СРПСКИ АРХИВ
ЗА ЦЕЛОКУПНО ЛЕКАРСТВО
SERBIAN ARCHIVES
OF MEDICINE

Address: 1 Kraljice Natalije Street, Belgrade 11000, Serbia
☏ +381 11 4092 776, Fax: +381 11 3348 653
E-mail: office@srpskiarhiv.rs, Web address: www.srpskiarhiv.rs

Paper Accepted*

ISSN Online 2406-0895

Original Article / Оригинални рад

Igor Đurišić[1,♣], Milan Žegarac[1,2], Milan Kocić[1], Vladimir Jokić[1], Nikola Vučić[1], Ognjen Petrović[1], Nada Santrač[1,2], Jovana Končar[1], Anđela Ivezić[1], Srđan Nikolić[1,2]

Male breast cancer – a single center experience

Карцином дојке код мушкараца – искуство једног центра

[1]Institute for Oncology and Radiology of Serbia, Belgrade, Serbia;
[2]University of Belgrade, Faculty of Medicine, Belgrade, Serbia

Received: August 2, 2024
Revised: December 23, 2024
Accepted: December 29, 2024
Online First: December 31, 2024
DOI: https://doi.org/10.2298/SARH240802098D

*__Accepted papers__ are articles in press that have gone through due peer review process and have been accepted for publication by the Editorial Board of the *Serbian Archives of Medicine*. They have not yet been copy-edited and/or formatted in the publication house style, and the text may be changed before the final publication.
Although accepted papers do not yet have all the accompanying bibliographic details available, they can already be cited using the year of online publication and the DOI, as follows: the author's last name and initial of the first name, article title, journal title, online first publication month and year, and the DOI; e.g.: Petrović P, Jovanović J. The title of the article. Srp Arh Celok Lek. Online First, February 2017.
When the final article is assigned to volumes/issues of the journal, the Article in Press version will be removed and the final version will appear in the associated published volumes/issues of the journal. The date the article was made available online first will be carried over.

♣**Correspondence to:**
Igor ĐURIŠIĆ
Institute for Oncology and Radiology of Serbia, Pasterova 14, 11000 Belgrade, Serbia
E-mail: drigordjurisic@gmail.com

Male breast cancer – a single center experience

Карцином дојке код мушкараца – искуство једног центра

SUMMARY

Introduction/Objective Male breast cancer is an exceptionally rare disease, accounting for only 0.5% of all male cancer cases, with an incidence of less than one case per 100,000 men annually. This study aims to present the experience of the Institute for Oncology and Radiology of Serbia (IORS) in managing male breast cancer.

Methods This retrospective study included all male patients treated at IORS for breast cancer during the period from 1997 to 2016. In total 124 cases were included in this study and analyzed regarding demographic, clinical, and pathohistological characteristics, therapeutic approach, and treatment outcomes.

Results Most patients were in stages IIa (27.4%) and IIIb (33.9%). Modified Madden radical mastectomy was performed on 70% of patients. The most prevalent pathohistological tumor type was ductal invasive carcinoma, most frequently in the T2 stage. Most patients (92.1%) had a positive estrogen receptor (ER) and progesterone receptor (PR) status (92.1% and 82.4%, respectively), while human epidermal growth factor receptor 2 (HER2) status was negative in 60% of the patients. The median overall survival was 121 months. Positive ER status was identified as the most important predictor of overall survival, while patients with initial stage IIIa/IIIb/IV disease had a greater risk of disease progression.

Conclusion Our research indicates that patients with ER-positive tumors, who are diagnosed with the disease early and do not have any distant or local metastases have significantly better overall survival rates.

Keywords: breast cancer; male; survival; stage; receptors

САЖЕТАК

Увод/Циљ Карцином дојке код мушкараца је изузетно ретка болест, која има инциденцу од мање од 1 особе на 100.000 људи и представља само 0,5% свих карцинома који се јављају код мушкараца. Ова студија има за циљ да представи искуство Института за онкологију и радиологију Србије (ИОРС) у дијагностици и лечењу мушкараца са карциномом дојке.

