PRINCIPLES OF BREAST SURGERY 
AND ONCOPLASTIC SURGERY

Ines Buccimazza
Breast and Endocrine Unit
Department of Surgery
University of KwaZulu-Natal, Durban

ESMO PRECEPTORSHIP ON BREAST CANCER

Cape Town, South Africa, 13-14 February 2020
DISCLOSURE OF INTEREST

None
All truth passes through three phases.

First, it is ridiculed.

Second, it is violently opposed.

Third, it is accepted as being self-evident.

Arthur Schopenhauer
BEST OPTION FOR LOCAL TREATMENT OF BREAST CANCER?

Combination
- Mastectomy
- Reconstruction
- Radiotherapy

Unavoidable approach for some patients

Better options
- Equal/improved survival rates
- Superior quality of life
BREAST CANCER

Classification

Widespread screening → early detection: occult lesions including DCIS

Advances in systemic therapy and radiotherapy

- Improved local control rates
- Decreased distant recurrences
- Improved survival

Multigene arrays → tailored systemic therapy → feasible; improved QOL
Why not BCS if technically possible and oncologically sound?
• Paradigm shift from mastectomy to breast conserving surgery
• Principles of breast conserving surgery
• The contribution of oncoplastic surgery
Paradigm shift from mastectomy to breast conserving surgery
PARADIGM SHIFT

Milan 1 Trial and NSABP-06 Trial

Non-inferiority of BCS compared to mastectomy for stages I and II breast cancer
<table>
<thead>
<tr>
<th>Reference (study)</th>
<th>Period</th>
<th>Pts (n)</th>
<th>Follow-up (years)</th>
<th>Treatment Type</th>
<th>Age (years)</th>
<th>Local recurrence (%)</th>
<th>Overall survival by age</th>
<th>Subset analysis</th>
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<td>van Dongen et al., 2000&lt;sup&gt;3&lt;/sup&gt; (Komen 10801)</td>
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BREAST CONSERVING SURGERY

1990 – National Institutes of Health Consensus Conference statement

- Breast conservation equivalent to mastectomy for stages I and II breast cancer
- Breast conservation recommended for majority of women with stages I and II breast cancer

Breast conserving surgery (BCS) → Complete resection of tumour → Limited excision of surrounding breast tissue
Breast conserving therapy (BCT) - BCS + RT

- Western Europe: 60% - 80% newly diagnosed BC amenable to BCS
  Cardoso et al Annals of Oncology 2019
- France: 71% (13.9% level II OPS)
  Clough et al Ann Surg Oncol 2015

Figure 1. Early breast cancer treatment algorithm.
NEWER DATA

Observational studies
- BCT higher rate disease-specific survival than mastectomy

- Contemporary cohort - 132,149 patients
- EBC
- Median follow up 10 years

Agarwal S et al. JAMA Surg 2014; 149 (3)

<table>
<thead>
<tr>
<th>10 YEAR BREAST CANCER SPECIFIC SURVIVAL (p &lt; 0.001)</th>
<th>BREAST CONSERVING THERAPY (70%)</th>
<th>MASTECTOMY (27%)</th>
<th>MASTECTOMY + RADIOTHERAPY (3%)</th>
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<tr>
<td>94%</td>
<td>90%</td>
<td>83%</td>
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Improved survival with BCT
- Differences in adjuvant therapy regimens or tumor biology
Breast conserving therapy and mastectomy revisited: Breast cancer-specific survival and the influence of prognostic factors in 129,692 patients.


