Wound Closure after mastectomy for advanced breast cancer and implication for adjuvant treatment.

Nicolette Landman
Developments in management have increased the complexity of planning wound closure after mastectomy for advanced breast cancer.
Advanced Breast carcinoma

- T3,4 or N2
  - Mastectomy, ANC, Chemo, RT =/- hormone
  - Consider neoadjuvant for larger tumor to assist with mastectomy
Neoadjuvant chemotherapy

- Myelosuppressive effect
  - WBC nadir 10-14 d post chemo
  - Recovery by D 21
- Delay wound healing
  - N if WBC > 3000/mm3
- Increase susceptibility to infection
Mastectomy with simple closure
Neoadjuvant chemotherapy

- K Azzawi et al: Neoadjuvant therapy’s effect on outcomes of IBR (171 cases)
  - Median interval between cessation of chemo and surgery 37d (aim between 4 – 6 wks)
  - Major complications comparable
  - Minor complications: NA 10%, control 6%
  - Delay to RT comparable 10%

- Forouhi et al: no increase in surgery complications (79 cases)

- Deutch et al: immediate TRAM flap safe after NA, but smoking + NA increased complications and delay to adjuvant chemotherapy
Advanced breast Ca

- Post mastectomy
  - Simple closure
  - Chest wall reconstruction
  - SSM + Immediate breast reconstruction
Complex mastectomy defect

- Evaluate:
  - Defect type
  - Pleural cavity status
  - Osseous support requirements
  - Soft tissue available

- Reconstructive options:
  - Latissimus dorsi flap +/- Gore-Tex mesh
  - Thoracoepigastric flap
  - Rectus abdominis flap with vertical / transverse skin island
  - Omental flap
Figure 4 - The omentum flap on the thoracic wall.
Immediate Breast reconstruction

- **Advantages**
  - ↓ cost
  - Psychosocial benefits, body image, quality of life, Not given up hope
  - Normal breast landmarks preserved, technical ease → Improved cosmesis

- **Disadvantages**
  - Prolong operative time
  - Necrosis of mastectomy flaps
  - Higher complication rate
  - Large tumor size, direct skin involvement, ≥4 nodes + = Postop RT – adversely affect recon

- **Relative contraindications**
  - Advanced disease Stage 3, 4
  - Post op RT needed
  - Medical comorbidities eg. Active smoking, obesity, cardiopulmonary disease

CONTROVERSIAL for Advanced Disease
IBR for Advanced Breast Ca

- Post op RT: Delayed reconstruction at our unit
- Dilemma: Need for RT only known after final pathology
- ?Delayed- immediate reconstruction
- IBR irrespective
Indications RT

- BCS
- Postmastectomy
  - T3-4 N0 M0
  - T1-2 N0 with pec fascia or muscle involvement, excision margins close or +
  - ≥ 4 nodes +
  - 1-3 nodes +: treat if score ≥ 3
    - ER - = 1
    - LV + = 1
    - Age ≤ 40 = 1
    - Nodes 1-3 = 1
Kronowitz et al

STAGE 1
Skin-Sparing Mastectomy
+ Subpectoral Tissue Expander
Intraoperative saline filling to manufacturer’s suggested fill volume

Assessment of permanent sections

Postoperative radiation consultation

No post mastectomy radiation therapy

STAGE 2
Definitive Breast Reconstruction

TRAM/DIEP/GAP, LD and implant, Permanent implant

Post mastectomy radiation therapy

Deflate tissue expander

Reinflate expander after post mastectomy radiation therapy

Skin-Preserving Delayed Reconstruction

TRAM/DIEP/GAP, LD and implant
Mastectomy skin flap necrosis

- Wide skin excision → skin preserving mastectomy
  - ↑cosmesis
  - ↑risk compromised perfusion to skin
- Incidence: 1.5 – 15.8%
- Flap thickness
- Risk factors:
  - ↑BMI
  - Tobacco 7.8% vs 1-2%
  - Prior breast RT
  - Pressure
Evaluation:
- Clinically: tissue quality, flap thickness, dermal edge bleeding
- Fluorescein-dye
- Indocyanine dye
- Diffusion imaging spectroscopy/near-infrared spectroscopy

