SURGICAL MANAGEMENT OF THE AXILLA

what about the lymph nodes?

Rachel Adams Greenup, MD, MPH
Departments of Surgery and Population Health Sciences
Duke University School of Medicine
July 17, 2019
LYMPHEDEMA
1991- Giuliano et al first reported SLNB for breast cancer.

1997- Veronesi et al validated lymphoscintigraphy and intraoperative identification of SLNB (98% accuracy).

Historically, positive SLNB → axillary lymph node dissection.
Sentinel lymph node biopsy

Radioactive substance and/or blue dye is injected near the tumor (left), the injected material is followed visually or with a probe (lower left), and the first lymph nodes to take up the material are removed and checked for cancer cells (below).
Axillary Cooperative Group Trials

- **NSABP B-32**: 2010
- **ACOSOG Z0011**: 2011
- **SENTINA**: 2013
- **ACOSOG Z1071**: 2013
- **EORTC AMAROS**: 2014

- **Single institution trials / studies**: TAD, MSKCC data
NSABP B-32

Sentinel-lymph-node resection compared with conventional axillary-lymph-node dissection in clinically node-negative patients with breast cancer: overall survival findings from the NSABP B-32 randomised phase 3 trial

NSABP B-32: SLNB vs. ALND in cN0

- **Is SLNB a reasonable way to stage the axilla in cN0 pts?**
- AIM: establish whether SLNB achieves the same survival & regional control as ALND, with fewer side-effects
- Trial Enrollment: 1999 - 2004
- Enrolled: N = 5611 invasive cancer (largest randomized SLNB trial)
- Sites: 80 centers (US/Canada)
- Follow-up: 8-years

- Random assignment to SLNB+ALND vs. SLNB alone (unless pN1->ALND)
- SLNB was performed with radiotracer & blue dye
- Outcome analyses performed on women with pN0
- Primary endpoint: OS
- Designed to detect a survival difference of 2% between sentinel node-negative patients in the two groups at 5 years.
- Morbidity with each procedure also evaluated

NSABP B-32: SLNB vs. ALND in cN0

N = 5611
Invasive BC

2807
SLN + ALND

2804
SLN alone
(if path negative)

NSABP B-32: SLNB vs. ALND in cNO

NSABP B-32: SLNB vs. ALND in cNO

- Overall study: False-negative rate (FNR) = 9.8%*
- Women with 3 detected SLN: FNR = 7%
- 3-year lymphedema rates (defined as ≥10% arm volume difference): 14% (ALND) vs 8% (SLNB)
- No difference in OS
  - 91.8% (ALND) vs. 90.3% (SLND)

NSABP B-32: SLNB vs. ALND in cN0

<table>
<thead>
<tr>
<th></th>
<th>SLN + ALND (n = 1975)</th>
<th>SLN (n = 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local recurrence</td>
<td>54 (2.7%)</td>
<td>49 (2.4%)</td>
</tr>
<tr>
<td>Regional recurrence</td>
<td>8 (0.4%)</td>
<td>14 (0.7%)</td>
</tr>
<tr>
<td>Distant metastasis</td>
<td>55 (2.8%)</td>
<td>64 (3.2%)</td>
</tr>
</tbody>
</table>

When the SLN is negative, SLN surgery alone with no further ALND is appropriate, safe and effective therapy for breast cancer patients with clinically negative lymph nodes.
ACOSOG Z-0011

Axillary dissection vs no axillary dissection in women with invasive breast cancer and sentinel node metastasis: a randomized clinical trial

JAMA. 2011; 305: 569-575.
ACOSOG Z0011

How does SLNB compare to SLNB+ALND in women with + SLNB?

Not all positive sentinel lymph nodes warrant ALND.
ACOSOG Z-0011

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ALND (n = 420)</th>
<th>SLND (n = 436)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median</td>
<td>56</td>
<td>54</td>
</tr>
<tr>
<td>Tumor size, median pT2</td>
<td>1.7cm</td>
<td>1.6cm</td>
</tr>
<tr>
<td></td>
<td>32.1%</td>
<td>29.4%</td>
</tr>
<tr>
<td>LVI, present</td>
<td>129 (40.6%)</td>
<td>113 (35.2%)</td>
</tr>
<tr>
<td>Receptor status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER+</td>
<td>82.8%</td>
<td>82.7%</td>
</tr>
<tr>
<td>ER-</td>
<td>17.2%</td>
<td>17.3%</td>
</tr>
</tbody>
</table>