Abstract
This large population-based study compared breast-conserving surgery with radiation therapy (BCT) with mastectomy on (long-term) breast cancer-specific (BCSS) and overall survival (OS), and investigated the influence of several prognostic factors. Patients with primary T1-2N0-2M0 breast cancer, diagnosed between 1999 and 2012, were selected from the Netherlands Cancer Registry. We investigated the 1999-2005 (long-term outcome) and the 2006-2012 cohort (contemporary adjuvant systemic therapy). Cause of death was derived from the Statistics Netherlands (CBS). Multivariable analyses, per time cohort, were performed in T1-2N0-2, and separately in T1-2N0-1 and T1-2N2 stages. The T1-2N0-1 stages were further stratified for age, hormonal receptor and HER2 status, adjuvant systemic therapy and comorbidity. In total, 129,692 patients were included. In the 1999-2005 cohort, better BCSS and OS for BCT than mastectomy was seen in all subgroups, except in patients < 40 years with T1-2N0-1 stage. In the 2006-2012 cohort, superior BCSS and OS were found for T1-2N0-1, but not for T1-2N2. Subgroup analyses for T1-2N0-1 showed superior BCSS and OS for BCT in patients >50 years, not treated with chemotherapy and with comorbidity. Both treatments led to similar BCSS in patients <50 years, without comorbidity and those treated with chemotherapy. Although confounding by severity and residual confounding cannot be excluded, this study showed better long-term BCSS for BCT than mastectomy. Even with more contemporary diagnostics and therapies we identified several subgroups that may benefit from BCT. Our results support the hypothesis that BCT might be preferred in most breast cancer patients when both treatments are suitable.

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Paradigm shifts in BC management

- Obligatory mastectomy obsolete
- Primary systemic therapy
- Oncoplastic surgery

Survival improved

Shift of focus

- Fear of death → aesthetic concerns
- Psychological morbidity
GOAL OF BCS

Goal of BCS

- Oncological treatment
- Good cosmetic outcome

Challenging

- Excision with clear margins
- Preserve aesthetic appearance
- Single, definitive surgical procedure
Principles of breast conserving surgery
ADEQUATE MARGIN WIDTH?

- Modifiable risk factor for IBTR
- Definition controversial
  - No consensus
- Problem
  - Re-excision rate: 20% - 25%
    - Compromise cosmetic outcome
    - Associated with high rate of conversion to mastectomy
Table 1. Summary of Clinical Practice Guideline Recommendations

<table>
<thead>
<tr>
<th>Clinical Question</th>
<th>Recommendation</th>
<th>Level of Evidence</th>
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<tbody>
<tr>
<td>What is the absolute increase in risk of IBTR with a positive margin? Can the use of radiation boost, systemic therapy, or favorable tumor biology mitigate this increased risk?</td>
<td>Positive margins, defined as ink on invasive cancer or DCIS, are associated with a two-fold increase in IBTR; this increased risk in IBTR is not nullified by delivery of a boost, delivery of systemic therapy (endocrine therapy, chemotherapy, biologic therapy), or favorable biology</td>
<td>Meta-analysis and secondary data from prospective trials and retrospective studies</td>
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<td>Do margins widths wider than no ink on tumor cells reduce the risk of IBTR?</td>
<td>Negative margins (no ink on tumor) optimize IBTR; wider margin widths do not significantly lower this risk; the routine practice to obtain wider negative margin widths than ink on tumor is not indicated</td>
<td>Meta-analysis and retrospective studies</td>
</tr>
<tr>
<td>What are the effects of endocrine or biologically targeted therapy or systemic chemotherapy on IBTR? Should a patient who is not receiving any systemic treatment have</td>
<td>Rates of IBTR are reduced with the use of systemic therapy; in the uncommon circumstance of a patient not receiving adjuvant systemic therapy, there is no evidence suggesting that margins wider than no ink on tumor are</td>
<td>Multiple randomized trials and meta-analysis</td>
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</table>

"No ink on tumour is the standard for an adequate margin in invasive cancer in the era of multimodality therapy"
“Margins of at least 2mm for in situ disease are preferred”
1. MARGINS

INTRAOPERATIVE MARGIN ASSESSMENT

• Specimen radiograph/ US review
  • Confirm targeted lesion removed
  • Direct any margin re-excision/ cavity shave

• Cavity shave margins
  • ↓ Rate of positive margins (19% vs. 34%, p=0.01)
  • ↓ Rate second surgery for margin clearance (10% vs. 21%, p=0.02)
  • No significant difference in complications and cosmetic outcomes
    Chagpar AB et al N Engl J Med 2015; 373 (6)

