HOW LONG IS TOO LONG?
DURATION OF POST-OPERATIVE
ANTIBIOTIC PROPHYLAXIS IN
BREAST RECONSTRUCTION
SURGERIES
Karen Aymá, PharmD
PGY1 Resident, St. David’s Medical Center

Objectives
■ Review ASHP-IDSA 2013 Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery recommendations regarding use and duration of post-operative antibiotic prophylaxis in breast reconstructive surgeries.
■ Review primary literature regarding post-operative antibiotic prophylaxis use and duration in breast reconstructive surgeries.
■ Evaluate evidence and make recommendations regarding post-operative antibiotic duration in presented patient case.

Abbreviations
■ ABX = antibiotics
■ ADM = acellular dermal matrix
■ ASHP = American System of Health-System Pharmacists
■ ASPS = American Society of Plastic Surgeons
■ DIEP = deep inferior epigastric artery perforator
■ IDSA = Infectious Diseases Society of America
■ Post-op = post-operative
■ PPX = prophylaxis
■ RCT = randomized controlled trial
■ SCIP = Surgical Care Improvement Project
■ SSI = surgical site infection
■ TRAM = transverse rectus abdominis myocutaneous

PATIENT CASE

CS:
Bilateral DIEP flap reconstruction
■ 55F | 5’2” | 100 kg
■ PMH:
  - HTN
  - HLD
  - DMT2
  - Depression
  - Breast cancer
    ■ s/p BL mastectomies 7/2019
  - NKDA
■ Home Meds:
  - Acetaminophen 325mg PO Q4H PRN
  - Bupropion XL 150mg PO QD
  - Lisinopril/HCTZ 20/12.5mg PO QD
  - Metformin ER 500mg PO QD
  - NKDA

S/p surgery: Cefazolin 2g IV Q8H x72h
■ Is this appropriate?
BACKGROUND

Breast reconstruction surgery
- Breast reconstruction surgery: reform/reshape breast following a mastectomy, lumpectomy, congenital deformity
- 2018 National Plastic Surgery Statistics
  - 101,657 breast reconstructions (by ASPS member surgeons)
  - 19,149 breast implant removals
- Types: implantation-based reconstruction vs flap reconstruction
  - Implantation-based: Saline, silicone gel, ADM
  - Flap reconstruction: TRAM vs DIEP
- Delayed reconstruction: tissue expanders

DIEP flap procedure
- Skin, fat, and blood vessels are removed from the abdomen and used to reconstruct the breast(s)
  - Can only be done once
  - Future DIEP reconstruction comes from back/buttocks
- Comparison with TRAM flap:
  - Muscle-sparing
  - Less risk of hernia
  - Shorter recovery period

TRAM = transverse rectus abdominis myocutaneous
DIEP = deep inferior epigastric artery perforator

Surgical site infections
- SSI: infection at or near surgical incision within 30 days of procedure
  - Within 90 days if implanted material
  - Superficial, deep incisional SSI
- SSI rate in breast procedures generally 3-15% higher than clean surgical procedures
  - Mastectomy/reconstruction vs aesthetic breast surgery
- Common organisms
  - S. aureus, staphylococci, streptococci
  - Gram negative organisms: more typical in moist environments
  - Obese individuals

Risk factors
- Age
- Diabetes
- Immunocompromised
- Tobacco use
- Obesity
- Chemotherapy
- Irradiation therapy
- Implantation
- History of colonization

Need for antibiotic prophylaxis?
- 2013 ASHP-IDSA Guidelines: varying evidence regarding antibiotic prophylaxis in plastic surgery procedures
  - Most placebo-controlled & retrospective studies did not find that abx ppx decreased risk of SSI
  - Cochrane review (7 RCT, 1984 patients) found pre- and perioperative antibiotic prophylaxis resulted in significant reduction of SSI rate
- 2015 meta-analysis of breast surgeries
  - RCTs: SSI rate w/ abx ppx = 2.5% vs control = 11.4% (p=0.001)
  - RCTs + non-RCTs: SSI rates w/ abx ppx = 3.8% vs 6.7% (p=0.003)
PATIENT CASE: CS
Is cefazolin 2g IV Q8H x72d appropriate for CS?

SURGEON PUSHBACK
Now what?

WHAT IS THE OPTIMAL DURATION FOR POST-OPERATIVE ANTIBIOTIC PROPHYLAXIS?