Методе У ову ретропективну студију су укључени сви мушкарци који су лечени у ИОРС због карцинома дојке у периоду од 1997. године до 2016. године. Укупно 124 пацијента је анализирано према демографским, клиничким и патохистолошким карактеристикама, терапеутском приступу и исходу лечења.

Резултати Већина пацијената је иницијално била у стадијуму IIa (27,4%) и IIIb (33,9%). Код 70% пацијената је спроведена је модификована радикална мастектомија по Мадену. Дуктални инвазивни карцином, најчешће у стадијуму T2, је био најфреквентнији патохистолошки тип тумора. Већина пацијената је имала позитиван статус естрогенских (92,1%) и прогестеронских (82,4%) рецептора, док је 60% пацијената имало негативан статус рецептора за хумани епидермални фактор раста (HER2). Медијана укупног преживљавања је била 121 месец. Позитивни статус за естрогенски рецептор је идентификован као најважнији предиктор укупног преживљавања, док су пацијенти у иницијалном стадијуму болести IIIa/IIIb/IV имали већи ризик за прогресију болести.

Закључак: Резултати нашег истраживања потврђују да мушкарци са карциномом дојке који испољава естрогенске рецепторе, чија је дијагноза постављена у раном стадијуму болести и који немају регионалне или удаљене метастазе, имају значајно боље преживљавање.

Кључне речи: карцином дојке; мушкарци; преживљавање; стадијум; рецептор

INTRODUCTION

Breast cancer (BC) in men is an exceptionally rare disease making up less than one case per 100,000 men annually and just 0.5% of all cancers in the male population [1, 2]. It is believed that men have a lower BC incidence than women because of their distinct hormonal status and

volume of breast tissue [2-4]. Nonetheless, BC incidence is rising in both genders with an estimated 26% increase in men over the last 25 years [1, 2, 4].

Men are affected by most histological types of BC that afflict women, however their incidence of occurrence varies. Roughly 90% of all BC in men are ductal, only 1% are lobular, and the remaining 9% accounts for rare BC subtypes like neuroendocrine, medullary, or tubular BCs [5]. When compared to female BCs, male BCs are more likely to express the estrogen, progesterone, and androgen receptors (ER, PR, AR respectively), be hormonally responsive, have lower expression of human epidermal growth factor receptor 2 (HER2) receptor, and most often manifest as unilateral tumors [5].

This study aims to present the experience of the Institute for Oncology and Radiology of Serbia (IORS) in managing male BC, from 1997 to 2016, regarding demographic, clinical, and pathohistological characteristics, therapeutic approach, and treatment outcomes.

METHODS

This retrospective study included all male patients treated at IORS for BC from 1997 to 2016. For most patients, data were collected from archived and active medical histories; only after 2014 was part of the data accessed via the hospital's electronic medical records. The IORS review board approved the study, and informed consent for participation was obtained from all living patients with active medical histories. We analyzed demographic data, disease characteristics (stage of the disease, pathohistological and immunohistochemical tumor parameters), and treatment protocols. Some of the data could not have been retrieved due to inconsistent reporting in the archived medical records, especially when initial part of the treatment had been done outside our cancer center. However, these patients haven’t been

excluded from the series given that the disease is rare and omitting could have potential implication on other insights gathered from the available data on these patients.

Numerical data are displayed by arithmetic mean and median, with standard deviation and percentiles. Attributive data are presented in absolute and relative frequencies. The Kolmogorov-Smirnov and Shapiro-Wilkov tests were used to check the data normality. T-test, Mann-Whintey U, and Chi-square test were used to assess the significance of the difference. A Cox proportional regression model was used for survival analysis. Survival curves were defined using the Kaplan-Meier method. In all analyses, $p<0.05$ was considered statistically significant. Statistical analysis was performed using the statistical program SPSS (SPSS for Windows, release 21.0, SPSS, Chicago, IL).

Ethical approval: The subjects' written consent was obtained, according to the Declaration of Helsinki, the study has been approved by competent ethics committee, and conforms to the legal standards.

