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Breast-Conserving Therapy and Irradiation in Women with Prior Breast Augmentation

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Abstract

Introduction: The incidence of breast-augmented women developing breast cancer is increasing and there is some disagreement regarding the optimal cancer treatment, in the setting of prior breast augmentation. The purpose of this study was to describe the outcome of Breast-conserving surgery and Radiation Treatment (BCT) for breast cancer, with preservation of the breast implants in breast-augmented women.

Methods: Medical records of 30 women with prior breast augmentation, undergoing BCT at our institution between 2018 and 2021, were retrospectively reviewed. Data regarding complications, capsular contracture rates, oncological and overall cosmetic outcomes following treatment were registered.

Results: Median follow-up time was 29 months with an overall complication rate of 30%. Surgery-requiring complications (capsular contracture) were observed in 10% of the patients, one case resulting in implant removal and two cases resulting in implant exchange, whereas 20% had complications not requiring reoperation. Two patients (7%) had positive margins and underwent re-excision. No patients experienced cancer recurrence. Fifty percent of those with relevant information (n=3/6) developed or had worsening of capsular contracture, and 63% (n=7/11) were evaluated as having an excellent to good overall cosmetic appearance upon follow-up.

Conclusion: Previously breast-augmented women should be informed of the risk of development or worsening of capsular contracture and the potential influence on overall cosmetic appearance following BCT.

Keywords: Breast-conserving therapy; Lumpectomy; Radiation therapy; Breast augmentation; Breast cancer.

Abbreviations: BCT: Breast-Conserving Therapy; CT: Computed Tomography.

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Introduction

As breast-augmented women age, they will constitute a growing part of the patient population in future breast cancer cases. For the time being, there is a lack of consensus regarding the treatment of breast-augmented women diagnosed with breast cancer. Non-augmented patients are preferably offered Breast-Conserving Therapy (BCT), which is associated with superior outcomes regarding recurrence and mortality when compared to mastectomy [1], which is used in about 30% of cases, primarily in large tumors and/or in small breasts [2]. BCT includes a lumpectomy followed by radiotherapy to the residual breast to reduce the risk of recurrence. Irradiation is associated with potential side effects, including fibrosis, edema, dyspigmentation, telangiectasia, and pain [3]. Currently, the literature provides limited and discordant data regarding BCT and radiotherapy in patients with breast implants. While some studies report that the presence of breast implants has little impact on fibrosis and cosmesis, other studies have shown both high rates of capsular contracture (firm fibrous tissue around the implant) as well as poor cosmetic results [4].

The primary aim of this study was to quantify the proportion of breast-augmented women who after BCT and radiotherapy for breast cancer had capsular contracture. Furthermore, we wished to investigate overall cosmetic outcome and complications that might affect both development of capsular contracture as well as cosmesis following BCT.

Materials and methods

Patients and measures

After obtaining approval from the institutional board, all breast-augmented women who underwent BCT and radiotherapy at Herlev and Gentofte Hospital, Denmark, from 2018 until 2021 were identified in the patient administrative electronic system based on radiation codes and radiotherapy planning CT scans (Figure 1). Data regarding demographics, augmentation, breast cancer and treatment characteristics, complications, oncological and cosmetic outcome was extracted through review of electronic patient charts. Breast symmetry was recorded on a three-point scale (good symmetry, some asymmetry, severe asymmetry) and capsular contracture on a four-point scale (none, slight, moderate and severe). Follow-up time was defined as the period from the date of last radiation therapy until the last date of patient consultation with an oncologist or breast surgeon. Complications were characterized as surgery-requiring or other complications. Time from finalized radiation therapy until debut of a complication was registered. Regarding cosmesis, four-graded scales used in several radiotherapy protocols [5,6] were copied (Table 3). If no specific rating of cosmetic appearance was described in medical records, senior author (LH) assessed cosmesis based on post-operative photos, if available.

Statistical analysis

We generated frequency analyses of complications, capsular contractures, oncologic and cosmetic outcomes. No further analyses to explore potential associations could be performed, since sample sizes were too small. Data analysis was conducted in IBM SPSS® (IBM Corp. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp; 2017).

Results

Patients

2038 consecutive scans were evaluated, and a total of 30 (1.5%) breast-augmented women undergoing BCT with preservation of breast implants were identified. Median follow-up time was 29 months (range 0-55 months). One patient with no follow-up consultations after radiotherapy had a mammography done five months later, which described inconspicuous conditions surrounding the subpectoral implants. Patient and implant characteristics are summarized in Table 1. Median patient age at date of surgery was 51 years (range 32-77 years). Median implant age was 6 years (range 1-30 years). Most implants were placed subpectorally (87%). The different tumor and treatment characteristics can be seen in Table 2.