2013 ASHP- IDSA Guidelines
Clinical practice guidelines for antimicrobial prophylaxis in surgery

2013 ASPS Guidelines:
Breast reconstruction with expanders and implants

LITERATURE REVIEW
Liu et al. (2011)

Duration of antibiotics after microsurgical breast reconstruction does not change surgical infection rate

- Retrospective review (2006-2009)
- Autologous breast reconstructions
- CDC criteria
  - 1: purulent drainage
  - 2: positive culture
  - 3: peri-incisional erythema
  - 4: physician clinical diagnosis of infection
- Abx ppx
  - Type
  - Duration
- Cohorts:
  - 24h post-op abx ppx
  - >24h post-op abx ppx

Liu et al. (2011)

Baseline data

Patient Demographics (n=258, flaps=364)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yr</td>
<td>49.1 ± 8.6</td>
</tr>
<tr>
<td>Pre-op comorbidities</td>
<td></td>
</tr>
<tr>
<td>Obesity (BMI ≥ 30)</td>
<td>70 (27.1)</td>
</tr>
<tr>
<td>Smoking</td>
<td>23 (8.9)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>17 (6.6)</td>
</tr>
<tr>
<td>Pre-op radiation</td>
<td>117 (45.3)</td>
</tr>
<tr>
<td>Pre-op chemotherapy</td>
<td>134 (51.9)</td>
</tr>
<tr>
<td>Timing of reconstruction</td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>78 (30.2)</td>
</tr>
<tr>
<td>Delayed</td>
<td>180 (69.8)</td>
</tr>
</tbody>
</table>

Abx ppx use: cefazolin (78%), vancomycin (16%), clindamycin (5%), fluoroquinolone (1%) - Abx other than cefazolin were chosen due to patient allergy and/or history of MRSA - Some surgeons continued oral abx ppx until drains are closed

Liu et al. (2011)

Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>24h post-op (n=82)</th>
<th>&gt;24h post-op (n=174)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic duration days (mean ± STD)</td>
<td>1.0 ± 0</td>
<td>10.6 ± 6.2</td>
<td>N/a</td>
</tr>
<tr>
<td>SSI (n, %)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDC 1-3</td>
<td>4 (4.9)</td>
<td>16 (19.5)</td>
<td>1.0</td>
</tr>
<tr>
<td>CDC 1-4</td>
<td>9 (11.2)</td>
<td>27 (15.9)</td>
<td>0.47</td>
</tr>
</tbody>
</table>

No significant difference between SSI rates between cohorts

- Abx ppx use: cefazolin (78%), vancomycin (16%), clindamycin (5%), fluoroquinolone (1%)
- Abx other than cefazolin were chosen due to patient allergy and/or history of MRSA
- Some surgeons continued oral abx ppx until drains are closed

Avashia et al. (2013)

Baseline data & Results

- Retrospective review (June 2007-August 2010)
- Immediate or delayed TE-based reconstruction procedures using ADM

Cohorts
- ≤24h (peri-op only)
- ≥24h post-op abx ppx
- Two Intervals

Patient Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>≤24h (peri-op) (n=19)</th>
<th>≥24h (1st time interval) (n=88)</th>
<th>≥24h (2nd time interval) (n=31)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>51.2</td>
<td>50.3</td>
<td>52.2</td>
<td>0.97</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0 (0)</td>
<td>10 (11.4)</td>
<td>0 (0)</td>
<td>0.99</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>2 (10.5)</td>
<td>19 (21.6)</td>
<td>14 (46.8)</td>
<td>0.48</td>
</tr>
<tr>
<td>Previous irradiation</td>
<td>2 (10.5)</td>
<td>6 (6.8)</td>
<td>3 (9.7)</td>
<td>1</td>
</tr>
<tr>
<td>Previous chemo</td>
<td>3 (15.8)</td>
<td>27 (30.7)</td>
<td>5 (16.1)</td>
<td>0.73</td>
</tr>
<tr>
<td>Delayed reconstruction</td>
<td>2 (10.5)</td>
<td>17 (19.3)</td>
<td>4 (12.9)</td>
<td>0.72</td>
</tr>
<tr>
<td>Infection rate</td>
<td>6 (31.6)</td>
<td>7 (7.9)</td>
<td>1 (3.2)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Postoperative antibiotic prophylaxis for implant-based breast reconstruction with acellular dermal matrix

Avashia et al. (2013)
Avashia et al. (2013)

- Reconstruction with acellular dermal matrix is often considered a separate risk factor for SSI and carries higher rates of infection.
- Uncontrolled variables: time between mastectomy and reconstruction, nodal dissection, operative history, uni- or bilateral reconstruction