? Perfusion
- Debride skin
- Flap banking 100% survival  Kovach et al
Crisera et al. 170 Advanced breast Ca pts immediate free TRAM reconstruction

- Comparable complication rates to mastectomy alone.
- Delay to chemotherapy (4.7% pts) similar / less than mastectomy alone.
- No delay in diagnosis of recurrence.
- Cosmetic outcome post RT: minimal distortion/shrinkage.
Godfrey et al. immediate autologous tissue reconstruction (21)
- No major flap complications
- No delay in adjuvant therapy
- 3 recurrences
- 5 pts metastatic disease

Styblo et al. immediate TRAM recon (21)
- No delay in adjuvant therapy
- No increased risk of local recurrence
- Sultan et al. (22) TRAM
  - No flap loss
  - 14% Early perioperative morbidity
  - No delay in chemotherapy
  - 1 local recurrence, 2 metastatic at 28 months

- Zimmerman et al. (21 pts) IBR free TRAM
  - Good cosmesis post RT 90% pts
  - 29% local / metastatic disease

47% of implant recons required implant removal.

IBR 35 d to chemo vs. 21 d mastectomy alone

? Oncologically insignificant similar rates of local or distant metastasis.
<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Reconstruction type</th>
<th>Time from surgery to CT (Mean/median days)</th>
<th>Chemotherapy delays</th>
<th>Morbidity during chemotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bailey et al.</td>
<td>28</td>
<td>Tissue expanders or implant Expansion avoided during CT</td>
<td>NS</td>
<td>No delays</td>
<td>NS</td>
</tr>
<tr>
<td>Johnson et al.</td>
<td>34</td>
<td>Silicon prosthesis</td>
<td>NS</td>
<td>No delays in initiation</td>
<td>NS</td>
</tr>
<tr>
<td>Hoffman et al.</td>
<td>17</td>
<td>Implant or tissue expander Expansion avoided during nadir</td>
<td>42</td>
<td>1/17 (6%) delayed initiation</td>
<td>NS</td>
</tr>
<tr>
<td>Schusterman et al.</td>
<td>28</td>
<td>TRAM</td>
<td>NS</td>
<td>7/28 (25%) delayed for wound complications</td>
<td>NS</td>
</tr>
<tr>
<td>Elliot et al.</td>
<td>36</td>
<td>TRAM</td>
<td>NS</td>
<td>1/36 (3%) delayed initiation</td>
<td>NS</td>
</tr>
<tr>
<td>Furey et al.</td>
<td>36</td>
<td>Tissue expander or silicon implant</td>
<td>36</td>
<td>No delay in initiation</td>
<td>10/36 (28%) wound complications</td>
</tr>
<tr>
<td>Yule et al.</td>
<td>23</td>
<td>Tissue expander and subsequent implant Expansion avoided during CT</td>
<td>14–28</td>
<td>Month long delays in 2/23 patients</td>
<td>No increase in surgical complications in chemotherapy group</td>
</tr>
<tr>
<td>Yeh et al.</td>
<td>15</td>
<td>TRAM, LD flap, implant or tissue expander</td>
<td>35</td>
<td>1/15 (7%) delayed</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Age 1</td>
<td>Age 2</td>
<td>Procedure</td>
<td>Control 1</td>
<td>Control 2</td>
</tr>
<tr>
<td>------------------------</td>
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<tr>
<td>Newman et al.(^\text{52})</td>
<td>50</td>
<td>72</td>
<td>TRAM, LD flap, implant</td>
<td>IBR/CT-35</td>
<td>Control-21</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Locally advanced cancers</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>25% preoperative chemotherapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contant et al.(^\text{36})</td>
<td>27</td>
<td>None</td>
<td>Silicon prosthesis</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Caffo et al.(^\text{43})</td>
<td>52</td>
<td>63</td>
<td>Skin expander</td>
<td>IBR/CT-44</td>
<td>Control-45</td>
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<td></td>
<td></td>
<td></td>
<td>Expansion continued during</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>chemotherapy</td>
<td></td>
<td></td>
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<tr>
<td>Allweis et al.(^\text{41})</td>
<td>49</td>
<td>308</td>
<td>TRAM, LD flap, implant or LD and implant</td>
<td>IBR/CT-41</td>
<td>Control-53</td>
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<tr>
<td>Taylor and Kumar(^\text{42})</td>
<td>44</td>
<td>49</td>
<td>TRAM, LD flap, implant</td>
<td>IBR/CT-38</td>
<td>Control-38</td>
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<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>comparable with controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phipp et al.(^\text{53})</td>
<td>50</td>
<td>None</td>
<td>TRAM, LD flap, DIEP(^\text{*}) tissue expander, implant</td>
<td>NS</td>
<td>IBR/CT-40.6</td>
</tr>
<tr>
<td>Aft et al.(^\text{43})</td>
<td>98</td>
<td>113</td>
<td>NS</td>
<td>IBR/CT-40.6</td>
<td>NS</td>
</tr>
</tbody>
</table>

