



## Original article

# A standard mastectomy should not be the only recommended breast surgical treatment for non-metastatic inflammatory breast cancer: A large population-based study in the Surveillance, Epidemiology, and End Results database 18



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## ABSTRACT

**Background:** Standard mastectomy has long been the recommended breast surgical treatment for non-metastatic inflammatory breast cancer (IBC). The objective of this population-based study was to evaluate the significance of various breast surgical treatments for this highly aggressive subtype.

**Methods:** The Surveillance, Epidemiology, and End Results program registry was searched to identify women with non-metastatic IBC receiving standard treatment including breast surgery, radiation therapy and chemotherapy diagnosed between 1998 and 2013. Comparisons of the proportions of various breast surgery procedures over the years were performed using Pearson's chi-square test. Breast cancer-specific survival (BCSS) and overall survival (OS) were estimated using the Kaplan-Meier product limit method and compared across groups using the log-rank statistic. Cox models were then fitted to compare the association between various breast surgical procedures and BCSS or OS after adjusting for patient and tumor characteristics.

**Results:** A total of 3374 cases were identified. Over the years, the proportion of contralateral prophylactic mastectomy (CPM), breast reconstruction and both were increasing. The proportion of implant-based reconstruction was also increasing with no difference in survival compared with other types of reconstruction. There was no statistically significant difference in BCSS or OS among various breast surgery treatments, such as breast conserving surgery, CPM, breast reconstruction and standard unilateral mastectomy.

**Conclusions:** Breast surgery is of great significance to the clinical outcome of IBC. Standard mastectomy should not be the only recommended breast surgical treatment.

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## 1. Introduction

Inflammatory breast cancer (IBC) is a rare and aggressive form of invasive breast cancer accounting for 1%–2% of all invasive breast cancers [1]. It is characterized by diffuse erythema and edema, which has a peau d'orange appearance that involves the majority of the breast, early dermal lymphatic and vascular invasion by tumor emboli, rapid tumor growth, and early development of distant metastases. IBC has traditionally been associated with a higher risk of early locoregional recurrence, distant metastases and a poorer

prognosis compared with non-inflammatory locally advanced breast cancer despite the similar multidisciplinary care given for both diseases [2,3].

IBC therapy has long been multimodal with neoadjuvant chemotherapy (NAC) subsequently followed by a modified radical mastectomy and adjuvant radiotherapy [4], so-called trimodality therapy, which was stated in a consensus panel in 2011 [5]. There has been a significant improvement in survival of patients diagnosed with IBC over the years due to advancements of systemic therapy [6]. In addition, recent publication revealed 5-year locoregional control rates of 83% in IBC patients completing trimodality therapy [7]. This improvement has led to questions regarding the surgical treatment of IBC. It may be not suitable to argue that modified radical mastectomy should be recommended

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to every IBC patient.

Given the controversial of breast surgery therapy for non-metastatic IBC, we conducted a retrospective study based on the Surveillance, Epidemiology, and End Results (SEER) 18 registry databases to investigate the significance of breast surgical treatment for non-metastatic IBC.

## 2. Materials and methods

### 2.1. Patient population

This retrospective study employed data derived from the National Cancer Institute's limited use SEER 18 registry databases that were released in November 2016. We identified patients with non-metastatic IBC receiving standard trimodality treatment including breast surgery, radiation therapy and chemotherapy as the study cohort, and patients in non-IBC AJCC stage IIIB and IIIC who received breast surgery, radiation therapy and chemotherapy as the control cohort. Search criteria were restricted to patients who were female and had histologically confirmed invasive carcinoma. Patients with more than one primary cancer, having metastatic disease at diagnosis or diagnosed at death or autopsy only were excluded. Based on surgery codes recorded in the SEER database after 1998, we selected cases diagnosed between 1 January 1998 and 31 December 2013. SEER 18 provided an adjusted AJCC 6th edition criteria for cases diagnosed between 1998 and 2003, a derived AJCC 6th edition criteria for cases between 2004 and 2009, and a derived AJCC 7th edition criteria for cases between 2010 and 2013. IBC was identified within SEER as T4d any N M0; non-IBC IIIB was defined as T4a-c N0-2 M0; non-IBC IIIC was defined as T1-4c N3 M0.

