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Trends in mastectomy performance for early breast cancer in a public institution with limited access: a retrospective cohort

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ABSTRACT

Objective: To assess trends in breast surgery, Breast-conserving surgery (BCS) and mastectomy, in an institution with limited access to health resources. **Methods:** A retrospective cohort study was carried out in patients who underwent surgery for non-metastatic breast cancer between 2012 and 2019 at the Hospital Geral de Fortaleza (HGF), an institution that exclusively treats patients from the Brazilian public health system (SUS). The main objective of the study was to evaluate the rates of mastectomy in the period, with or without immediate reconstruction, as well as BCS rates. The χ^2 test, with Bonferroni adjustment, was applied to the relative frequency of the procedures performed to test for statistical significance in the evolution of the frequencies of surgeries over the years. **Results:** A total of 805 patients underwent surgical treatment for non-metastatic breast cancer, with an average of 100 surgeries per year (range 85–118) during the study period. Mastectomy was performed in 552 cases (68.57%), while 253 patients underwent BCS (31.42%). Among the patients who underwent mastectomy, 181 (32.78%) had immediate reconstruction, with the highest proportion using implants (92.26%). No statistical difference was observed between mastectomies with or without reconstruction throughout the period (p=0.6635), with a statistically significant difference between BCS (p=0.04281) and mastectomies. **Conclusion:** There was no increase in the rates of mastectomies, with and without immediate reconstruction, over the years, but a trend towards an increase in BCS. Further studies are needed to better understand this trend in settings with limited access to health care.

KEYWORDS: breast neoplasms; mastectomy; mastectomy, subcutaneous; mastectomy, segmental; mammaplasty.

INTRODUCTION

Breast cancer is the most common malignant neoplasm in women, with an estimated 2 million cases annually worldwide[1,2]. In Brazil, the National Cancer Institute (INCA) estimates that there will be more than 73,000 cases of breast cancer in 2023[3]. The prognosis of the disease, on the other hand, has improved significantly in recent decades, with a significant impact on mortality. The advent of organized screening, significant improvements in cancer treatment, and a better understanding of biology are responsible for this impact[4,5].

Breast cancer surgery has evolved substantially over the years: there has been a gradual replacement of more radical techniques, such as the mastectomy proposed by Halsted, by less invasive approaches[6]. Breast-conserving surgery (BCS), associated with modern multimodal treatment, has similar local recurrence and overall survival rates compared to mastectomy[7,8]. However,

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despite the oncological safety of BCS, a trend towards increasing mastectomy rates, especially bilateral mastectomy, has been observed in developed countries in recent years. The advent of genetic knowledge, the possibility of immediate reconstruction and the false impression of greater safety have been related to the increase in mastectomy rates[9-14]. This trend, however, has not yet been adequately evaluated among patients with limited access to health care systems, where these technologies are not universally available.

The objective of this study was to characterize the trends in surgical procedures in non-metastatic breast cancer, especially mastectomies, with or without immediate breast reconstruction, compared to BCS, between 2012 and 2019, in a single Brazilian institution that provides exclusive treatment to patients of the Unified Health System (SUS).

METHODS

The main objective of this study was to analyze trends in mastectomy and BCS rates, between 2012 and 2019, in patients treated for non-metastatic breast cancer at the Hospital Geral de Fortaleza (HGF), a Brazilian public institution that provides care exclusively to patients covered by SUS. In Brazil, 80% of the population's medical care is provided by SUS. The study was initiated after approval by the institution's Research Ethics Committee (CAAE 29325720.7.0000.5040).

The records of surgical treatment of patients with breast cancer were evaluated, which included: BCS (with or without oncoplastic surgery), total mastectomy without immediate reconstruction, and mastectomy associated with immediate reconstruction, total or with preservation of the nipple-areola complex. The type of reconstruction performed, implants (permanent or temporary expanders) or myocutaneous flaps, and the specific date (year) of each procedure were also evaluated. The decision on each procedure was individually decided by the institution's breast surgeons, as well as the surgical technique used, including oncoplasty and the type of reconstruction. The institution's adjuvant and neoadjuvant treatments followed international guidelines. There was no genetic counseling or testing available during the study period. Patients with benign or indeterminate lesions, as well as other malignant breast lesions, such as melanoma or sarcoma, were excluded from the analysis, as were cases without adequate information on surgical treatment, clinical stage IV at the time of diagnosis or who did not undergo surgery.