\(^\text{*}\)Deep inferior epigastric perforator flap, CT-chemotherapy
<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Follow-up Mean/median (months)</th>
<th>Local recurrence</th>
<th>Distant recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noone et al. (^3)</td>
<td>185</td>
<td>26</td>
<td>10/185 (5%)</td>
<td>4/185 (2%)</td>
</tr>
<tr>
<td>Johnson et al. (^4)</td>
<td>118</td>
<td>28</td>
<td>7/118 (6%)</td>
<td>11/118 (9%)</td>
</tr>
<tr>
<td>Kuske et al. (^5)</td>
<td>66</td>
<td>48</td>
<td>5/66 (7%)</td>
<td>26/66 (39%)</td>
</tr>
<tr>
<td>Noone et al. (^6)</td>
<td>306</td>
<td>77</td>
<td>16/306 (5%)</td>
<td>33/306 (11%)</td>
</tr>
<tr>
<td>Slavin et al. (^7)</td>
<td>161</td>
<td>65</td>
<td>17/116 (15%)</td>
<td>NS (not specified)</td>
</tr>
<tr>
<td>Carlson et al. (^8*)</td>
<td>187</td>
<td>37.5</td>
<td>9/187 (4.8%)</td>
<td>NS</td>
</tr>
<tr>
<td>Kroll et al. (^9*)</td>
<td>104</td>
<td>67</td>
<td>7/104 (7%)</td>
<td>13/104 (9%) died</td>
</tr>
<tr>
<td>Sandelin et al. (^10)</td>
<td>100</td>
<td>36</td>
<td>8/100 (8%)</td>
<td>from disseminated disease</td>
</tr>
<tr>
<td>Petit et al. (^11)</td>
<td>146</td>
<td>156</td>
<td>13/146 (9%)</td>
<td>22/146 (15%)</td>
</tr>
<tr>
<td>Hidalgo et al. (^12*)</td>
<td>28</td>
<td>27</td>
<td>0/28</td>
<td>2/28 (7%)</td>
</tr>
<tr>
<td>Ringberg et al. (^13)</td>
<td>79</td>
<td>43</td>
<td>4/79 (5%)</td>
<td>4/79 (5%)</td>
</tr>
<tr>
<td>Kroll et al. (^14*)</td>
<td>154</td>
<td>72 or more</td>
<td>11/154 (7%)</td>
<td>16/154 (10%)</td>
</tr>
<tr>
<td>Toth et al. (^15*)</td>
<td>50</td>
<td>57</td>
<td>0/50</td>
<td>5/50 (10%)</td>
</tr>
<tr>
<td>Rivadeneira et al. (^16)</td>
<td>198</td>
<td>49</td>
<td>9/198 (5%)</td>
<td>NS</td>
</tr>
<tr>
<td>Vandeweyer et al. (^17)</td>
<td>49</td>
<td>72</td>
<td>2/49 (4%)</td>
<td>7/49 (14%)</td>
</tr>
<tr>
<td>Foster et al. (^18)</td>
<td>25</td>
<td>49.2</td>
<td>1/25 (4%)</td>
<td>4/25 (16%)</td>
</tr>
<tr>
<td>Medina-Franco et al. (^19*)</td>
<td>173</td>
<td>73</td>
<td>7/173 (4%)</td>
<td>31/173 (18%)</td>
</tr>
<tr>
<td>Foster et al. (^20*)</td>
<td>25</td>
<td>49.2</td>
<td>1/25 (4%)</td>
<td>4/25 (16%)</td>
</tr>
<tr>
<td>Brown et al. (^21*)</td>
<td>151</td>
<td>48</td>
<td>3/151 (2%)</td>
<td>9/151 (6%)</td>
</tr>
</tbody>
</table>