Complications and capsular contracture

Complications were documented in nine patients (30%), three of whom required additional surgical treatment due to capsular contracture. In one case, the implant was removed, in two other cases capsulotomy was performed and the implants were exchanged. The remaining six patients (20%) had complications that did not require surgical intervention (Figure 2). Hematoma and seroma was treated with percutaneous drainage. Patients with lymphedemas were referred to physiotherapeutic treatment. Follow-up and outcome data are shown in Table 3. Assessment of capsular contracture following treatment was only documented in six of the 30 patients (20%). Three patients (50%) were classified with no contracture and three (50%) with moderate to severe capsular contracture. One had worsening of a preexisting moderate contracture to severe capsular contracture. The two others developed moderate and severe contracture, respectively. Median time until patients were diagnosed with a new or worsening capsular contracture was 12 months. Overall cosmetic appearance following BCT was rated in 11 patients (37%), of whom 63% had good to excellent cosmetic outcome whereas 36% women had fair to poor cosmetic outcome. There were no local recurrences during follow-up and all patients were alive at the end of study.

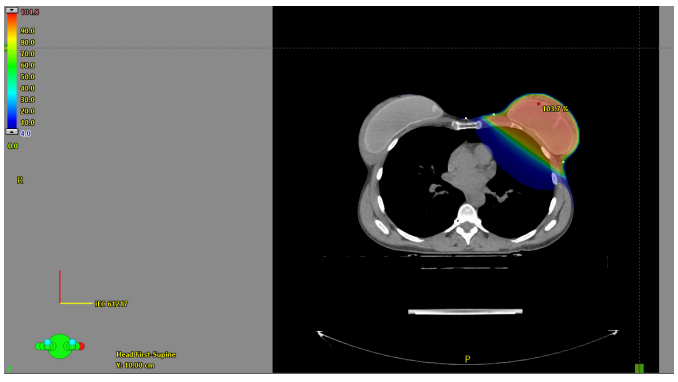

Figure 1: Radiotherapy planning CT scan.
An example of a radiotherapy planning CT scan.

Table 1: Patient and implant characteristics.

Age, years (MEDIAN, range)	51(32-77)
BMI, kg/m^2 (median, range)	21.4(17.9-27.6)
Smoking status, n (%)	
Never	18(60%)
Every day	7(23%)
Sometimes	-
Former smoker	5(17%)
Breast tissue Thickness preoperatively, mm (median, range)	15(8-36)
Implant age, years (median, range)	6(1-30)
Data missing, N	7
Baseline capsular contracture, n (%)	
None	7(78%)
Slight	1(11%)
Moderate	1(11%)
Severe	-
Data missing	21
Implant shape, n (%)	
Round	3(75%)
Anatomical	1(25%)
Data missing	26
Implant filling, n (%)	
Silicone	30(100%)
Incision for augmentation, n (%)	
Inframammary	8(62%)
Axillary	1(8%)
Other*	4(31%)
Data missing	17
Implant position, n (%)	
SubGlandular	4(13%)
Subpectoral	26(87%)

*Other incisions included one wise pattern and three patients with medical charts describing scars following mastopexy.

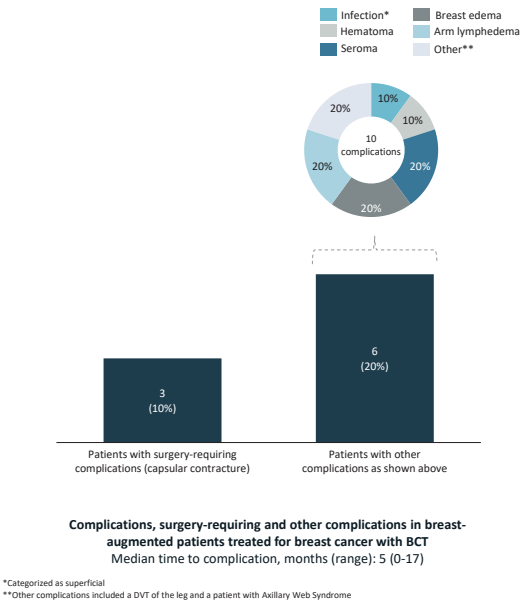

Figure 2: Complications Surgery-requiring and other complications within a median follow-up time of 29 months (range 0-55 months).

Table 2: Tumor and treatment characteristics.