• Intraoperative pathology assessment
  • Decrease re-excision: 3.6% vs. 13.2% national database (IDC and DCIS)
  • FS analysis all margins
    • Time-consuming: average 40 minutes
    • Dependent on resources; expertise: dedicated, highly trained pathologists
    Boughey JC et al Surgery 2014; 156 (1)
2: AESTHETICS

- Key requirements
  - Favourable tumour : breast ratio
  - Tumour location
  - Breast density
  - Degree of ptosis

- Poor judgement – adverse sequelae
  - Radiation- induced fibrosis
  - Poor cosmesis
  - Chronic pain
3: TECHNIQUE

Standard approach – conventional BCS

- Incision over tumour
- No skin taken; removal 20g – 30g tissue
- Lumpectomy cavity left open
- Post-operative seroma
- Preserve normal breast contour in short term
- Cavity consolidation with scar tissue
- Large cavity retraction → breast deformity
- Magnified by post-op. RT

Silverstein MJ. J Am Coll Surg 2016; 222 (1)

Problems

- Poor cosmesis

Wilke LG et al. JAMA Surg 2014; 149
4: LIMITS OF CONVENTIONAL BCS

Free margins not possible
  • Oncologic reasons
    • Tumour size
    • Multicentricity
  • Anatomic reasons
    • Breast size
    • Tumour location

Large resection → post-operative deformity
  • Lower pole
  • Upper inner quadrant
ALTERNATIVE STRATEGIES

Large tumours/ large resections anticipated

- **Pre-operative CT**
  
  - Advantages
    - Prognostic factor
    - Downsize for BCS → 20% - 65% cases
  
  - Limitations
    - Unsuitable: large DCIS, multifocal cancers
    - No response

- **OPS**
The art of oncoplastic surgery
PIONEERS OF ONCOPLASTIC SURGERY
ONCOPLASTIC SURGERY (OPS)

- **Definition**
  - Oncological principles + best principles PRS techniques =
    - \( \uparrow \) cosmetic outcome
    - \( \downarrow \) complications

- **Goals**

- **Techniques**
  - Volume displacement
    - Re-coning (OPS I)
    - Reduction mammoplasty (OPS II)
  - Volume replacement
    - Fasciocutaneous flaps
    - Myocutaneous flaps
    - Mastectomy and immediate reconstruction
ONCOPLASTIC BREAST SURGERY

Concept at variance with general surgical training – not “oncological”

• Open additional surgical planes
• Move/ rearrange tissue during cancer surgery

Goal of “oncologic” surgeon

• Resect cancer with clear margins
• Not preserve breast shape/ function
• Not worry about cosmetic outcomes
• Primary surgery

Mind-switch and training
Two level guide

Atlas

- Aids surgical planning
- Select most appropriate procedure
OPS SELECTION CRITERIA

- **Excision volume**
  - ≥ 20% breast volume → risk deformity
    - Visual assessment

- **Tumour location**
  - High risk zones
    - Lower pole ("bird’s beak" deformity)
    - Central quadrant
    - Upper inner quadrant

- **Breast density**
  - Composition: clinical and MMG
  - Undermining

- **Degree of ptosis**
COUNSELLING & CONSIDERATIONS

- Scars
  - Longer, multiple

- Contralateral surgery
  - Symmetrisation

- Markings
  - Pre-operative
  - Upright; sitting

- Exposure
  - Both breasts draped
OPS LEVEL 1

- No specific training
- Technique within the ambit of any general surgeon
- Six simple steps

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Result</th>
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<tr>
<td>Skin incision</td>
<td>Allows wide access for excision and reshaping</td>
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<tr>
<td>Skin undermining</td>
<td>Facilitates wide excision and glandular mobilization for reshaping</td>
</tr>
<tr>
<td>NAC undermining</td>
<td>Avoids displacement of nipple towards excision defect</td>
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<tr>
<td>Full-thickness excision</td>
<td>Prevents anterior and posterior margin involvement</td>
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<tr>
<td>Glandular reapproximation</td>
<td>Late-occurring deformity is avoided</td>
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<tr>
<td>Deepithelialization and NAC repositioning</td>
<td>Recenters NAC on new breast mound</td>
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OPS LEVEL I – SIX STEPS

