Accelerated Partial Breast Irradiation (APBI)

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Case Presentation

• 62 year old female underwent annual bilateral screening mammogram
  – A new focal asymmetry in the left breast upper outer quadrant was demonstrated

• Patient is otherwise asymptomatic
Patient History

• Past Medical History
  – Hyperlipidemia

• Past Surgical History
  – Tonsillectomy as a child
  – C-section in 1984

• Medications
  – Atorvastatin

• No known drug allergies
Patient History (con’t)

• Gynecologic History
  – G2P3, 28 years old at first pregnancy
  – Second pregnancy identical twins
  – Menarche at 13, natural menopause at 50
  – OCP use from age 21-27, and hormone replacement therapy from age 52-54.

• Social History
  – Currently working full time as an engineer.
  – Never smoker, no current alcohol or drug use, or history of IV drug use. No prior XRT exposure.
  – Strong family support.

• No known family history of malignancy
Physical Exam

- Vitals: HR 62, BP 117/75, RR 13, Temp 98.4°F
- General: Well-appearing female, relaxed, alert, conversational.
- Lymphatics: No palpable cervical, supraclavicular, or axillary lymphadenopathy bilaterally.
- CV: RRR, no murmurs, rubs, or gallops.
- Resp: CTA B/L.
- Breast: Breasts are symmetrical and appear to be D cup breasts. There is no visible erythema, edema, nipple inversion, or discharge. There are no palpable masses.
- Neurologic: CN II-XII grossly intact, no focal neurologic deficits otherwise noted, sensation grossly intact throughout, gait normal.
Diagnostic Workup

• Diagnostic left mammogram
  – Confirms 13mm irregular mass in the left breast at 1 o’clock, mid-depth.

• Targeted US of left breast
  – Re-demonstrates 13mm solid mass in the left breast at 1 o’clock, 30mm from nipple.

• US-guided core needle biopsy
  – Invasive ductal carcinoma
  – Intermediate grade
  – ER/PR positive (Allred 8/8 for both), Her2/neu amplification negative by FISH analysis.
Multidisciplinary Discussion

• Patient was presented at the multidisciplinary breast cancer tumor board.
• Presented options for local treatment: simple mastectomy, lumpectomy/SLNB + WBI, or lumpectomy/SLNB + accelerated partial breast irradiation (APBI).
• The patient elected to undergo lumpectomy/SLNB + APBI using Contura multi-lumen balloon catheter.
Introduction to APBI

• Whole breast irradiation (WBI)
  – Standard of care after breast conservation surgery for early stage breast cancer.

• APBI introduced with possible advantages over WBI while providing equivalent LC in low risk patients
  – Shortened treatment course
    • Typically 5-7 days vs 4-6 weeks
  – Decreased radiation dose/toxicity
    • Reduced exposure to heart, lung, ribs.
Which patients should be considered for APBI?

• Must be candidates for breast-conserving therapy
  – No prior radiotherapy
  – No history of collagen vascular diseases
  – Not pregnant

• Consensus guidelines from ASTRO in 2009 put patients into 3 classes
  – Suitable
  – Cautionary
  – Unsuitable
### ASTRO consensus statement for APBI

<table>
<thead>
<tr>
<th></th>
<th>Suitable (Pt meets all criteria)</th>
<th>Cautionary (Pt meets any criteria)</th>
<th>Unsuitable (Pt meets any criteria)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>≥ 60</td>
<td>50-59</td>
<td>&lt; 50</td>
</tr>
<tr>
<td><strong>Tumor Size, T stage</strong></td>
<td>≤ 2 cm, T1</td>
<td>2.1 – 3 cm, T0 or T2</td>
<td>&gt; 3 cm, T3-T4</td>
</tr>
<tr>
<td><strong>N stage, surgery</strong></td>
<td>pN0 (SNBx or ALND)</td>
<td></td>
<td>pN1-3 or no nodal surgery</td>
</tr>
<tr>
<td><strong>Margins</strong></td>
<td>Negative (≤ 2 mm)</td>
<td>Close (&lt; 2 mm)</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>LVI</strong></td>
<td>No</td>
<td>Limited/focal</td>
<td>Extensive</td>
</tr>
<tr>
<td><strong>ER status</strong></td>
<td>Positive</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td><strong>Centricity</strong></td>
<td>Unicentric</td>
<td>Microscopic multicentricity</td>
<td>Present</td>
</tr>
<tr>
<td><strong>Histology</strong></td>
<td>Invasive ductal or favorable histology</td>
<td>Invasive lobular</td>
<td></td>
</tr>
<tr>
<td><strong>EIC or Pure DCIS</strong></td>
<td>Not allowed</td>
<td>≤ 3 cm</td>
<td>&gt; 3 cm</td>
</tr>
<tr>
<td><strong>Associated LCIS</strong></td>
<td>Allowed</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Neoadjuvant Tx</strong></td>
<td>Not allowed</td>
<td></td>
<td>Received</td>
</tr>
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# ASTRO vs. ABS vs. ASBS

