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Breast cancer conservation therapy in Sub-Saharan Africa: Between constraints and prospects

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Abstract

Objective: To describe the epidemiological profile, diagnostic aspects and evaluate the treatment strategy for breast cancer patients treated with breast conserving therapy.

Methods: We conducted a retrospective descriptive study of all patients who underwent breast cancer conserving therapy in the radiotherapy department of the Dalal Jamm Hospital in Senegal from January 2021 to December 2024. Epidemiological, diagnostic, and therapeutic variables were systematically analyzed.

Results: During the study period, 46 patients with breast cancer were treated with breast conserving therapy, representing 6.54% of cases. Age range was 26 to 67 years, with a mean of 43.8 years. T2-classified tumors were the most common (41.30%). Non-specific invasive ductal carcinoma was found in 93.5% of cases. All patients underwent lumpectomy with negative margins in 41 cases (91.1%). Neoadjuvant Chemotherapy was administered in 95.6% of cases. The average duration between surgery and the start of radiotherapy was 7.7 months. Hypofractionated radiotherapy delivering a total dose of 42 Gy in 15 fractions of 2.8 Gy was used in all patients. Radiodermatitis was the most common acute toxicity (58.7%) of radiotherapy. Locoregional recurrence was found in 2 cases and metastatic recurrence in 6 patients, or 13.04% of cases.

Conclusion: Breast cancer conserving therapy is still struggling to be popularized in sub-saharan Africa due to late diagnosis and difficult access of radiotherapy.

Keywords: Breast-Conserving Therapy; Breast Cancer; Radiotherapy; Senegal

1. Introduction

Breast cancer is the second most common cancer and the third leading cause of cancer death among women in Senegal. In 2022, there were 11,841 new cases of breast cancer in Senegal, with 8,134 deaths in the same year [1]. This is a real public health problem. Treatment is multimodal, based on radical or partial mastectomy, radiotherapy, chemotherapy, and sometimes hormone therapy or targeted therapy. In sub-Saharan Africa, surgical management of breast cancer remains largely dominated by radical mastectomy. In Senegal, over two-thirds of patients are diagnosed at a locally advanced stage, which considerably limits the possibilities for conservation therapy. Added to this, is the uncertainty surrounding rapid access to adjuvant radiotherapy, which is recommended within 8 to 12 weeks after conservative surgery. A study conducted in 2024 at Dalal Jamm Hospital in Dakar revealed that 97% of patients who underwent surgery had a total mastectomy [2]. In addition, the lack of a structured breast reconstruction program amplifies the

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psychosocial impact of this radical approach [3]. However, for early-stage disease and selected cases of locally advanced breast cancer, breast-conserving therapy (lumpectomy followed by whole-breast irradiation) has, for several decades been demonstrated to provide oncologic outcomes equivalent to mastectomy, while offering superior psychological benefits [4]. Although breast-conserving therapy is rarely performed in Senegal due to a lack of early screening and technical resources (preoperative localization, sentinel lymph node surgery, access to radiotherapy), it is now attracting renewed interest thanks to recent efforts to strengthen technical facilities and train medical teams. In this situation, it is relevant to describe the profile of patients who, despite the constraints, have access to conservative treatment, to analyze the conditions under which it is delivered, the therapeutic strategies employed, and the associated survival outcomes. Understanding these factors will help to identify areas for improvement with a goal to encourage the broader and more systematic integration of the conservative approach into breast cancer care in Senegal.

2. Material and methods

We conducted a retrospective descriptive study in the radiotherapy department of the Dalal Jamm Hospital (Dakar, Senegal) over a four-year period, from January 2021 to December 2024. The study included 46 patients with breast cancer who were treated by lumpectomy followed by adjuvant radiotherapy, with or without chemotherapy. The variables studied focused on epidemiological, clinical, paraclinical, therapeutic, and evolution characteristics. We used the American Joint Committee on Cancer (AJCC) Tumor-nodes-metastasis (TNM) classification 8th edition to classify tumors before treatment (cTNM) and after surgery (pTNM) or ypTNM if surgery is preceded by chemotherapy. Local recurrence was defined as any histologically confirmed reappearance of invasive or in situ breast carcinoma in the treated breast, at the surgical scar or in the same quadrant, after an initial period of remission. The data were extracted from medical records and radiotherapy treatment records, then transferred to a pre-established evaluation form. For patients who were lost to follow-up, follow-up information was collected by telephone, using the numbers listed in the records or from relatives. Data analysis was performed using Microsoft Excel® software (Windows 10 version).