- **Step 1: Skin incision**
  - Length
  - Location

- **Step 2: Skin undermining**
  - Extensive undermining prior to excision
  - Follows mastectomy plane
  - Caution

- **Step 3: NAC undermining**
  - Avoids deviation
  - Retain 0.5 – 1.0 cm tissue

Clough et al Annals of Surgical Oncology 2010
**OPS LEVEL I – SIX STEPS**

- **Step 4: Glandular excision**
  - Full-thickness; fusiform towards NAC
  - Orientation
  - Metal clips
  - Weight resection specimen: 10 – 50g
  - Specimen radiography

- **Step 5: Re-approximation**
  - Cavity closed; layers
  - Glandular flaps

- **Step 6: NAC re-positioning**
  - NAC undermining
  - Peri-areola skin de-epithelialized

Clough et al. *Annals of Surgical Oncology* 2010
OPS LEVEL I - POST-SURGERY
OPS LEVEL I - POST-RADIOThERAPY
OPS LEVEL II - SELECTION

**Indications**
- Medium to large breasts
- Volume excisions 20% - 50%
- Challenging locations
- Significant ptosis

**Considerations**
- Patient wish
- Safety

**Requirements**
- Advanced training
- Dual-team approach
Essential steps

- **Therapeutic volume reduction**
  - 20% - 50% volume
  - Mean weight >200g

- **Volume displacement**
  - Dermoglandular flaps
  - Round block techniques

- **Contralateral symmetrization**
Inverted T-mammoplasty for all quadrants

- Superior and inferior pedicle techniques
- Major limitations

No vertical scar mammoplasty

- More versatile
- Extended pedicle options

Atlas
Improving Breast Cancer Surgery: A Classification and Quadrant per Quadrant Atlas for Oncoplastic Surgery
### OPS LEVEL II: ATLAS

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<td>5–7 o’clock</td>
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<td>7–8 o’clock</td>
<td>Superior pedicle mammoplasty/V scar</td>
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<td>Lower inner quadrant</td>
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<td>9–11 o’clock</td>
<td>Batwing / Rotation flap</td>
</tr>
<tr>
<td>Upper inner quadrant</td>
<td></td>
</tr>
<tr>
<td>12 o’clock</td>
<td>Inferior pedicle mammoplasty or round block mammoplasty</td>
</tr>
<tr>
<td>Upper pole</td>
<td></td>
</tr>
<tr>
<td>1–2 o’clock</td>
<td>Racquet mammoplasty/radial scar</td>
</tr>
<tr>
<td>Upper outer quadrant</td>
<td></td>
</tr>
<tr>
<td>4–5 o’clock</td>
<td>Superior pedicle mammoplasty/J scar</td>
</tr>
<tr>
<td>Lower outer quadrant</td>
<td></td>
</tr>
<tr>
<td>Central subareolar</td>
<td>Inverted T or vertical-scar mammoplasty with NAC resection</td>
</tr>
</tbody>
</table>
CENTRAL LOCATION

Local techniques

Big, ptotic breasts

- No vertical scar mammoplasty
- NAC reconstruction
Local techniques
Small, ptotic breasts

- Round block mastopexy: skin pattern modification
- NAC reconstruction
BCS – lateral defect replaced by autologous extra-mammary tissue

- Fasciocutaneous flaps
  - Based on local perforators (lateral ICAP)

- Myocutaneous flaps
  - Mini-LD flap

Main benefits

- Restore initial shape and volume; minimal scarring
- No contralateral procedure
OPS LEVEL II - VOLUME REPLACEMENT

BCS – central defect replaced by autologous extra-mammary tissue

- Fasciocutaneous flaps
  - Based on local perforators (lateral ICAP)
CONTRA-INDICATIONS TO BCS - EBC

- Multicentric disease, including extensive DCIS
- Unfavourable tumour: breast ratio
- Radiotherapy contraindications
  - Prior radiotherapy
  - Pregnancy
- Patient choice
Mastectomy