Data were tabulated in a spreadsheet compatible with the SPSS-IBM version 20.0 application, used for data analysis. Data were expressed as absolute frequencies and percentages. The χ^2 test, with Bonferroni adjustment, was applied to the relative frequency of the procedures performed to determine the statistical significance in the evolution of frequencies by year. 95%CI with $p<0.05$ was used to determine the relationship of the variables with the trends in the rates measured during the study period under a log-linear model (Poisson regression).

RESULTS

After applying the study inclusion criteria, 805 patients undergoing surgical treatment for non-metastatic breast cancer were included for analysis. The average number of surgeries during this period was 100 procedures per year, ranging from 85 cases in 2012 to 118 in 2015 (Figure 1).

The most frequently performed surgical procedure was total mastectomy, in 552 cases (68.57%), while 253 patients underwent BCS (31.42%). In 2012, among the 85 surgeries performed, 44 (51.76%) cases were mastectomies without reconstruction, 19 (22.35%) mastectomies with reconstruction, and 22 (25.88%) BCS. On the other hand, in the last year of the analysis, in 2019, among 106 surgical procedures performed, 41 (38.68%) cases were BCS, 43 (40.57%) mastectomies without reconstruction, and 22 (20.75%) mastectomies with reconstruction. The year with the highest proportion of BCS was 2018 (n=41; 40.20%), while 2014 had the highest proportion of mastectomies (n=70; 81.40%). Among patients undergoing mastectomy, 181 (32.78%) had immediate reconstruction, where the highest proportion were with isolated implants (92.26%) and 14 cases with flaps (7.73%) (Figure 2).

When analyzing the evolution of mastectomies, no statistically significant increase in this procedure was observed over the period, nor was there a statistically significant difference between mastectomies with or without reconstruction (p=0.663). On the other hand, there was a statistically significant difference in conservative surgery over the years (p=0.042). Individually evaluating the proportions of each type of surgery during the study period, a statistically significant change was found only for conservative surgery (p=0.001; Bonferroni adjustment: p=0.003), compared to mastectomy without reconstruction (p=0.623; Bonferroni adjustment: p=0.299) and mastectomy with reconstruction (p=0.591; Bonferroni adjustment: p=0.663), as shown in Table 1. Finally, using

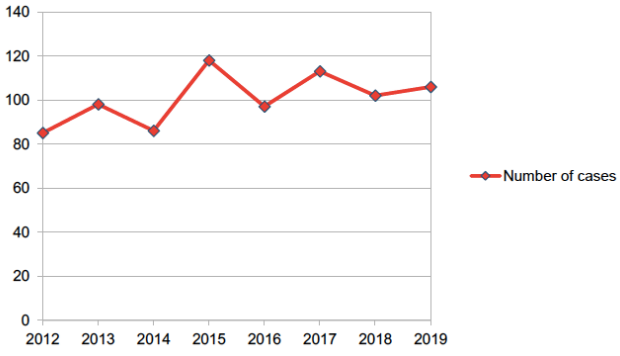


Figure 1. Evolution of total surgeries annually between 2012 and 2019.

Poisson regression, a variation in the profile of surgeries over the years was identified (<0.001), but without a significant difference between the types of surgery or immediate reconstruction (Table 2).

DISCUSSION

In this study, no overall increase in mastectomies was observed in an institution that treated patients in the Brazilian public system between 2012 and 2019. Conversely, an upward trend in BCS rates was observed throughout the study period. BCS is the preferred treatment for early breast cancer, replacing radical mastectomy in most cases, following the results of several randomized studies. A study from Denmark, for example, assessed the prevalence of BCS between 1982 and 2002, with an increase from less than 1% to 25% of conservative surgery, with a significant increase triggering the increase after the publication of the Danish Breast Cancer Cooperative Group study in 1988[15]. This trend, however, has recently changed in developed countries. A retrospective American study evaluated the temporal trend of mastectomies in more than 1 million women treated in centers accredited by the American Cancer Society and the American College of Surgeons Commission on Cancer between 1998 and 2011, using the National Cancer Database (NCDB), and it observed a 34% increase in mastectomies, with an odds ratio of 1.34 (95%CI 1.31–1.38)[14]. Other studies also identified an increase in bilateral mastectomies in the United States, with stability in conservative surgeries[12,13,16].

There are several hypotheses that may explain these differences, including the availability of immediate reconstruction. In Brazil, immediate breast reconstruction after mastectomy was guaranteed by a recent law for the public health system (Law No. 12,802, of 2013)[17]. However, in practice, it is possible that the impact has not yet been significant. In our analysis, only 32% of cases underwent immediate reconstruction, which may have affected the results, despite it being available in the institution.

