Evaluation of Shaved Cavity Margins with Micro-Computed Tomography —
A Novel Method for Predicting Lumpectomy Margin Status Intraoperatively


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INTRODUCTION

- A recent prospective clinical trial found that taking shaved cavity margins (SCM) at the time of lumpectomy decreased re-excision rates from 36% to 19% in women with breast cancer.
- We assessed the ability of micro-computed tomography (micro-CT) to evaluate SCM intraoperatively to determine whether this technology could rapidly identify margin involvement by tumor and further reduce re-excision rates.

METHODS

- SCM were scanned with a Skyscan 1173 tabletop micro-CT scanner (Skyscan, Belgium) with a 5 minute scanning protocol, with up to 3 SCM scan simultaneous.
- Micro-CT images were evaluated by a surgeon familiar with micro-CT and blinded to SCM histopathology results. However, Biopsy histopathology results and pre-operative images were available.
- looking for radiographic signs of breast cancer including clustered microcalcifications and spiculated masses.
- Assessment of SCM status on micro-CT images was compared to histopathological results.

RESULTS

- A total of 103 SCM from 26 lumpectomies were studied. Primary tumor includes 20 invasive ductal carcinomas (IDC) with ductal carcinoma in situ (DCIS), 1 pure IDC, 3 pure DCIS, and 2 invasive lobular carcinomas (ILC).
- Margin status by micro-CT was concordant with histopathology in 83% of SCM specimens (86/103). Micro-CT overestimated margin involvement in 13 SCM and underestimated margin involvement in 4 SCM.
- Micro-CT had 73% sensitivity, 85% specificity, 46% positive predictive value, and 95% negative predictive value for the presence of tumor in SCM.
- 19% of cases (5/26) required a re-excision based on the histopathology margin status; micro-CT correctly identified margins as positive in 3 of these 5 cases.

<table>
<thead>
<tr>
<th>Micro-CT Results</th>
<th>Histopathology Status</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Positive</td>
<td>11 (true positive)</td>
<td>24</td>
</tr>
<tr>
<td>Negative</td>
<td>4 (false negative)</td>
<td>79</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>88</td>
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</tbody>
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CONCLUSION

- Evaluation of SCM by micro-CT is a promising method for intraoperative margin assessment in breast cancer patients.
- The scanning time required is short enough to permit real time feedback to the operating surgeon, allowing immediate directed re-excision and further reducing rates of second surgical procedures.