Median Nodes = 17 (ALND), 2 (SLNB)
ACOSOG Z-0011

• 96% (ALND), 97% (SLNB) patients received some form of systemic therapy
  • 58% in both groups had *chemotherapy*, (similar types)
  • 46% in both groups had *hormonal therapy*

• The majority of patients received whole breast XRT
  • 89% in ALND
  • 90% in SLNB

• **RESULTS:**
  • In the completion ALND group, **27.3% (97/355)** had additional metastases in lymph nodes removed by ALND
  • This finding suggests that about a quarter of patients who *DID NOT* have ALND, also harbored positive nodes

*JAMA. 2011; 305: 569-575.*
Z0011 — ALND vs. No ALND for Invasive Cancer and Low Volume Nodal Metastases

<table>
<thead>
<tr>
<th>Recurrence Type</th>
<th>ALND (n = 420)</th>
<th>SLND (n = 436)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>15 (3.6%)</td>
<td>8 (1.8%)</td>
</tr>
<tr>
<td>Regional</td>
<td>2 (0.5%)</td>
<td>4 (0.9%)</td>
</tr>
<tr>
<td>Total Locoregional</td>
<td>17 (4.1%)</td>
<td>12 (2.8%)</td>
</tr>
<tr>
<td>Survival</td>
<td>91.8%</td>
<td>92.5%</td>
</tr>
</tbody>
</table>

JAMA. 2011; 305: 569-575.
Z0011 — ALND vs. No ALND for Invasive Cancer and Low Volume Nodal Metastases

<table>
<thead>
<tr>
<th>Recurrence Type</th>
<th>ALND (n = 420)</th>
<th>SLND (n = 436)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>15 (3.6%)</td>
<td>8 (1.8%)</td>
</tr>
<tr>
<td>Regional</td>
<td>2 (0.5%)</td>
<td>4 (0.9%)</td>
</tr>
<tr>
<td>Total Locoregional</td>
<td>17 (4.1%)</td>
<td>12 (2.8%)</td>
</tr>
<tr>
<td>Survival</td>
<td>91.8%</td>
<td>92.5%</td>
</tr>
</tbody>
</table>

JAMA. 2011; 305: 569-575.
Z0011 – ALND vs. No ALND for Invasive Cancer and Low Volume Nodal Metastases

• Overall Survival

• Disease Free Survival

JAMA. 2011; 305: 569-575.
Patient Age and Tumor Subtype Predict the Extent of Axillary Surgery Among Breast Cancer Patients Eligible for the American College of Surgeons Oncology Group Trial Z0011

Cecilia T. Ong, MD1, Samantha M. Thomas, MS2,3, Rachel C. Blitzblau, MD, PhD1,3, Oluwadamilola M. Fayanju, MD, MA, MPH1,3, Tristen S. Park, MD1, Jennifer K. Plichta, MD, MS1,3, Laura H. Rosenberger, MD, MS1,3, Terry Hyslop, PhD2,3, E. Shelley Hwang, MD, MPH1,3, and Rachel A. Greenup, MD, MPH1,3

1Department of Surgery, Duke University Medical Center, Durham, NC; 2Department of Biostatistics and Bioinformatics, Duke University, Durham, NC; 3Duke Cancer Institute, Duke University, Durham, NC
SENTINA

Sentinel-Lymph Node Biopsy in Patients with Breast Cancer Before and After Neoadjuvant Chemotherapy (SENTINA): A Prospective, Multicentre Cohort Study (SENTInel NeoAdjuvant)

Lancet Oncol. 2013, 14: 609-618.
Sentinel-Lymph Node Biopsy in Patients with Breast Cancer Before and After Neoadjuvant Chemotherapy (SENTINA): A Prospective, Multicentre Cohort Study (SEN Tin e l Neo Adjuvant)

• 4-arm, prospective, multicenter study: 100+ institutions, Germany/Austria
• Patients designated for chemotherapy
• Arm A – cN0 (clinically negative), initial SLNBx, NACT – no further tx - N = 660
• Arm B – cN0, initial SLNBx (+, pN1), NACT – REPEAT SLNBx - N = 360
• Arm C – cN1 (clinically positive), immediate NACT – if ycN0 – then SLNBx - N = 590
• Arm D – cN1 (clinically positive), NACT – stayed positive (ycN1) – ALND - N = 120