RESULTS

Between 1997 and 2016, IORS treated 124 male patients with BC, with an average age of 64.29±11.18 years. All patients had a IORS multidisciplinary team (MDT) - tumor board consisting of a medical oncologist, surgeon and radiotherapist - decision for the treatment. Patients initially treated outside our cancer center, in general hospitals, did not undergo the same procedure and there were no MDT decisions, complete evaluation and staging, and some of the data reporting wasn't uniform and standard.

The initial clinical disease stage was unknown in 20/124 (16%) as they had breast lump surgically removed in other institutions, without proper staging and data reporting. In the

available data, most patients were in stages IIa (27.4%) and IIIb (33.9%), with 3.2% of patients in stage IV and just 8.9% in clinical stage I (Table 1). Surgical treatment was performed in 120/124 (97%) of patients; however, data regarding the type of surgery, based on standard surgical nomenclature, were unavailable for 15% (18 out of 120) of patients. Modified Madden radical mastectomy was performed on 70% of patients (Table 2). Pathohistological data were unavailable for 18/124 (14.5%) of patients. The most prevalent pathohistological tumor type was ductal invasive carcinoma, present in 70% of patients (Table 3). Tumor grade II was the most frequently encountered in 88/106 (83%) patients, while grade I and II were evenly distributed in the population (8.1% and 8.2% of patients, respectively). The T2 tumor stage was most frequently encountered in surgically treated patients, followed by the T1 and T4 tumor stages (Table 4). There was an even distribution of patients with negative findings on ipsilateral axillary lymph nodes (N0, 50.6%) and those with metastases (N+, 49.4%). Data regarding tumor receptor expression were available only for 44/124 (35.5%) of patients. Most patients (92.1%) had a positive ER (92.1%) and PR (82.4%) status, while HER2 status was negative (0 or 1+) in 60% of the patients. None of the patients have been treated with neoadjuvant chemotherapy, probably due to the fact that tumors have been previously surgically removed for the pathological verification, in the absence of non-surgical biopsies. Adjuvant chemotherapy was administered in 46/124 (37%) of patients and anti-estrogen therapy in almost two-thirds of patients. Nearly half of the study population (61/124, 48.8%) received local radiotherapy. For the metastatic stage (3.2%) the systemic treatment has been administered based on the available protocols.

Follow-up and treatment outcomes

During the follow-up, one-third of the patients (43/124, 35%) had metastases. The most common were bone metastases (20/43, 47%), followed by visceral (13/43, 30%) and soft-tissue

metastases (10/43, 23%). One-third of patients relapsed (40/124, 32.5%). The median overall survival was 121 months (95% CI: 58.1-183.9) (Figure 1). Median disease-free survival was not reached (Figure 2). Median survival until disease progression was 84 months (95% CI: 58.8-109.1) (Figure 3).

The median survival for patients with initial clinical disease stages I, IIa, and IIIb was not reached, while patients with initial disease stages IIIa, IIIb, and IV had a median survival of 39 months (Figure 4). Patients with T3/T4 tumors had significantly shorter overall survival than those with T1/T2 stages (73 vs. 121 months) (Figure 5). Patients with N+ status had a median survival of 84 months, while the median survival was not reached in patients with the N0 status (Figure 6).

The following potential predictors for overall survival and survival until the disease progression were analyzed: age, initial disease stage (I/IIa/IIb vs. IIIa/IIIb/IV), T stage, N status, ER, PR, and HER2 status, adjuvant therapy (hormonal or systemic). The univariate and multivariate Cox regression analyses for overall survival and survival until the disease progression are shown in Tables 5 and 6 respectively. Positive ER status was identified as the most important and favorable predictor of overall survival. At the same time, the worse initial disease stadium (IIIa/IIIb/IV) was the most important predictor of disease progression.