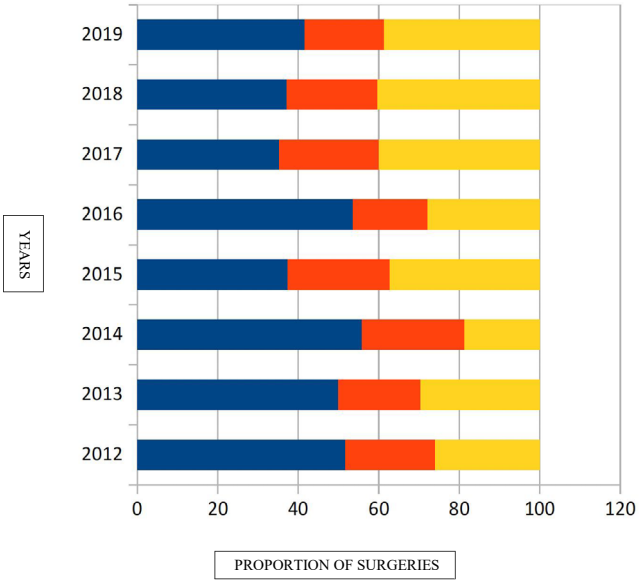


Figure 2. Proportion (%) of surgeries (breast-conserving therapy, in yellow; total mastectomy, in blue; and mastectomy and immediate reconstruction, in red) annually during the period of 2012 to 2019.

Table 2. Poisson regression for evaluation of surgeries annually.

	p-value
Year of surgery	<0.001
Type of surgery	
Mastectomy (No-BR + IBR)	0.907
BCS	1.000
Reconstruction	
No-BR	1.000
Implant	0.950
Myocutaneous flap	0.924

No-BR: Total mastectomy without reconstruction; IBR: Mastectomy and immediate reconstruction; BCS: Breast-conserving surgery; p: Value of significance after Poisson regression.

Table 1. Evolution of surgeries (BCS, No-BR and IBR) annually between 2012 and 2019 (number of surgeries and proportion).

Year	No-BR(n)	%	IBR (n)	%	BCS (n)	%	Total
2012	44	51.76	19	22.35	22	25.88	85
2013	49	50.00	20	20.41	29	29.59	98
2014	48	55.81	22	25.58	16	18.60	86
2015	56	47.46	30	25.42	32	27.12	118
2016	52	53.61	18	18.56	27	27.84	97
2017	40	35.40	28	24.78	45	39.82	113
2018	39	38.24	22	21.57	41	40.20	102
2019	43	40.57	22	20.75	41	38.68	106
Total p-Value	371	- p=0.299	181	- p=0.663	253	- p=0.003	805

In line with our findings, a recent Brazilian study reported an increase in breast reconstructions in Brazil between 2008 and 2014, reaching 29%, consistent with the results of this study[18]. In fact, the availability of immediate reconstruction has been related to mastectomies in some studies, especially in cases of unilateral cancer and contralateral risk-reducing mastectomy. In this sense, a retrospective study using the NCDB demonstrated that the mastectomy rate, specifically contralateral mastectomy, increased by 7% for each percentage point increase in reconstruction[11]. The rates of immediate reconstruction, on the other hand, were similar to those observed in some countries. For example, a European study evaluated 2,315 patients with early breast cancer between 2002 and 2016, in which the authors showed that the rate of immediate reconstruction was 34.3%[19]. Other factors, including barriers to access to breast reconstruction, were highlighted through a Canadian systematic review, which identified that, in rural areas, the high costs of the procedure, insufficient reimbursement by insurance companies, non-acceptance of the procedure by the patient, tumor characteristics and lack of patient awareness about reconstruction were related to non-performance of reconstruction[20].

The false impression that mastectomy could be a safer treatment may also explain the increase in mastectomies[21]. A study showed that only 38.1% of patients with unilateral breast cancer knew that contralateral prophylactic surgery had no effect on survival[22]. In fact, many patients opt for mastectomy, whether unilateral or bilateral, even after the proven observation of a reduction in ipsilateral recurrences or new contralateral tumors in patients undergoing conservative surgeries, observed over the years, possibly because of the advent of systemic therapy[23]. Another reason patients may opt for bilateral mastectomy, especially in cases of unilateral breast cancer with indication for mastectomy and reconstruction with implants, is the possibility of better symmetry: a study conducted at Memorial Sloan Kettering Cancer Center using Breast-Q in 3,489 breasts of women who opted for mastectomy with bilateral reconstruction with implants showed that the latter procedure had the best aesthetic result over a 12-year follow-up[22].