\(^*\) Majority of patients had skin-sparing mastectomy.
Reconstruction effect on RT

- Sloping contour – imprecise geometric match of medial and lateral irradiation fields
- Underdosing of chest wall, centrally under breast mound & internal mammary nodes
- Increased irradiation to normal tissues
RT effect on reconstruction

- **Implants**
  - ↑ capsular contractures
  - Spear et al 47.5% irradiated breasts with saline implants needed conversion to flap reconstruction

- **Autologous reconstruction**
  - Early complications not significantly more likely
  - ↑ late complications in immediate recon (fat necrosis, volume loss, flap contracture)

- **Delayed recon post RT**
  - Autogenous tissue preferred
Table 4  Radiotherapy immediately after mastectomy and IBR with implant or expander.

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Follow-up Mean/median (months)</th>
<th>Cosmesis (% good/excellent)</th>
<th>Capsular contraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chu et al.</td>
<td>5</td>
<td>30</td>
<td>3/5 (60%)</td>
<td>2/5 (40%)</td>
</tr>
<tr>
<td>Von Smitten and Sundell</td>
<td>15</td>
<td>30</td>
<td>1/15 (7%)</td>
<td>NS</td>
</tr>
<tr>
<td>Rosato and Dowden</td>
<td>15</td>
<td>34</td>
<td>NS</td>
<td>11/15 (73%)</td>
</tr>
<tr>
<td>Evans et al.</td>
<td>9</td>
<td>38</td>
<td>NS</td>
<td>3/9 (33%)</td>
</tr>
<tr>
<td>Ramon et al.</td>
<td>11</td>
<td>34</td>
<td>Radiotherapy associated with lower surgeon cosmesis score</td>
<td>6/11 (55%) Baker III or IV</td>
</tr>
<tr>
<td>Spear and Majidian</td>
<td>18</td>
<td>19</td>
<td>NS</td>
<td>4/18 (2.2%)</td>
</tr>
<tr>
<td>Victor et al.</td>
<td>13</td>
<td>32</td>
<td>7/13 (54%)</td>
<td>4/13 (31%)</td>
</tr>
<tr>
<td>Ringberg et al.</td>
<td>9</td>
<td>43</td>
<td>NS</td>
<td>6/9 (67%)</td>
</tr>
<tr>
<td>Contant et al.</td>
<td>13</td>
<td>30</td>
<td>NS</td>
<td>5/13 (38%)</td>
</tr>
<tr>
<td>Spear and Onyevu</td>
<td>24</td>
<td>28</td>
<td>Mean cosmesis score 2.99 Scale 1–4</td>
<td>13/40 (33%)*</td>
</tr>
<tr>
<td>Krueger et al.</td>
<td>9</td>
<td>31</td>
<td>50% patient satisfaction*</td>
<td>5/19 (26%)*</td>
</tr>
<tr>
<td>Tallet et al.</td>
<td>47</td>
<td>25</td>
<td>54%*</td>
<td>8/47 (17%)</td>
</tr>
</tbody>
</table>