3. Result

During a period of 48 months, 1,015 patients with breast cancer were treated in our department. Among these patients, 78 patients (7.68%) were treated by breast conserving surgery. Thirty-two (32) patients of them were excluded because they had not yet received radiotherapy and 46 patients were included for the final analysis. The average age of the patients was 43.8 years, ranging from 26 to 67 years. Patients under 50 years of age at the time of diagnosis were 35 (76.09%). However**,** 19 patients (41.30 %) were less than 40 years. A family history of first-degree breast cancer was found in 9 patients (19.56%). Tumor location was equally distributed between the left and right breasts, with a slight predominance on the left side (52.17%). The average tumor size was 3.43 cm, ranging from 1 to 6 cm. T2-classified tumors (2–5 cm) were found in19 cases (41.30 %), while larger tumors T3 and T4 were respectively observed in 9 (19.57 %) and 8 cases (17.39 %). In terms of lymph node involvement, N1 was observed in 47.83% of patients, while one-third (34.78%) had no lymph node involvement (N0) at the diagnosis. Epidemiological and Clinical characteristics of patients are shown in Table 1. Invasive Ductal Carcinoma of No Special Type (IDC-NST) was predominant, with 43 cases (93.47%). The Scarff-Bloom-Richardson (SBR) grade II was the most common (32 cases, 69.57%), followed by grade III (11 cases, 23.91%). Immunohistochemistry (IHC) was performed in 30 patients (65.22%). Hormone receptors were positive in 17 cases (56.67% of tests performed, or 36.96% of the total). Human Epidermal Growth Factor Receptor 2 (HER2) overexpression was found in 3 cases (6.52%). The triple-negative phenotype was found in 11 cases (23.91%). The Ki-67 proliferation index was less than or equal 20% in 14 cases (30.43%) and greater than 20% in 14 cases (30.43%). Anatomopathological caracteristics of patients are shown in Table 2.

All patients were treated by lumpectomy. Surgical margins were negative in 41 cases (89.13%), involved in 4 cases (8.69%), and unspecified in 1 case. Neoadjuvant chemotherapy was administered in 44 cases (95.65%) and adjuvant chemotherapy in 5 cases (10.87%). The patients with a tumor overexpressing HER2 (6.52%) received targeted therapy with trastuzumab. Postoperative radiotherapy was performed in all patients in the cohort. The average interval between surgery and radiotherapy was 7.7 months, ranging from 2.9 to 17 months. All patients were treated with three-dimensional conformal radiotherapy (3D-CRT) using 6 and 10 MV photon beams energy. The standard regimen applied to all patients consisted of a total dose of 42 Gray (Gy) delivered in 15 fractions of 2.8 Gy. A boost dose was administered to the surgical bed in 41 patients (89.13%). The boost was not performed in 5 patients. The average dose of boost delivered was 10.4 Gy, with extreme values ranging from 8 to 11.2 Gy. Irradiation of the supraclavicular lymph node areas was performed in 32 cases (69.56%) and not performed in 14 cases (30.43%). Irradiation of the internal mammary node was performed in 3 patients at a dose of 42 Gy. Adverse effects related to radiotherapy were observed in 35 cases (76.08%). Radiodermatitis was the most common acute toxicity, occurring in 27 cases (58.70%). It was grade 1 in 14 cases (51.85%), grade 2 in 10 cases (37.04%), and grade 3 in 5 cases. Other acute toxicities reported were

rarer, dominated by mastodynia (3 cases, 6.52%). Among chronic toxicities, skin fibrosis was the most common, observed in 6 cases (13%). Toxicity of radiotherapy are shown in Table 3. The mean follow-up period after radiotherapy was 18.06 months, with extremes of 3 and 56 months. Locoregional recurrence was observed in 2 cases, representing 4.35% of the cohort. The mean time to locoregional recurrence was 3.5 months after radiotherapy. Metastatic recurrence was found in 6 patients, or 13.04% of cases. The mean time to metastatic recurrence was 10 months after radiotherapy, with extremes of 4 months and 22 months.

Table 1 Epidemiological and Clinical caracteristics of patients

Caracteristics	**Number (N)**	**Percentage (%)**
Age (years)		
Median (extremes)	43.84 (26–67)	
< 40 years	19	41.30
40–50 years	17	36.96
> 50 years	9	19.57
No precision	1	2.17
Affected side		
Right breast	22	47.83
Left breast	24	52.17
Tumor size (T)		
Tis	1	2.17
T1 (≤ 2 cm)	6	13.05
T2 (2–5 cm)	19	41.30
T3 (> 5 cm)	9	19.57
T4	8	17.39
No precision	3	6.52
Lymp Nodes (N)		
N0	16	34.78
N1	22	47.83
N2	3	6.52
N3	1	2.17
No precision	4	8.70