Tumor localization, n (%)	
Lower medial quadrant	-
Upper Medial quadrant	8(27%)
Lower Lateral quadrant	3(10%)
Upper Lateral quadrant	9(30%)
Central	3(10%)
Other*	7(23%)
Tumor histology, n (%)**	
DCIS	4(12%)
INvasive ductal	24(73%)
Invasive lobular	3(9%)
Other***	2(6%)
Tumor size, mm (median, range)	11(2-23)
Nearest resection margin, n (%)	
Negative margin (≥ 2 mm)	28(93%)
Positive margin (< 2 mm)	2(7%)
Reexcision, n (%)	2(7%)
ER expression, n (%)	
Positive	25(89%)
Negative	3(11%)
HER2 expression, n (%)	
Normal expression	27(96%)
Overexpression	1(4%)
Ki67 index, n (%)	
≤10 %	16(57%)
>10%	12(43%)
Sentinel node status, n (%)	
No metastasis	19(63%)
Macrometastasis	5(17%)
Micrometastasis	3(10%)
Single cell infiltration	2(7%)
SN not performed	1(3%)
Subsequent axillary surgery, n (%)	2(7%)
Chemotherapy, n (%)	
Before surgery	1(3%)
After surgery	11(37%)
None	18(60%)
Antihormonal treatment, n (%)	
Tamoxifen	12(40%)
Aromatase inhibitor	11(37%)
None	7(23%)
Biological treatment, n (%)	
Traztuzumab	1(3%)
None	29(97%)
Radiation technique, n (%)	
WBI**** + boost	14(47%)
WBI	14(47%)
PBI*****	2(7%)

*Other tumor localization included tumors localized on the border of two quadrants: four tumors at 12 o'clock and the three remaining at three, six and nine o'clock, respectively., **One patient can contribute with >1 tumor. ***Other tumors included a tubular carcinoma and Pagets of the nipple. ****WBI = Whole breast irradiation. *****PBI = Partial breast irradiation.

Table 3: Follow-up and outcome.

Follow-up, months (MEDIAN, range)	29(0-55)
Pain (breast), n (%)	10(33%)
Data missing	20
Fibrosis (breast), n (%)	
None	5(63%)
Slightly palpable	3(38%)
Palpable	-
Clearly palpable, retraction of skin and fixation	-
Data missing	22
Capsular contracture after BCT, n (%)	
None	3(50%)
Slight	-
Moderate	1(17%)
Severe	2(33%)
Data missing	24
Time to capsular contracture, months (median, range)	12(10-12)
Breast symmetry after BCT, n (%)	
Good symmetry	5(56%)
Some asymmetry	4(44%)
Severe asymmetry	-
Data missing	21
Dyspigmentation, n (%)	
No difference	2(29%)
Slight difference	4(57%)
Moderate difference	1(14%)
Dramatic difference	-
Data missing	23
Cosmetic appearance, n (%)	
Excellent	2(18%)
Good	5(45%)
Fair	3(27%)
Poor	1(9%)
Data missing	19
Local recurrence, n (%)	None

Discussion

Only a very small group of women with cosmetic breast implants underwent BCT including radiotherapy in our cohort of women treated with BCT including radiotherapy in the period 2018-2021. Complications were minor and only 10 percent were operated for capsular contracture within a follow-up time of a little more than 2 years as a median.

Capsular contracture

Our group has in 2020 published a systematic review on the literature based on 17 articles on capsular contracture after BCT and radiotherapy in breast-augmented women [4], and found a capsular contracture rate of 22.2% following BCT with reported rates ranging from 0% to 65% [7-10]. Two more recent studies also evaluated rates of capsular contracture among breast-augmented breast cancer patients undergoing BCT including radiotherapy. A French study of 50 patients by Lesniak et al. [11] found 34% with capsular contracture within a follow-up time of median 51 months, and a US study of 70 patients by Tadros et al. [12] had a capsular contracture rate of 25.4% observed within 1.9 years.

Our contracture rate is comparable to those of previous studies: 50% of the patients with available information had capsular contracture at follow-up, and median time until diagnosis of a new or worsening of contracture was reported in the medical records was 12 months. Although only six patients had available data on capsular contracture assessment, we assume the remaining 24 patients did not have contracture to a degree that made them express concerns or dissatisfactions at follow-up consultations nor prompted a physician to refer them to surgical revision. The health care is tax funded and free, and patients with severe symptoms can be expected to be referred. This assumption results in a proportion of capsular contracture of 3/30 (10%). The true proportion of women with significant capsular contracture, based on our material, is therefore likely in between 10% and 50%.