*Result combined with patients receiving preoperative radiotherapy.
<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Reconstruction type</th>
<th>Follow-up Mean/median (months)</th>
<th>Cosmesis (% good/excellent)</th>
<th>Flap tissue loss/necrosis (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hartrampf and Bennett^24</td>
<td>52</td>
<td>TRAM</td>
<td>Approx 36</td>
<td>NS</td>
<td>6/52 (12%) flap tissue loss</td>
</tr>
<tr>
<td>Salmon et al.^75</td>
<td>40</td>
<td>Lat dorsi</td>
<td>NS</td>
<td>NS</td>
<td>2/40 (5%) minor skin necrosis</td>
</tr>
<tr>
<td>Jacobsen et al.^76</td>
<td>47</td>
<td>TRAM (18% also had implant)</td>
<td>29</td>
<td>NS</td>
<td>4/47 (8%) fat necrosis</td>
</tr>
<tr>
<td>Kroll et al.^77</td>
<td>82</td>
<td>Lat dorsi or TRAM</td>
<td>24</td>
<td>64%</td>
<td>3/47 (6%) flap tissue loss</td>
</tr>
<tr>
<td>Kroll et al.^78</td>
<td>65</td>
<td>TRAM</td>
<td>NS</td>
<td>Mean cosmesis score 2.70</td>
<td>28/82 (34%) flap tissue loss</td>
</tr>
<tr>
<td>Williams et al.^79</td>
<td>108</td>
<td>TRAM</td>
<td>28</td>
<td>NS</td>
<td>19/108 (17.6%) fat necrosis</td>
</tr>
<tr>
<td>Tran et al.^31</td>
<td>70</td>
<td>TRAM</td>
<td>60</td>
<td>NS</td>
<td>3/108 (2.8%) full thickness skin loss</td>
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<td></td>
<td></td>
<td></td>
<td>5/70 (7%) partial flap loss</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>6/70 (9%) fat necrosis</td>
</tr>
</tbody>
</table>
Table 6  Effect of implant insertion as a component of breast reconstruction in previously irradiated tissue.

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Reconstruction type</th>
<th>Follow-up Mean/median (months)</th>
<th>Cosmesis (% good excellent)</th>
<th>Capsular contraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dickson and Sharpe\textsuperscript{71}</td>
<td>10</td>
<td>implant</td>
<td>NS</td>
<td>NS</td>
<td>3/10 (33%)</td>
</tr>
<tr>
<td>Olenius and Jurell\textsuperscript{72}</td>
<td>11</td>
<td>implant</td>
<td>32</td>
<td>5/11 (45%) acceptable cosmesis</td>
<td>NS</td>
</tr>
<tr>
<td>Evans et al.\textsuperscript{59}</td>
<td>7</td>
<td>implant</td>
<td>42</td>
<td>NS</td>
<td>11/30 (37%)</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>implant+lat dorsi</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>4</td>
<td>implant+TRAM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kraemer et al.\textsuperscript{73}</td>
<td>35</td>
<td>implant</td>
<td>46</td>
<td>11/35 (31%)</td>
<td>15/35 (43%)</td>
</tr>
<tr>
<td>Contant et al.\textsuperscript{16}</td>
<td>15</td>
<td>implant</td>
<td>30</td>
<td>NS</td>
<td>9/15 (60%)</td>
</tr>
<tr>
<td>Spear and Onyewu\textsuperscript{63}</td>
<td>16</td>
<td>implant</td>
<td>28</td>
<td>Mean cosmesis score 2.9 (Scale 1-4)</td>
<td>13/40 (33%)*</td>
</tr>
<tr>
<td>Krueger et al.\textsuperscript{64}</td>
<td>10</td>
<td>implant</td>
<td>31</td>
<td>50% patient satisfaction*</td>
<td>5/19 (26%)*</td>
</tr>
</tbody>
</table>

*Result includes patients having radiotherapy post-reconstruction.
Conclusion

- Conflicting reports on oncological safety and good cosmetic outcome for immediate breast reconstruction
- Timing of surgery
- Known post-op RT – Delay reconstruction
- Patient selection
  - Non smokers
  - N BMI
Thank you
References