Table 2 Anatomopathological caracteristics

Histologic grade (SBR)	**Number (N)**	**Percentage (%)**
I	3	6.52
II	32	69.57
III	11	23.91
Histological type		
Invasive ductal carcinoma, NOS	43	93.47
Invasive lobular carcinoma	0	0.00
Others	3	6.52
Biomarkers		
RH+ (ER et/ou PR)	17	36.96
HER2+	3	6.52
Triple-negative	11	23.91
No precision	16	34.78
ki-67 score		
≤ 20 %	14	30.43
> 20 %	14	30.43
No precision	18	39.14

Table 3 Toxicity of radiotherapy

Toxicity	**Number (N)**	**Percentage (%)**
Radiodermatitis	27	58.70
Cutaneous fibrosis	9	19.56
Lymphedema	2	4.35
Others	8	17.39
Total	46	100.00

4. Discussion

We conducted a cross-sectional study of patients who received conservative treatment for breast cancer. During our study period, 1,015 patients were treated for histologically confirmed breast cancer, including 78 cases of breast conserving surgery which represents 7.68% of patients treated for breast cancer. These results are similar to those of Diéne et al [5], who in an identical study conducted in 2011 at the Juliot Curie Institute of the Aristide Le Dantec Hospital (HALD) in Dakar, including 72 patients, found that partial mastectomy was performed in 6.54% of cases of patients treated for breast cancer. However, these results are significantly lower than those of Dimassi et al. in Tunisia [6], who observed partial mastectomy in 23.8% of cases. In Cameroon, Kemfang et al. [7] noted that partial mastectomy was performed in 15.2% of cases. In Senegal, partial mastectomy remains infrequently performed, primarily due to late-stage diagnosis and limited access to radiotherapy.

We included a sample of 46 patients in our study. The average age of the patients was 43.84 years, ranging from 26 to 67 years. The majority of patients, 76.09%, were young (under 50 years of age). These results are comparable to those of Diéne et al [5], who found an average age of 44.4 years, ranging from 19 to 72 years, with a preponderance of patients under 50 years of age (69.4%). In Cameroon, Kemfang et al [7] noticed an average age of 45.17 years, with the most

represented age group being 40 to 49 years. In Ethiopia, Kantelhardt et al [8] recorded similar results, with a median age of 43.0 years and extremes ranging from 20 to 88 years. Contrariwise, our results contrast with those reported in North Africa, where the average age was 52 years in Tunisia [6] with extremes ranging from 30 to 75 years, and an average age in Morocco [9] of 51.6 years with extremes of 23 and 89 years. Nevertheless, the average age at diagnosis of breast cancer in France is much higher (64 years) [10].

4.1. Tumor size

The average tumor size was 3.43 cm, ranging from 1 to 6 cm. These results are comparable with those of Dimassi et al [6], who found an average clinical size of 3.02 cm. Tumors classified as T2 were the most common, accounted for 41.30%. T3 and T4 tumors accounted for 19.57% and 17.39%, respectively. Similarly, Diéne et al. [5] observed a predominance of T2 tumors (70.8%). The high frequency of T2 tumors in this series could be explained by selection bias. Typically, breast tumors less than or equal 5 cm are the most eligible for conservative treatment.

4.2. Excision margins

The condition of the margins, vascular or lymphatic emboli, and the in-situ component are all important prognostic factors. They influence the risk of local or metastasis recurrence, and, consequently patient survival [11-13]. To have negative margins is therefore crucial in the management of breast cancer. In our study, resection margins were involved in 4 cases (8.69%) and 41 patients (89.13%) had negative margins (R0 margins). The surgical technique has improved in our series, with a decrease in the rate of involved margins compared to the series of Diéne et al. in 2011 [5], who noted resection margin involvement in 13.9% of cases. Although conservative treatment has been the standard of care for localized breast cancer for several years, the definition of negative resection margins has long been a subject of debate. In this regard, in the study presented by Azu et al [14], 11% of surgeons defined negative margins as the absence of tumor cells at the stained edges, 42% defined them as 1-2 mm, 28% limited them to ≥ 5 mm, and 19% to 10 mm. According to the consensus of the Society of Surgical Oncology (SSO), American Society for Radiation Oncology (ASTRO), and American Society of Clinical Oncology (ASCO) [15,16], margins are considered negative in our study if there are no tumor cells at the edges of the resection and positive if tumor cells are present at the edges of the resection .

