clinical implications and future potential applications

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Current clinical practice

64 year-old woman recalled from screening
Well circumscribed intraductal nodule
Surprising results

Reinforces biopsy demand
Biopsy

DCIS growing inside a papilloma
Irregular mass
Reducing the need for biopsy

BI-RADS 4a
To
BI-RADS 2

Fibroadenoma
When to use opto-acoustics?
When to use opto-acoustics?
When to use opto-acoustics?
A look at IMAGIO

• Combines US and opto-acoustics

• Switches from US to hybrid in seconds
A look at IMAGIO

Lasers generate heat, so some cooling is mandatory

Imagio now only needs a well air-conditioned room
Further precautions

- Doors must be locked
- Signs must be posted
- Protective eyewear is mandatory
Safety

• No IV contrast agents or radio-nuclides required
• No negative side-effects seen within maestro trial
Does IMAGIO meet the demands

- Easily available

- No inconvenience (both for the doctor and the patient)

- Safe
5 Reasons that negative likelihood (NLR) ratio is both underappreciated and very important in BI-RADS

1. Can be calculated from sensitivity and specificity – therefore, can be calculated for any study with published sensitivity and specificity
   \[ \text{NLR} = \frac{1 - \text{sensitivity}}{\text{specificity}} \]

2. Is prevalence independent, unlike PPV and NPV

3. Allows comparison of different modalities and neutralizes the differences in prevalences between studies

4. Can calculate post test probability my multiplying NLR x pre-test probability

5. When we know the desired post-test probability – (2% or less for BI-RADS 3), we can calculate exactly how high a pre-test probability can be reduced to BI-RADS 3 when test is negative
# Sensitivity– Negativity Likelihood Ratio

<table>
<thead>
<tr>
<th>Modality</th>
<th># of studies analyzed</th>
<th>Summary sensitivity</th>
<th>NLR</th>
<th>authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA MAESTRO interim</td>
<td>1 (75 masses)</td>
<td>97.1%</td>
<td>0.067</td>
<td>Seno Medical</td>
</tr>
<tr>
<td>MRI</td>
<td>41</td>
<td>91.7%</td>
<td>0.107</td>
<td>Bruening W et al. (ref 1)</td>
</tr>
<tr>
<td>PET</td>
<td>7</td>
<td>83.0%</td>
<td>0.230</td>
<td>Bruening W et al.</td>
</tr>
<tr>
<td>Scintomammography</td>
<td>10</td>
<td>84.7%</td>
<td>0.199</td>
<td>Bruening W et al.</td>
</tr>
<tr>
<td>Color Doppler</td>
<td>6</td>
<td>88.5%</td>
<td>0.151</td>
<td>Bruening W et al.</td>
</tr>
<tr>
<td>Power Doppler</td>
<td>7</td>
<td>70.8%</td>
<td>0.402</td>
<td>Bruening W et al.</td>
</tr>
<tr>
<td>ES - color scale</td>
<td>22 (4713 masses)</td>
<td>83.4%</td>
<td>0.197</td>
<td>Gong X, et al (ref 2)</td>
</tr>
<tr>
<td>ES - Strain ratio</td>
<td>22 (4713 masses)</td>
<td>88.3%</td>
<td>0.144</td>
<td>Gong X, et al</td>
</tr>
<tr>
<td>SWE - ARFI</td>
<td>12 (1552 masses)</td>
<td>86.2%</td>
<td>0.158</td>
<td>Liu B et al. (ref 3)</td>
</tr>
<tr>
<td>SWE - Supersonics</td>
<td>21 (4436 masses)</td>
<td>89.7%</td>
<td>0.119</td>
<td>Liu B et al.</td>
</tr>
</tbody>
</table>
Does IMAGIO meet the demands

Easily available

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Safe

Might be worth it
Clinical benefit for other patients?
Intracystic papillary carcinoma

- 82-year-old lady in poor medical condition
- After multi-disciplinary discussion, it was decided not to treat
Prediction of growth?
Prediction of response to anti-angiogenic drugs

OA image of highly vascular tumor
In conclusion

• OA is capable of reducing the need for biopsy in breast lesions

• OA might be used to characterize cancers and be used for therapy monitoring

• OA might be highly valuable in other organs

However, research has so far only just started...
Thank you for your attention