Microbiology from cultures (following TE removal)

<table>
<thead>
<tr>
<th>Day</th>
<th>Microorganism</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>MSSA</td>
</tr>
<tr>
<td>17</td>
<td>MRSA</td>
</tr>
<tr>
<td>18</td>
<td>S. epidermidis</td>
</tr>
<tr>
<td>20</td>
<td>Enterococcus</td>
</tr>
<tr>
<td>22</td>
<td>MSSA</td>
</tr>
<tr>
<td>28</td>
<td>MSSA</td>
</tr>
<tr>
<td>29</td>
<td>S. epidermidis</td>
</tr>
<tr>
<td>31</td>
<td>MRSA</td>
</tr>
<tr>
<td>50</td>
<td>MRSA</td>
</tr>
<tr>
<td>72</td>
<td>MSSA</td>
</tr>
<tr>
<td>37</td>
<td>Mycobacterium abscessus</td>
</tr>
<tr>
<td>50</td>
<td>MRSA</td>
</tr>
<tr>
<td>72</td>
<td>MSSA</td>
</tr>
<tr>
<td>58</td>
<td>Mycobacterium abscessus</td>
</tr>
<tr>
<td>60</td>
<td>MRSA</td>
</tr>
<tr>
<td>82</td>
<td>MRSA</td>
</tr>
<tr>
<td>104</td>
<td>MSSA</td>
</tr>
<tr>
<td>127</td>
<td>[Culture negative]</td>
</tr>
<tr>
<td>134</td>
<td>[Culture negative]</td>
</tr>
</tbody>
</table>

Phillips et al. (2013)

A systematic review of antibiotic use and infection in breast reconstruction: what is the evidence?

- Systematic review (1970-2011)
- Antibiotic protocols & infection rates
- All forms of breast reconstruction
- 81 studies included
- Cohorts
  - ≤24h
  - >24h

Phillips et al. (2013) Results

<table>
<thead>
<tr>
<th>Abx Protocol</th>
<th>Number of patients</th>
<th>Number of infections</th>
<th>Infection rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>90</td>
<td>13</td>
<td>14.44</td>
</tr>
<tr>
<td>≤24h</td>
<td>1077</td>
<td>62</td>
<td>5.76</td>
</tr>
<tr>
<td>&gt;24h</td>
<td>13,780</td>
<td>797</td>
<td>5.78</td>
</tr>
</tbody>
</table>

McCullough et al. (2016)

Antibiotic prophylaxis and resistance in surgical site infection after immediate tissue expander reconstruction of the breast

- Retrospective review (2005-2011)
- Immediate tissue expander reconstruction procedures
- All patients received single dose of pre-op abx ppx
- Cohorts
  - No post-op abx
  - Oral post-op abx ppx at discharge

McCullough et al. (2016) Baseline data & Results

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No post-op abx ppx (n=178)</th>
<th>Post-op abx ppx (n=200)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (yrs)</td>
<td>50.8</td>
<td>52.0</td>
<td>0.31</td>
</tr>
<tr>
<td>Obesity (BMI ≥ 30)</td>
<td>38 (21.3%)</td>
<td>44 (22.0%)</td>
<td>0.88</td>
</tr>
<tr>
<td>Smoking</td>
<td>13 (7.3%)</td>
<td>19 (9.5%)</td>
<td>0.44</td>
</tr>
<tr>
<td>Radiation</td>
<td>52 (29.3%)</td>
<td>66 (33.3%)</td>
<td>0.43</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>92 (51.7%)</td>
<td>98 (49.0%)</td>
<td>0.60</td>
</tr>
<tr>
<td>ADM</td>
<td>136 (76.4%)</td>
<td>164 (82.0%)</td>
<td>0.18</td>
</tr>
<tr>
<td>Bilateral</td>
<td>85 (47.8%)</td>
<td>94 (47.0%)</td>
<td>0.86</td>
</tr>
<tr>
<td>SSI</td>
<td>24 (13.5%)</td>
<td>24 (12.0%)</td>
<td>0.67</td>
</tr>
</tbody>
</table>
Take-away points

- Evidence generally does not support post-op abx ppx for more than 24h
- Some evidence indicating longer duration may be appropriate in TE and/or ADM reconstructive procedures
- Surgeons may be reluctant to limit post-op abx ppx
  - Not only in plastics!
  - Establish relationship to begin antimicrobial stewardship discussion

Acknowledgements

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References