4.3. Interval between surgery and radiotherapy

The average interval between surgery and radiotherapy was 7.69 months, ranging from 2.9 months to 17.03 months. This interval appears to be significantly longer than that found by Diéne et al [5], who reported an average interval between surgery and radiotherapy of 2.8 months, with extremes of 1 and 11 months. Dimassi et al [6] had noticed a mean interval of 3.5 months between surgery and radiotherapy, ranging from 1 to 10 months. In comparison, Punglia et al [17], in a retrospective analysis of the impact of the interval between conservative surgery and radiotherapy involving 18,050 patients in the USA, had found an average delay of 1.13 months, with extremes of 1 and 6 months. The longer delay in our study may be attributed to the extended waiting list for patients in the radiotherapy department at Dalal Jamm Hospital. In Dakar, this department represents the only public facility offering radiotherapy treatment. There is also a single private radiotherapy center whose expensive treatment restrict access for most patients who are then forced to register on the long waiting list at Dalal Jamm Hospital. In fact, the maximum delay recommended between surgery and radiotherapy is 8 to 12 weeks. Extending this delay is a factor of recurrence, impacting patient survival [17, 18]. In this regard, Hershman et al [19] emphasize that there is an adverse effect on overall survival if radiotherapy is started more than 12 weeks after surgery (in the absence of chemotherapy). However, in the case of adjuvant chemotherapy, radiotherapy must be started within a maximum of 20 weeks [20].

4.4. Postoperative radiotherapy

The technique of radiotherapy used in all cases was three-dimensional conformal radiotherapy (3D-CRT) with energies of 6 and 10 megavolts (MV). In the study of Diéne et al [5], conventional radiotherapy using cobalt-60 with an energy of 1.25 MeV was the technique used to irradiate patients. The 3D-CRT is the recommended technique for irradiating breast cancer [21]. A dose of 42 Gy in 15 fractions of 2.8 Gy was used in all patients. In breast cancer irradiation, a dose of 50 Gy in 25 fractions (fr) has been the international standard regimen used. However, moderately hypofractionated breast irradiation has also become standard in recent years, with equivalence in terms of survival versus conventional fractionated radiation therapy demonstrated in several randomized trials and meta-analyses [22, 23]. Hypofractionation practiced in Senegal helps to overcome the problem of delays in treatment while offering the advantage of treating a large number of patients in a short time.

A boost dose was administered to 41 patients, representing 89.13% of cases. The boost was not administered to 5 patients. Among them, 4 patients voluntarily stopped the treatment and 1 patient had over 60 years for whom the boost was not indicated. The average boost dose was 10.44 Gy, ranging from 8 to 11.2 Gy. A boost dose of 10 to 16 Gy in 5-8

fractions is recommended in patients under 50 years of age, as it reduces the risk of local recurrence [24]. For patients over 50 years of age, the boost is discussed based on the risk factors for recurrence [21].

The average duration of radiotherapy treatment was 29.49 days, with extremes of 16 and 54 days. These results are analogous to those reported by Diéne et al [5], who found an average of 36.5 days, with extremes of 18 and 68 days using conventional fractionation. During hypofractionated treatment of 42 Gy in 15 fractions, the normal duration of treatments should be a maximum of 21 days. The extension of treatment duration in our situation can be explained not only by patients' failure to comply with instructions (who sometimes do not respond to appointments), but also by repeated breakdowns of the linear accelerators, forcing treatment to be interrupted and postponed. The duration of radiotherapy is a major factor in therapeutic efficacy. Indeed, extending the duration of treatment alters the quality of treatment because it promotes the repopulation of tumor cells, leading to an increased risk of recurrence. Several studies have shown that lengthening the course of treatment has a negative impact on local control and survival regardless of tumor location [25, 26]. In a retrospective study of 853 patients about the effect of treatment interruptions in postoperative breast cancer radiation therapy, Bese et al [27] concluded that interruptions of more than one week during postoperative breast cancer radiation therapy negatively affect treatment outcomes.

Radiodermatitis was the most common acute toxicity, with 27 cases, or 58.70% of the toxicities observed, predominantly G1 radiodermatitis (14 cases, or 51.85%), followed by G2 (10 cases, or 37.04%). These results are comparable to those of Tortorelli et al [28], who, when comparing the skin toxicities of conventional fractionated radiotherapy versus hypofractionated radiotherapy, found a predominance of grade 1 toxicities (63.5%), followed by grade 2 toxicities (30%) in the hypofractionated arm. In the literature hypofractionated radiotherapy is better tolerated by patients in terms of acute toxicities versus normofractionated radiotherapy [29, 30].

5. Conclusion

Breast cancer treatment is multimodal and must be discussed in a multidisciplinary consultation meeting. Breast conservative treatment which is standard for localized stages, remains difficult to apply in Senegal because of late diagnosis, requiring radical mastectomy. In addition, radiotherapy, which is an essential therapeutic tool in the conservative treatment of breast cancer, remains difficult to access. Optimizing the management of breast cancer requires raising awareness to encourage strong participation in individual and mass screening, and thereby enabling early diagnosis for effective treatment. However, the implementation of a sound health policy facilitating access to radiotherapy is necessary to reduce treatment delays which is fundamental of therapeutic efficacy.

Compliance with ethical standards

Disclosure of conflict of interest

The authors have declared no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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