Tamoxifen

- Estrogen agonist-antagonist
- In molar excess it acts like a competitive antagonist of estrogen activity in the breast but not in other estrogen-sensitive tissues, hence the side-effects.
  - Hot flushes
  - ↑ Endometrial Ca
  - Tromboembolism
Implant –based techniques

- **Indications**
  - Skin envelope adequate
  - Smaller, minimally ptotic breasts
  - Contralateral breast surgery planned for symmetry
  - Distant donor site/ surgical risk unacceptable

- **Contraindications**
  - Planned postop RT
  - Implant unacceptable
  - Large ptotic breast to match (relative)
  - Unstable circulation in skin envelope (relative)
  - Current smoker (relative)
Implant –based techniques

- **Advantages**
  - Surgical simplicity
  - Cosmetically similar adjacent tissue cover implant
  - No donor site morbidity
  - ↓ operative time
  - Rapid postop recovery (7-10 d)

- **Disadvantages**
  - Frequent clinic visits
  - 2\textsuperscript{nd} Surgery
  - Better cosmesis and pt satisfaction with autogenous techniques

- **Complications**
  - Infection
  - Capsular contracture
  - Deflation
Mastectomy flap necrosis

- Hultman et al. Factors associated with flap complications
- ↑BMI
- Previous breast/ mediastinal irradiation
- DM
- Need for reoperation
- Not significant
Implant Breast Reconstruction
Latissimus dorsi flap reconstruction
Latissimus dorsi musculocutaneous flap

- **Indications**
  - Inadequate skin envelope, other flaps unavailable
  - Skin-sparing mastectomy: Skin island for NAC, or muscle coverage
  - Autogenous recon: other donor sites unavailable
  - Recon of quadrantectomy segmental defect from BCS
  - Recon of Poland syndrome with breast agenesis
Latissimus dorsi musculocutaneous flap

- Contraindications
  - Prior lateral thoracotomy, lats divided
  - Prior division thoracodorsal a, vv (relative if branches via serratus ant muscle to lats intact)
  - Planned RT post recon (relative)
  - Prior RT to ipsilateral post sup trunk (relative)
  - Competitive athlete using lats (relative)
  - Current smoker (relative)
Latissimus dorsi musculocutaneous flap

- **Advantages**
  - Reliable, suitable to marginal candidates for more complicated flap techniques

- **Disadvantages**
  - Donor site scarring
  - Implant and/or expander needed

- **Complications**
  - Seroma donor site
  - Hematoma
  - Infection
  - Fat necrosis
  - Partial or total flap loss (Low)
TNM Classification

- **T**
  - Tis Carcinoma in situ
  - T1 ≤ 2cm
  - T2 > 2 cm ≤ 5cm
  - T3 > 5 cm
  - T4 any size extension to chest wall (T4a), or skin (T4b), or both (T4c). Inflammatory carcinoma (T4d)

- **N**
  - N0 No regional nodes
  - N1 1-3 axillary nodes + and/or int. mammary + by biopsy
  - N2 4-9 axillary nodes + or int. mammary clinically +
  - N3 ≥ 10 axillary nodes + or axillary and int. mammary metastasis

- **M**
  - M0 no distant metastasis
  - M1 distant metastasis
St Gallen

- **Low risk**
  - N- and all of:
    - pT \( \leq 2\text{cm} \)
    - Grade 1
    - Absence extensive peritumoral vascular invasion
    - ER and/or PgR +
    - Her2/ Neu gene –
    - Age\( \geq 35\text{ yrs} \)

- **Intermediate risk**
  - Node – and at least one of:
    - pT > 2cm
    - Grade 2-3
    - Presence extensive peritumoral vascular invasion
    - ER and PgR –
    - Her2/ neu +
    - Age < 35 yrs
  - Node + (1-3) and
    - ER/ PgR + and
    - Her2/neu -