• Endpoints:
  • Accuracy of SLNBx after NCT
  • False-negatives rates
  • Detection rates

  * Nodal stage after NAC reflects prognosis more accurately than initial axillary status

Lancet Oncol. 2013, 14: 609-618.
SENTINA – Sentinel Node after NAC

- 1022 patients in arms A & B (1st SLNB): detection rate 99.1%
- 592 patients in arm B (2nd SLNB): detection rate 60.8%
  - False negative rate: 51.6%
  - Do not repeat SLNBx after NAC
- 360 patients in arm C (SLNB after NACT): detection 80.1%
  - False negative rate: 14.2%

Lancet Oncol. 2013, 14: 609-618.
SENTINA – Sentinel Node after NAC

*Significantly increased detection rate with dual agent in MV analysis.

Lancet Oncol. 2013, 14: 609-618.
SENTINA – Sentinel Node after NAC

- FNR inversely proportional to number of sentinel lymph nodes removed
- Accuracy is particularly unfavorable if only 1 or 2 SLN are removed after neoadjuvant chemotherapy
  - (remember NSABP B-32)
- Using a combined tracer may improve false-negative rates

<table>
<thead>
<tr>
<th>Arm B (n=64)</th>
<th>Arm C (n=226)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall false-negative rate (n/N; 95% CI)</td>
<td>51.6% (33/64; 38.7-64.2)</td>
</tr>
<tr>
<td>False-negative rate, according to number of sentinel nodes removed</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>66.7% (16/24)</td>
</tr>
<tr>
<td>2</td>
<td>53.8% (7/13)</td>
</tr>
<tr>
<td>3</td>
<td>50.0% (5/10)</td>
</tr>
<tr>
<td>4</td>
<td>50.0% (3/6)</td>
</tr>
<tr>
<td>5</td>
<td>18.2% (2/11)</td>
</tr>
</tbody>
</table>

False-negative rate, according to detection technique

<table>
<thead>
<tr>
<th>Radiocolloid alone</th>
<th>Radiocolloid and blue dye</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.2% (13/39)</td>
<td>16.0% (23/144)</td>
</tr>
<tr>
<td>60.9% (14/23)</td>
<td>8.6% (6/70)</td>
</tr>
</tbody>
</table>

Data are rate (number of patients), unless otherwise stated.

Table 4: False-negative rate of sentinel-lymph-node resection in patients with positive nodes, according to selected factors

Lancet Oncol. 2013, 14: 609-618.
SENTINA – Sentinel Node after NAC

- Number of sentinel nodes was a significant predictor of false-negative rate
- However, dual agent alone was not significant

Authors conclude:
- Overall detection rate and accuracy of SLNBx are inferior for patients who convert during chemotherapy to node negative disease
- 2nd SLNB after NAC in patients with positive nodes is not a good clinical option

Lancet Oncol. 2013, 14: 609-618.
ACOSOG Z-1071

Sentinel Lymph Node Surgery After Neoadjuvant Chemotherapy in Patients With Node-Positive Breast Cancer

JAMA. 2013, 310: 1455-1461.
Background:

- Residual axillary nodal disease is only found in 50-60\% of node-positive patients (cN1), post NAC
- Accurate nodal staging is important post NAC, however ALND to assess for residual nodal disease is morbid and potentially only a subset will benefit
- **NSABP B-27** included cN0 + cN1, NAC (in various arms)
  - FNR = 10.7\%
- 756 women from 136 institutions (2009-2011)
- Clinical T0-4, **N1-2**, M0 – all had FNA or Core biopsy
- All underwent neoadjuvant chemo
- All underwent post-adjuvant - SLNB and ALND

*JAMA. 2013, 310: 1455-1461.*
ACOSOG Z-1071

- Sentinel lymph nodes = radioactive, blue, or palpably abnormal
- Dual agent was recommended but not required
- Protocol required at least 2 SLN be identified
- H&E stained, positive defined as metastases of 0.2mm or larger (excludes ITCs)

JAMA. 2013, 310: 1455-1461.
ACOSOG Z-1071

- cN2 = 5% of trial
- >50% were 2cm-5cm
- >25% were 5+ cm!
  - (not small)
- 45% ER/PR +
- 30% Her2 +
- 25% triple negative