- Breast reconstruction available
- Immediate breast reconstruction

Options

- Autologous
- Implant-based
- Combination

Optimal reconstruction method: individualized
## OPS VS CONVENTIONAL BCS

### 1° ENDPOINTS

- **Local recurrence**
  - 5-year: 3% - 7%
  - 10-year: 4.5% - 19.7% with conventional BCS

- **Overall survival**
  - Similar to conventional BCS
  - 5 years OS: 86% - 95.7%

### 2° ENDPOINTS

- **Positive margins:** 5% - 18%
  - Conventional BCS 20% - 40%

- **Re-excision:** <10%
  - Conventional BCS 20% - 25%

- **Complications:** 7% - 25%
  - Minimal impact adjuvant therapies

- **Patient satisfaction:** >90%

Clough et al Ann Surg Oncol 2015
UNANSWERED QUESTIONS

1. BCS in multicentric disease

Extreme oncoplasty

“Evolutionary leap” in progression of, or “revolutionary concept” in breast conservation

…work in progress
Effectiveness of Breast-Conserving Surgery and 3-Dimensional Conformal Partial Breast Reirradiation for Recurrence of Breast Cancer in the Ipsilateral Breast
The NRG Oncology/RTOG 1014 Phase 2 Clinical Trial


CONCLUSIONS AND RELEVANCE For patients experiencing recurrence of breast cancer in the ipsilateral breast after lumpectomy and whole breast irradiation, a second breast conservation was achievable in 90%, with a low risk of re-recurrence of cancer in the ipsilateral breast using adjuvant partial breast reirradiation. This finding suggests that this treatment approach is an effective alternative to mastectomy.
Treatment of LABC

- Multimodality treatment strongly indicated in almost all cases
  - Initial therapy should be systemic
    - Initial therapy depends on tumour and patient characteristics
      - **HR+ HER2- LABC**
        - Non-inflammatory
          - Endocrine therapy
            - Operable tumour
              - Non-inflammatory
                - **BCS if appropriate**
                  - RT (if not given previously)
              - Inflammatory
                - **Mastectomy**
      - **Triple-negative LABC**
        - Inflammatory
          - **ChT**
            - Further systemic treatment (if appropriate)
              - RT
                - Tumour remains inoperable
                  - Palliative care
      - **HER2+ LABC**
        - ChT + anti-HER2 therapy
          - Tumour remains inoperable
            - Adjuvant endocrine therapy/continuation of anti-HER2 (if appropriate)
PRINCIPLES

- Training and careful planning
- Incision placement
- Remove all breast tissue
- Avoid “dog-ears”
- Plicate/quilt flaps
- Contralateral breast
Axillary management from routine treatment to individualized staging

ALND – diminishing role
New gold standard

cN0

- SNB
  - SN -
    - No further axillary management
  - SN +
    - pN1mi
    - pN0(i+)
      (Macrometastases)
      - No further axillary management
      - IBCSG 23-01
      - ACOSOG Z0011: Observation
      - AMAROS: RT
      - ALND

- Primary chemotherapy

  cN1

  - SNB
    - SN -
      - NSABP B-51/RTOG 1304
        RNI vs. no RNI
    - SN +
      - ALND
  - cN0
    - ACOSOG Z1071
      SENTINA
      SNAC
    - Alliance A011202
      RNI + ALND vs. RNI
    - ≥ 3 SNs

- RNI vs. no RNI
- Dual tracer
- TAD

RNI = Regional Node Invade
ALND = Axillary Lymph Node Dissection
SNB = Single Node Biopsy
IBCSG 23-01
ACOSOG Z0011
AMAROS
RTOG 1304
NSABP B-51
Alliance A011202
SENTINA
SNAC
CONCLUSION

Paradigm shift in BC management
- All outcomes important

OPS and BCT
- Improved results
- Extended indications

Standard techniques available to all patients
- Procedures tailor-made
- Solution for every tumour quadrant
- General surgeons – team up with plastic surgeon