- **High risk**
  - Node + (1-3) and
    - ER and PgR -
    - HER2/neu +
  - Node + (4 or more)
<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Standard mammogram</th>
<th>Compression/displacement</th>
<th>Number with abnormal mammogram</th>
<th>Number with abnormal radiology (including ultrasound)</th>
<th>Node positive at presentation (%)</th>
<th>Mean tumour size (cms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leibman and Kruse\textsuperscript{26}</td>
<td>11</td>
<td>9/11</td>
<td>2/11</td>
<td>9/11 (82%)</td>
<td>10/11 (91%)</td>
<td>4/11 (36%)</td>
<td>NS</td>
</tr>
<tr>
<td>Silverstein et al. \textsuperscript{29}</td>
<td>42</td>
<td>35/42</td>
<td>7/42</td>
<td>27/42 (64%)</td>
<td>NS</td>
<td>19/38 (50%)</td>
<td>2.3</td>
</tr>
<tr>
<td>Carlson et al. \textsuperscript{30}</td>
<td>35</td>
<td>31/35</td>
<td>0/35</td>
<td>17/31 (55%)</td>
<td>19/31 (61%)</td>
<td>16/35 (46%)</td>
<td>NS</td>
</tr>
<tr>
<td>Clarke et al. \textsuperscript{31}</td>
<td>33</td>
<td>29/33</td>
<td></td>
<td>19/29 (66%)</td>
<td>23/33 (70%)</td>
<td>6/31 (19%)</td>
<td>1.5</td>
</tr>
<tr>
<td>Cahan et al.\textsuperscript{28}</td>
<td>22</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>7/22 (32%)</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Table 5  Effect of radiotherapy following conservative surgery for carcinoma in previously augmented breast.

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient number</th>
<th>Follow-up Mean/median (months)</th>
<th>Cosmesis (% good/excellent)</th>
<th>Capsular contracture (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ryu et al.</td>
<td>3</td>
<td>30</td>
<td>1/3 (33%)</td>
<td>1/3 (33%)</td>
</tr>
<tr>
<td>Chu et al.</td>
<td>7</td>
<td>44</td>
<td>6/7 (86%)</td>
<td>NS</td>
</tr>
<tr>
<td>Guenther et al.</td>
<td>20</td>
<td>46</td>
<td>17/20 (85%)</td>
<td>NS</td>
</tr>
<tr>
<td>Handel et al.</td>
<td>NS</td>
<td>36</td>
<td>NS</td>
<td>17/26 (65%)</td>
</tr>
<tr>
<td>Mark et al.</td>
<td>21</td>
<td>22</td>
<td>9/21 (43%)</td>
<td>12/21 (57%)</td>
</tr>
<tr>
<td>Victor et al.</td>
<td>9</td>
<td>32</td>
<td>8/8 (100%)</td>
<td>0/8</td>
</tr>
<tr>
<td>Karanas et al.</td>
<td>19</td>
<td>38</td>
<td>18/19 (95%) &quot;not poor&quot;</td>
<td>3/19 (16%)</td>
</tr>
<tr>
<td>Study</td>
<td>Patient number</td>
<td>Follow-up Mean/median (months)</td>
<td>Reconstruction type</td>
<td>Cosmesis (% good/excellent)</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------</td>
<td>--------------------------------</td>
<td>---------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Williams et al.(^{80})</td>
<td>19</td>
<td>53.2</td>
<td>TRAM</td>
<td>NS</td>
</tr>
<tr>
<td>Zimmerman et al.(^{81})</td>
<td>21</td>
<td>19</td>
<td>TRAM</td>
<td>18/20 (90%)</td>
</tr>
<tr>
<td>Tran et al.(^{82})</td>
<td>41</td>
<td>36</td>
<td>TRAM</td>
<td>7/41 (17%) good symmetry</td>
</tr>
<tr>
<td>Rogers and Allen(^{83})</td>
<td>30</td>
<td>19.9</td>
<td>Deep inferior epigastric perforator flap</td>
<td>Assessed in 10 patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7/10—worse cosmesis after radiotherapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 8  Chest wall irradiation following autologous tissue breast reconstruction.