JAMA. 2013, 310: 1455-1461.
ACOSOG Z-1071

Table 1. Patient and Treatment Characteristics by Clinical Nodal Staging at Presentation

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>cN1 Cohort (n = 663)</th>
<th>cN2 Cohort (n = 38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings on axilla after chemotherapy</td>
<td>No palpable adenopathy</td>
<td>556 (83.9)</td>
</tr>
<tr>
<td></td>
<td>Palpable lymph nodes</td>
<td>76 (11.5)</td>
</tr>
<tr>
<td></td>
<td>Fixed or matted lymph nodes</td>
<td>2 (0.3)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>29 (4.4)</td>
</tr>
<tr>
<td>Type of breast surgery after chemotherapy</td>
<td>Partial mastectomy</td>
<td>266 (40.1)</td>
</tr>
<tr>
<td></td>
<td>Total mastectomy</td>
<td>395 (59.6)</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>2 (0.3)</td>
</tr>
<tr>
<td>Type of axillary surgery</td>
<td>SLN</td>
<td>2 (0.3)</td>
</tr>
<tr>
<td></td>
<td>SLN with no SLN identified and ALND</td>
<td>46 (6.9)</td>
</tr>
<tr>
<td></td>
<td>SLN with SLN identified and ALND</td>
<td>603 (91.0)</td>
</tr>
<tr>
<td></td>
<td>ALND</td>
<td>12 (1.8)</td>
</tr>
</tbody>
</table>

- Palpable LN post NAC = 11%
- BCS = 40%
- Mastectomy = 60%
- 7% had no SLN identified
- 91% detection rate
  - (slightly higher than SENTINA)

JAMA. 2013, 310: 1455-1461.
ACOSOG Z-1071

- 80% used dual agent
- 12% identified 1 SLN
- 24% identified 2 SLN
- 23% identified 3 SLN
- 14% identified 4 SLN
- 21% identified 5 or more
ACOSOG Z-1071

- Overall trial FNR = 12.6%
  - Single agent mapping: FNR = 20.3%
  - Dual agent mapping: FNR = 10.8%

- 2 SLN identified: FNR = 21.1%
- 3 SLN identified: FNR = 9.1%

- Complete pathological nodal response = 41%

JAMA. 2013, 310: 1455-1461.
• Multi-variable model –

• Dual agent & 3 or more SLN were identified as independent factors affecting FNR

Table 3. Factors Affecting the Likelihood of a False-Negative Sentinel Lymph Node Finding in the 310 Women With cN1 Disease at Presentation, 2 or More SLNs Examined, and Residual Nodal Disease After Neoadjuvant Chemotherapy

<table>
<thead>
<tr>
<th>Factor</th>
<th>False-Negative SLN Findings, No. (Total)</th>
<th>FNR (95% CI), %</th>
<th>Fisher Exact Test, P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.0-49.9</td>
<td>20 (150)</td>
<td>13.3 (8.3-19.8)</td>
<td>.73</td>
</tr>
<tr>
<td>≥50.0</td>
<td>19 (160)</td>
<td>11.9 (7.3-17.9)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥25.0</td>
<td>25 (227)</td>
<td>11.0 (7.3-15.8)</td>
<td>.18</td>
</tr>
<tr>
<td>&lt;25.0</td>
<td>14 (83)</td>
<td>16.9 (9.5-26.7)</td>
<td></td>
</tr>
<tr>
<td>Clinical T category prior to chemotherapy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tis, T0, T1, or T2</td>
<td>32 (225)</td>
<td>14.2 (9.9-19.5)</td>
<td>.18</td>
</tr>
<tr>
<td>T3 or T4</td>
<td>7 (85)</td>
<td>8.2 (3.4-16.2)</td>
<td></td>
</tr>
<tr>
<td>Palpable, fixed, or matted nodes after chemotherapy</td>
<td>10 (52)</td>
<td>19.2 (9.6-32.5)</td>
<td>.17</td>
</tr>
<tr>
<td>No</td>
<td>28 (247)</td>
<td>11.3 (7.7-16.0)</td>
<td></td>
</tr>
<tr>
<td>Mapping agents used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>12 (39)</td>
<td>20.3 (11.0-32.8)</td>
<td>.05</td>
</tr>
<tr>
<td>Dual</td>
<td>27 (251)</td>
<td>10.8 (7.2-15.3)</td>
<td></td>
</tr>
<tr>
<td>Multiple Injection sites</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 (70)</td>
<td>7.1 (2.4-15.9)</td>
<td>.21</td>
</tr>
<tr>
<td>No</td>
<td>30 (225)</td>
<td>13.3 (9.2-18.5)</td>
<td></td>
</tr>
<tr>
<td>No. of SLNs examined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>19 (90)</td>
<td>21.1 (13.2-31.0)</td>
<td>.007</td>
</tr>
<tr>
<td>≥3</td>
<td>20 (220)</td>
<td>9.1 (5.6-13.7)</td>
<td></td>
</tr>
</tbody>
</table>
Author conclusions:

• Dual-agent tracer and recovery of more than 2 SLN were associated with lower FNRs

• Among women with cN1 breast cancer, s/p NAC who had 2 or more SLN examined, the FNR was 12.6% and higher than pre-specified threshold of 10%
AMAROS (EORTC)

Radiotherapy or surgery of the axilla after a positive sentinel node in breast cancer (EORTC 10981-22023 AMAROS): a randomised, multicentre, open-label, phase 3 non-inferiority trial

AMAROS

*Is axillary radiation as effective as ALND?*

- Early stage invasive breast cancers with +SLNB.
- 2001-2010
- N=4806 patients
  - 2402 ALND
  - 2404 axillary radiotherapy
- 6.1 years of follow-up
- 33% of ALND group had additional nodal disease.
- Axillary recurrences were low (ALND=0.43% vs. Axillary RT=1.2%)
AMAROS

- AIM: to determine whether axillary XRT provided similar axillary local control as ALND in patients with a positive SLN.
- Trial Enrollment: 2001 – 2010
- Enrolled: N = 4823, 34 centers in Europe, N = 1425 with SLN+
- Eligibility: cT1-2N0 → pN+
- ALND group → 33% had additional positive nodes
  - Z0011 (27%)

Unbiased allocation to ALND*

### AMAROS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ALND (n =)</th>
<th>Ax XRT (n =)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median</td>
<td>56</td>
<td>55</td>
</tr>
<tr>
<td>Tumor size, median</td>
<td>1.7cm</td>
<td>1.8cm</td>
</tr>
<tr>
<td>pT2</td>
<td>18%</td>
<td>21%</td>
</tr>
<tr>
<td>Pre-Op Ax Ultrasound</td>
<td>59%</td>
<td>62%</td>
</tr>
<tr>
<td>Type of Surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCS</td>
<td>82%</td>
<td>82%</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>17%</td>
<td>18%</td>
</tr>
</tbody>
</table>
AMAROS: ALND vs. AxRT

- No diff in DFS or OS
- 5-yr DFS: 86.9% vs 82.7%
- 5-yr OS: 93.3% vs. 92.5%
- 5-yr axillary recurrence: 0.43% vs. 1.19%
- 5 yr lymphedema rates: 13% vs 6% ($p = 0.0009$)

AMAROS

• NSAPB-04 trial, the axillary recurrence rate after a 25-year follow-up was 4% in both treatment groups (RM, ALND vs. TM+XRT).

• French trial, with a 15-year follow-up, a slightly better axillary control was noted in the ALND group (1% vs 3% in the axillary radiotherapy group; p=0.04) but no difference in DFS or OS.  

• Low rates of axillary failure* and no difference in survival.
Targeted Axillary Dissection

Single Institution Study

Targeted Axillary Dissection (TAD)

- **AIM:**
  - 1. Determine if pathologic changes in clipped nodes reflect the status of the nodal basin.
  - 2. Determine if TAD, (SLNB + clip node), improves the FNR compared with SLNB alone

- **Trial Enrollment:** 2011-2015, prospective registry
- **Enrolled:** $N = 208$ enrolled, 191 underwent ALND

- **Eligibility:**
  - Axillary US for all patients
  - Biopsy-proven nodal mets
  - Clipped placed at biopsy
  - NAC
  - SLNB- either Tc-$^{99}$, blue dye, or both
  - $I^{125}$ seed for localization
  - SLN defined: blue, radioactive, or palpably abnormal