Complications rates

Serritzlev et al. found that 30.6% of patients undergoing BCT developed complications and 17.1% required reoperations due to complications. In the study by Tadros et al., 12.7% were referred for revisional surgery. Our study shows a similar complication rate of 30%. Ten percent of the patients had complications requiring revisional surgery all due to capsular contracture, and all requiring implant removal or exchange, and 20% had complications that did not require surgical intervention. In contrast, Lesniak et al. had no patients requiring reoperations or explantation of implants due to early complications.

Cancer control

Our study supports previous findings [10,11,13,14] that good tumor control can be obtained with BCT in previously breast-augmented women. Two patients (7%) had positive resection margins and needed subsequent re-excision, and there were no local recurrences. As reference, the overall local recurrence rate within five years following BCT is 2.4% in Denmark [15].

Prabhakaran et al. investigated tumor margins, re-excision rates and recurrence in previously breast-augmented women (n=52) versus non-augmented women (n=51) who underwent breast-conserving therapy. In the augmented group 11.5% had positive margins, 21.2% underwent re-excision and 7.7% had recurrence within a follow-up time of median 100.3 months. They found no statistical difference between the two groups, which led them to conclude that BCT in augmented breast cancer patients is safe and feasible, from an oncological standpoint.

In Denmark, the surgical standard care for early-stage breast cancer is BCT if feasible, because the breast is preserved, and superior survival compared with mastectomy has been found [1]. This also applies to breast-augmented women, however, in some cases, the tumor/breast tissue ratio does not allow for this solution, and skin or nipple-sparing mastectomy and primary reconstruction is then generally recommended, or a mastectomy “on top of the implant” may yield a satisfactory cosmetic result. The distribution of the different surgical solutions is not known.

Overall cosmetic outcome

Even though information on overall cosmetic outcome was only accessible in 11 patients, our results seem comparable to

findings of previous studies. Sixty-three percent of our patients with available information were rated as having an excellent to good overall cosmetic appearance following BCT, which is very similar to the 67.6% and 68% previously reported [4,11]. However, our information was mainly based on information retained at one-year follow-up consultations with a breast surgeon and implant-related information was limited. Afterwards, patients were primarily followed by oncologists who did not report further on cosmesis of the breast.

Complications and cosmetic outcome of BCT in non-augmented women

In a randomized Phase III Trial, the Danish Breast Cancer Group compared hypofractionated radiotherapy to standard fractionated therapy in 1854 patients following breast-conserving surgery [16]. Registered complications included induration (considered a marker for fibrosis), edema and pain as well as overall cosmetic outcome at three- and five-year follow-ups. Induration was reported in 9% of the patients receiving hypofractionated radiotherapy after 5 years, 1% had edema and 4% experienced pain. A good to excellent cosmetic outcome was reported in 80% of the patients. No overall complication rate was specified. Although comparison to our study is impaired by our small sample sizes, it seems that non-augmented women have lower rates of complications and better cosmetic outcome following BCT.

Limitations

Our study is limited by the retrospective design, sparse amount of data in medical records, the small sample size of patients and a relatively short follow-up period. The lack of data on capsular contracture assessment and cosmetic outcome makes conclusions less valid. However, we do assume unacceptable levels of contracture and poor cosmetic results would have been mentioned in medical records or led a clinician to respond with a referral to evaluation by a breast- or plastic surgeon. Despite our small sample size, we did observe distributions of overall complication rates and cosmetic outcomes which seem similar to findings in other studies. The lack of longer follow-up time might influence the rate of capsular contracture and other complications, since contracture is known to develop over years [17]. Another limitation is our study's susceptibility to the risk of selection bias since the distribution of augmented breast cancer patients between BCT and mastectomy is unknown. Patients are selected for either BCT or mastectomy based on patient and cancer characteristics. This might have resulted in most of the complicated cases being selected for mastectomy and perhaps primary breast reconstruction rather than lumpectomy. Among strengths are the thorough evaluation of a consecutive cohort of breast cancer patients to identify the study group, and since our hospital was responsible for the radiotherapy for approximately half of the women treated in the Capital Region of Denmark, it does give valid information about the small number of breast-augmented women who currently has received this treatment.

Further research in the form of a prospective study is needed to determine whether BCT is the best treatment option for women with prior augmentation.

Conclusion

This study is merely a step towards better understanding the outcome of BCT in previously breast-augmented women. Our results suggest that women with prior augmentation should be informed of the risk of development or worsening of capsular contracture and the potential impact on overall cosmetic appearance following breast-conserving surgery and radiation therapy. Furthermore, our study emphasizes the importance of improved documentation concerning implant- and breast-related factors in breast cancer treatment of breast-augmented women.

Conflicts of interest: Senior author Lisbet Rosenkrantz Hölmich has received a research grant from Johnson & Johnson/Mentor. All other authors have no conflict of interest to declare.

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