We obtained permission to access the files of SEER program custom data with additional treatment fields such as radiation therapy and chemotherapy. The informed consent was not required because personal identifying information was not involved. This study was reviewed and approved by the Institutional Review Board of Obstetrics and Gynecology Hospital of Fudan University.

### 2.2. Statistical analysis

Comparisons of the proportions of breast surgery procedures over the years were performed using Pearson's chi-square test. Follow-up cut-off was 31 December 2014. Overall survival (OS) was computed from the time of diagnosis of IBC to the time of death from any cause or last follow-up with patients still alive at last follow-up censored. Breast cancer-specific survival (BCSS) was computed from the time of diagnosis of IBC to the time of death from IBC with patients who died of other causes or still alive at last follow-up censored. Survival outcomes were estimated using the Kaplan-Meier product limit method and compared across groups using the log-rank statistic. Adjusted hazard ratios (HRs) with 95% confidence intervals were calculated using Cox proportional hazards model to assess the multivariable relationship of various patient and tumor characteristics and the survival outcomes. Two-sided  $P < 0.05$  was considered statistically significant. All the statistical analysis was performed using SPSS 19.0 software package (SPSS, Chicago, IL, USA).

## 3. Results

### 3.1. Patient and tumor characteristics

Between 1998 and 2013, 3374 women with non-metastatic IBC receiving breast surgery, radiation therapy and chemotherapy were identified. Median age of diagnosis was 53 years (range 22–90 years). The majority of the patients were of white race. 150 patients

had breast conserving surgery (BCS). 3224 patients had mastectomy, among which, 592 patients had contralateral prophylactic mastectomy (CPM), and 264 patients underwent breast reconstruction. 259 patients did not remove any regional lymph node, 1029 patients removed less than 10 lymph nodes or underwent lymph nodes biopsy, and 2034 patients removed at least 10 lymph nodes or underwent lymph nodes dissection. The patient and tumor characteristics of the cohort studied were summarized in Table 1.

### 3.2. Breast surgery treatments in non-metastasis IBC with standard treatment

12032 cases of non-IBC breast cancer patients with AJCC stage

**Table 1**  
Patient and tumor characteristics.

	Cases	Percentage (%)
<b>Year at diagnosis</b>		
1998–2001	752	22.3
2002–2005	989	29.3
2006–2009	871	25.8
2010–2013	762	22.6
<b>Age</b>		
≤55	1943	57.6
>55	1431	42.4
<b>Race</b>		
white	2723	80.7
black	434	12.9
Asian or American Indian	209	6.2
unknown	8	0.2
<b>Marital status</b>		
married	1921	56.9
unmarried	1355	40.2
unknown	98	2.9
<b>Laterality</b>		
left	1743	51.7
right	1626	48.2
unknown	5	0.1
<b>Grade</b>		
I: well differentiated	80	2.4
II: moderately differentiated	769	22.8
III: poorly differentiated	2018	59.8
IV: Undifferentiated	85	2.5
unknown	422	12.5
<b>AJCC stage</b>		
IIIB	2539	75.3
IIIC	757	22.4
III NOS	78	2.3
<b>N stage</b>		
N0	441	13.1
N1	1218	36.1
N2	880	26.1
N3	757	22.4
NX	78	2.3
<b>ER status</b>		
negative	1530	45.3
borderline	9	0.3
positive	1585	47.0
unknown	250	7.4
<b>PR status</b>		
negative	1846	54.7
borderline	18	0.5
positive	1231	36.5
unknown	279	8.3
<b>Lymph nodes removed</b>		
none	259	7.7
<10 or biopsy	1029	30.5
≥10 or dissection	2034	60.3
unknown	52	1.5
<b>Breast surgery</b>		
mastectomy	3224	95.6
BCS	150	4.4
CPM	592	17.5
reconstruction	264	7.8

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