## Targeted Axillary Dissection (TAD)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ALND (n =)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median</td>
<td>49</td>
</tr>
<tr>
<td>Tumor size, median</td>
<td>4.2cm*</td>
</tr>
<tr>
<td>cT2</td>
<td>65%</td>
</tr>
<tr>
<td>cT3</td>
<td>23%</td>
</tr>
<tr>
<td>Pre-Op Ax Ultrasound</td>
<td>100%*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Surgery</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BCS</td>
<td>35%</td>
</tr>
<tr>
<td>Mastectomy</td>
<td>64%*</td>
</tr>
</tbody>
</table>

Clinically node-positive patients N = 208

No ALND performed n = 17

Evaluable patients n = 191

Pathologic node negative n = 71 (37%)

Pathologic node positive n = 120 (63%)

False-negative* result 5 of 120

False-negative rate 4.2% (95% CI, 1.4 to 9.5)

NAC for ALL pts

SLNB vs. TAD

Clinically node-positive patients
N = 208

SLND not performed
n = 74

SLND performed
n = 134

ALND not performed
n = 16

Evaluable patients
n = 118

Pathologic node negative
n = 44 (37%)

Pathologic node positive
n = 74 (63%)

SLN negative = 7 of 69
SLN not identified = 5

Clipped node and SLNs negative
n = 1 of 74

False-negative rate
SLN alone = 10.1% (95% CI: 4.2 to 19.8)
SLN + evaluation of the clipped node = 1.4% (95% CI: 0.03 to 7.3)
P = .03
Targeted Axillary Dissection (TAD)

- Other findings:
  - Clipped node was *not a SLN* (post-NAC) in 23%
    - Only factor associated with this discordance was ≥4 abnormal nodes on pre-op US.
    *This suggests retrieving additional nodes may have identified this as a SLN*
  - SLNB performed using dual tracers in 65 patients (55%).

- Similar FNR:
  - Single-tracer mapping (10%; 3 of 30)
  - Dual agent mapping (10.3%; 4 of 39).

- Similar FNR:
  - ≥ 2 SLNs removed (10.7%; 6 of 56)
  - < 2 SLNs removed (7.7%; 1 of 13)

Targeted Axillary Dissection (TAD)

- FNR of standard SLNB = **10.1%**
- FNR of *Clipped Node* = **4.2%**
- FNR of *TAD* (clip&SLNB) = **1.4%**

**Not reported:**
- FNR by nodal count, continuous or by ≥3
- Cost* (adds clip, adds localization, adds specimen X-ray)
- SENTINA (N=360, arm C), Z1071 (N=663), TAD (N=74)

- **ACOSOG Z1071 trial** - removal of the clipped node (N=170 / 663).
  - 107 pts (63%) for whom the clipped node was retrieved as an SLN, the FNR was 6.8% (95% CI, 1.9% to 16.5%).
  - As compared to TAD trial: 4.2% - supports the clipped node is valuable in lowering FNR

Targeted Axillary Dissection (TAD)

- Technical considerations: Localization – not sentinel in 20% of Z1071, 23% of TAD
  - Netherlands (N=100) – marks w seed at diagnosis, remains during NAC. 97% identification, no SLNB, 7% FNR.
  - Tattooing nodes w sterile black carbon suspension (N=12), 83% identification

CONCLUSION:
- Significant improved accuracy of axillary staging post-NAC by performing TAD, (SLNB + clipped node)
- The FNR for TAD was 2.0% versus 10.1% for SLND alone.
- Although sample size limits statistical comparison of the two approaches, these exploratory data are promising

ALLIANCE 11202

Is Axillary RT as effective as ALND + Axillary RT when SLNB remains + after chemotherapy?
SUMMARY

• SLNB is a widely accepted means of axillary staging in clinically node negative patients – NSABP B-32

• In cT1-2N0, BCT patients, low volume axillary metastases (1-2+ LN) does not require completion ALND - ACOSOG Z0011

• Axillary radiation may offer similar local control, DFS & OS to completion ALND in patients with cT1-2N0, with pN+ disease - AMAROS

• In the Post-NAC setting, previous cN1, which converts to cN0 with chemotherapy, FNR of SLNB are >10% - SENTINA/Z1071

• Improved accuracy of axillary staging may be obtained by a targeted axillary dissection (clipped node & SLN) with excellent FNR (2.0%) – TAD trial