The advent of genetic counseling and multigene testing, which evaluate genes that are related to a greater hereditary predisposition for patients with unilateral breast cancer to develop recurrence or contralateral breast cancer, may also influence mastectomy rates. Recent studies conducted with thousands of patients have identified genes with a high predisposition for the incidence of breast cancer, whether first or second primary, after treatment for breast cancer, especially BRCA1 and BRCA2[24-27]. Some studies have also demonstrated a significant reduction in new tumors after bilateral mastectomy, as well as an impact on mortality in women with BRCA mutations and unilateral breast cancer[28,29]. However, in many places around the world, access to financial resources for health care is a significant impediment, as is the case for patients in the Brazilian public health system, who were the patients treated in this analysis. Furthermore, several regions of Brazil do not have the availability of cancer genetic specialists even for women with access to the private supplementary health network[30]. This issue, however, does not seem to be a problem only in countries with limited resources, with significant disparities occurring in developed countries in the management of breast cancer patients. An observational study presented at the 2023 American Society of Clinical Oncology (ASCO) meeting involving more than 1 million women who were diagnosed with any type of cancer between 2013 and 2019 assessed the prevalence of germline testing in American patients, with only 6.8% of them undergoing genetic testing, with tests performed below expectations even in cases where the test is recommended in guidelines[31]. Furthermore, patients of Asian, Hispanic or Black ethnicity had a lower proportion of tests performed[31].

Another fact that stands out in our study. is the high volume of mastectomies during this recent period. This is possibly because diagnosis still occurs in stages II and III, with great frequency, as a consequence of inadequate screening in patients in the public system. A Brazilian study conducted with 4,912 patients diagnosed with breast cancer in Brazil in 28 institutions in 2001 and 2006 demonstrated that approximately 75% of cases were stages II and III, higher than that observed in high-income countries, and approximately 80% of these cases were treated in the public system[32]. Despite this, there was paradoxically a trend towards an increase in BCS in our analysis during the study period, which may hypothetically reflect the advent of neoadjuvant therapies and a greater possibility of BCS in initially ineligible patients. In Brazil, during the study period, patients in the public system had access to adequate systemic treatment, including anti-HER2 therapy since 2013, although pertuzumab is not yet available for non-metastatic disease. Several studies have, in fact, demonstrated an increase in the rate of breast conservation and oncological safety in performing BCS in patients who were ineligible at the time of diagnosis[33,34]. The use of oncoplastic techniques frequently used in our institution may also have contributed to this trend, possibly favoring an increase in the rate of breast conservation even in extreme cases (tumors larger than 5 cm, for example), being an alternative to mastectomy[35].

Our study had some limitations, including the fact that it was a retrospective study at a single institution that treats patients in the public system, with limited resources. Therefore, our results should not be extrapolated in a generalized manner, especially in relation to institutions that treat patients with access to the private and supplementary health network in Brazil. For these patients, there is a tendency for bilateral mastectomies to increase[36], similar to what happens in some high-income countries. The analysis of a single institution may also not reflect other institutions, even public ones, or other cities or regions. Finally, factors specific to the surgical team, such as the incorporation of oncoplastic techniques and clinical-pathological characteristics of the disease, such as staging and younger age, for example, may have influenced decision-making and were not evaluated in this study[37].

To the best of our knowledge, this is the first study to assess the contemporary trend of breast surgeries (mastectomy and BCS) for the treatment of early breast cancer in an institution with limited resources — in this case, in Brazil. These data reveal the importance of discussion, as well as public policies for the incorporation of new technologies, including genetic testing. As in other places in the world, access and disparity are relevant problems in Brazil, whether for surgical treatment, including immediate reconstruction, or even for the incorporation of new drugs with high costs for systemic treatment.

CONCLUSIONS

We did not see an increase in mastectomy rates during the study period (2012–2019) in a public institution with limited resources. However, a trend of increasing BCS rates was demonstrated over the years at HGF. Although these results may not be generalizable, suggest that rising mastectomy trends may not be consistent across countries, especially with differences in access to health care systems, and warrant further studies and discussion on this scenario.

AUTHORS' CONTRIBUTION

FPC: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. TMGP: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. FPZ: Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing. ECM: Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing. AM: Conceptualization, Vali dation, Visualization, Writing – original draft, Writing – review & editing. MA: Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing. FPB: Conceptualization, V alidation, Visualization, Writing – original draft, Writing – review & editing. GGN: Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing. ALF: Conceptualizat ion, Validation, Visualization, Writing – original draft, Writing – review & editing. RFJ: Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing.

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