Implementation of a Breast Intraoperative Radiation Therapy (IORT) Program is Associated with a Reduction in Mastectomy Rate

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Introduction

• IORT reduces the number of radiation fractions and shortens treatment time in selected breast cancer patients.
• We hypothesized that IORT would make more patients amenable to breast conservation that would have otherwise experienced many obstacles in accessing post-operative radiotherapy, especially patients living at increased distances from our Institution. Mastectomy rates were examined before and after IORT was implemented at a single Institution.

Background

• Breast cancer screening programs have increased dramatically, allowing for earlier stages of disease to be detected. Treatment options have shifted away from the more invasive and less patient-friendly mastectomy toward breast conservation surgery.1
• When treating early-stage breast cancer, breast conserving surgery (lumpectomy with whole breast, external beam radiation treatment [EBRT]) is equally as effective as mastectomy.2
• EBRT treatment regimen is not acceptable to many patients; thus, many elect to undergo mastectomy even if breast conservation is possible.3
• IORT is the delivery of partial radiation therapy, using either electrons or photons, directly to the tumor bed immediately following lumpectomy.4 IORT identifies the tumor bed, decreasing potential for residual tumor proliferation.4
• Advantages of IORT include reduced treatment visits and eliminating patient attrition.5 IORT facilitates more breast conservation in rural areas where access to radiation is limited, decreases unnecessary radiation exposure of heart, lungs, benign breast tissue, and surrounding skin, thus providing better cosmetic results, and a potential reduction in healthcare costs.2,5,6
• The international randomized control trial, TARGIT-A, comparing IORT to conventional EBRT, patient survival was equivalent.4
• The 5-year risk of local recurrence was 3.3% for IORT patients compared to 1.3% for EBRT patients (p=0.042).4
• IORT patients had significantly lower number of breast cancer-related deaths compared to EBRT (1.4% vs. 3.5%; p=0.006).4

Methods

• Patients with newly diagnosed breast cancer presenting for surgery over an 8 year period at a single Institution with cT1, cT2, or cT2c, cN0, and cM0 disease were analyzed and divided into two groups: pre-IORT vs. post-IORT.
• IORT was implemented at our institution in August 2012.
  – The pre-IORT group consisted of 683 patients presenting from January 2009 to August 2012.
  – The post-IORT group was comprised of 940 patients presenting from August 2012 to March 2017.
• Patients were excluded from analysis if they had a contraindication to breast conservation, had clinically positive nodes, or had received neoadjuvant chemotherapy.

Results

• Mastectomy Rate Based on Clinical Stage and Distance from Institution

<table>
<thead>
<tr>
<th>Clinical Stage</th>
<th>Pre-IORT</th>
<th>Post-IORT</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tis (297)</td>
<td>40.9% (91)</td>
<td>32.3% (80)</td>
<td>0.08</td>
</tr>
<tr>
<td>T1 (982)</td>
<td>32.9% (139)</td>
<td>26.1% (146)</td>
<td>0.021</td>
</tr>
<tr>
<td>T2 (244)</td>
<td>63.1% (70)</td>
<td>54.9% (73)</td>
<td>0.197</td>
</tr>
<tr>
<td>Overall (1,623)</td>
<td>39.5% (270)</td>
<td>31.8% (256)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

  *Pearson Chi-Square Test

• Mastectomy Rate Based on Clinical Stage

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<tr>
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<th>Pre-IORT</th>
<th>Post-IORT</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tis (151)</td>
<td>45.8% (27)</td>
<td>27.2% (25)</td>
<td>0.019</td>
</tr>
<tr>
<td>T1: 25+ Miles (125)</td>
<td>37.8% (34)</td>
<td>35.3% (55)</td>
<td>0.692</td>
</tr>
<tr>
<td>T1: 0-24 Miles (426)</td>
<td>29.2% (69)</td>
<td>29.1% (46)</td>
<td>0.029</td>
</tr>
<tr>
<td>T2: 25+ Miles (554)</td>
<td>36.2% (81)</td>
<td>30.3% (100)</td>
<td>0.149</td>
</tr>
<tr>
<td>T2: 0-24 Miles (69)</td>
<td>61.5% (24)</td>
<td>56.7% (17)</td>
<td>0.683</td>
</tr>
<tr>
<td>T2: 25+ Miles (175)</td>
<td>63.9% (46)</td>
<td>54.4% (56)</td>
<td>0.209</td>
</tr>
</tbody>
</table>

Conclusion and Discussion

• In the patients treated after the implementation of IORT (post-IORT group), 346/940 (36.8%) actually received IORT as their initial therapy or as a boost.
• The implementation of an IORT program was associated with a significant reduction in the mastectomy rate in this study, suggesting that IORT alleviates the barriers of post-op radiation therapy and allows eligible patients to undergo breast conservation. Larger studies will be required to validate this finding.
• There was not a significant decrease in mastectomy rate in Tis, T1, or T2 patients living 25+ miles from our Institution.
• Studies show that the choice of local therapy is largely surgeon-directed, with most cancer patients making decisions together with their physician or even letting their physician select for them.5,6 This could support the need for increased patient and physician education regarding IORT availability, especially for those 25+ miles from our Institution.
• Future directions include analyzing the health care cost savings of the IORT program given the significant reduction in mastectomy rate.
• Future analysis may include comparing mastectomy rates of patients based on their distance from all radiation centers, not only our Institution. More targeted patient and physician education could be provided if mastectomy rates were determined based on patient specific zip codes and then compared to all patients living in that zip code, not just those treated at our Institution.

References


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