Comparison of criteria for approved group

<table>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td>≥ 60</td>
<td>≥ 50</td>
<td>≥ 45 (IDCA), ≥ 50 (DCIS)</td>
</tr>
<tr>
<td><strong>Tumor Size, T stage</strong></td>
<td>≤ 2 cm, T1</td>
<td>≤ 3 cm</td>
<td>≤ 3 cm</td>
</tr>
<tr>
<td><strong>N stage, surgery</strong></td>
<td>pN0 (SNBx or ALND)</td>
<td>pN0 (SNBx or ALN level I/II)</td>
<td>pN0 (SNBx)</td>
</tr>
<tr>
<td><strong>Margins</strong></td>
<td>Negative (≤ 2 mm)</td>
<td>Negative microscopic</td>
<td>Negative microscopic</td>
</tr>
<tr>
<td><strong>Centricity</strong></td>
<td>Unicentric, clinically unifocal</td>
<td>Unifocal</td>
<td></td>
</tr>
<tr>
<td><strong>LVSI</strong></td>
<td>Not present</td>
<td>Not present</td>
<td></td>
</tr>
<tr>
<td><strong>Histology</strong></td>
<td>Invasive ductal or favorable histo</td>
<td>Any invasive</td>
<td>Invasive ductal or DCIS</td>
</tr>
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</table>
APBI Methodology

- Multiple methods available
  - Brachytherapy
    - Multi-catheter interstitial (High, Low, or Pulsed dose rates)
    - SAVI
    - Balloon catheterization (Mammosite, Contura)
  - External beam
    - Electrons
    - 3D-CRT/IMRT
    - Protons
    - Single-dose intraoperative radiotherapy (IORT)
- Multi-catheter interstitial brachytherapy has longest history, but currently data lacking to determine optimal method of delivering APBI.
RTOG 95-17 - Phase II trial

• APBI alone using multi-catheter interstitial brachytherapy after lumpectomy in early-stage breast cancer.

• 99 patients treated prospectively with HDR or LDR brachytherapy.

  – Eligibility: Stage I/II, unifocal, invasive non-lobular, negative margins, Tumor ≤3cm, Level I/II ALND with 0-3 positive nodes without ECE.

<table>
<thead>
<tr>
<th>Modality</th>
<th># pts tx</th>
<th>Median f/u</th>
<th>5-year failure rates</th>
<th>Survival rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ipsilat. br</td>
<td>Contralat. br</td>
</tr>
<tr>
<td>HDR (34Gy, 10 BID fxns in 5 days)</td>
<td>66</td>
<td>6.55 yrs</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>LDR (45Gy in 3.5-6 days)</td>
<td>33</td>
<td>7.09 yrs</td>
<td>6%</td>
<td>6%</td>
</tr>
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ASSOCIATION OF RESIDENTS IN RADIATION ONCOLOGY
RTOG 95-17 - Phase II trial (cont’d)

- **Toxicity and cosmesis** (Rabinovitch et al. 2014)
  - Skin toxicity at 5 years (% of pts):
    - Grade 1-2 (78%), Grade 3 (13%), no G4
    - 54% - Catheter marks
    - 45% - Fibrosis
    - 45% - Telangiectasias
    - 37% - Dimpling or indentation
    - 15% - Symptomatic fat necrosis (1 req’d surgical excision, no pt req’d mastectomy)
  - Patient-reported outcomes after 5 years (% of pts):
    - Breast asymmetry (73%), of which 77% reported a smaller treated breast
    - Excellent/good cosmesis (66%)
    - Satisfaction w/ treatment (75%)
    - Would choose same treatment again (95%)
Treatment

• Our patient underwent lumpectomy/SLNB with Contura maintenance catheter placement intraop
  – Invasive ductal carcinoma measuring 7mm
  – No associated DCIS
  – Surgical resection margins widely negative (>5mm for all margins)
  – ER+, PR+, Her2/neu amplification negative
  – SLNBx reviewed intraoperatively 0/2 LNs positive for disease

• Contra balloon spacer replaced with Contura HDR brachytherapy unit during CT simulation
Treatment

• CT simulation completed with brachytherapy device in place. Pt is simulated on breast board with both arms up.

• Maintenance catheter was removed and Contura treatment catheter device placed with radio-opaque dye to visualize balloon and intraluminal catheters for treatment planning.

• Treatment device remains in place for 5 days.

• Total dose of 34Gy delivered in BID fractions with greater than 6 hours of intrafx interval.
Treatment

Five catheter channels connected to HDR after-loader for treatment
Treatment Set Up

Catheter aligned to tattoo to ensure daily rotational consistency.
Fluoroscopic imaging to ensure set up performed prior to each daily fraction

Day 1 – Fluoroscopy set up

Day 3 – Fluoroscopy set up
References


Please provide feedback regarding this case or other ARROcases to arrocase@gmail.com