DISCUSSION

In this study, we have shown the management experience of male BC at the Serbian referral facility for BC treatment (IORS). As male BC is an exceedingly uncommon disease, retrospective studies like this still provide most of our knowledge. In comparison to women, men are diagnosed with BC 100 times less frequently, with a peak incidence occurring at age

67, which is later than for women [1, 6]. The subjects' average age in our study was 64.29±11.18 years, which is comparable to other studies [1, 3, 6-8]. Worldwide, the prevalence of BC in both men and women is rising [1, 5]. BC in females is detected more frequently in the asymptomatic phase, because of advanced screening programs [9]. However, as males are not screened for BC in any country in the world, the disease's incidence in the male population remains obscure and it typically presents in more advanced stages [5]. This is supported by our study, which found that 75% of patients were diagnosed in more advanced clinical stages, and almost 50% of surgically treated patients had metastatic disease present in axillary lymph nodes. Similarly, in a recent study that included a larger population, 46.7% of male patients with BC had metastatic disease in axillary lymph nodes at the time of the diagnosis [6]. Contrary to other studies, however, most of our patients had axillary dissection rather than sentinel lymph node biopsy (SLNB), a highly accurate technique that lowers surgical complications [10]. This is because SLNB is still not performed in most Serbian BC treatment facilities due to technical reasons.

Only 8.9% of the patients in our study had a stage I diagnosis while most patients were in stages II (33.9%) and III (37.3%). A comparable retrospective study conducted in the Czech Republic between 2007 and 2017 found that more patients (37%) had been diagnosed with stage II, and fewer patients (26%) with stage III [7]. Some other studies showed a significantly higher proportion of patients in stage I of the disease (around 37%), which contradicts our findings [6, 11]. This can be explained by a generally lower level of health awareness in our population, the challenges associated with accessing healthcare, and the unavailability of modern diagnostic techniques before 2014. For example, preoperative core needle biopsy (CNB) of suspicious breast lesions became available in IORS only after 2014.

Unlike women with BC, men with BC typically do not undergo sparing operations due to the smaller volume of breast tissue [12]. Although most patients in our study (70%) underwent a modified radical Madden mastectomy, a considerable portion of the patients (10.8%) underwent a sparing procedure. These patients had multiple comorbidities and were not suitable candidates for a more invasive surgical procedure.

Research indicates that male breast cancers are more likely to be of the ductal subtype and to express hormone receptors more frequently than HER2 receptors when compared to female breast cancers [5, 6, 13]. The results of this study are consistent with data from the literature, showing that ductal invasive carcinoma was the most prevalent tumor type in our population (70.2% of cases). While only a small portion of the study population had data on BC receptor expression analysis available, over 80% of the analyzed BCs were hormone-dependent tumors, and 60% were HER2-negative. Similar results were obtained by Bielickova et al. as nearly 90% of their population had hormone-dependent and HER2-negative BCs [7].

Consistent with data from the literature, adjuvant chemotherapy was administered to almost one-third of our patients, two-thirds received adjuvant antiestrogen therapy, and roughly half underwent postoperative radiation [8, 13, 14].

Men with BC generally have a worse prognosis than women with BC [13, 15]. Many studies indicate that BC may be biologically different between sexes even though shorter survival in men may be, to some extent, explained by older age and later stage at diagnosis [1, 3, 13, 15]. In one of the largest studies that compared overall survival in male and female BC, Wang et al. concluded that male patients had significantly higher mortality across all stages [15]. Namely, in men versus (vs.) women, the overall survival rate was 45.8% vs. 60.4%, while 3-year and 5-year survival rates were 86.4% vs. 91.7% and 77.6% vs.86.4%, respectively [15]. Another

recent study showed that males with BC had worse overall survival compared to females with BC when in stages III and IV, while overall survival was similar in early BC stages [16]. In our study, the patients' median overall survival was 121 months (95% CI: 58.1-183.9), and in one-third (32.5%) disease relapsed. These data are comparable with the conclusions of other studies done in Europe [6, 7].

Patients with initial disease stage IIIa, IIIb, or IV had a median survival of 39 months, and this is the most important predictor for disease progression in our study. Patients with T3/T4 tumors had significantly shorter overall survival than those with T1/T2 stage (73 months vs. 121 months). These results are in accordance with the results of other studies [3, 7, 15-17].

In our analysis, positive ER status was the most significant favorable predictor of overall survival. The patients with positive ER status had a 94% lower chance of dying (HR: 0.058; 95% CI: 0.005-0.650, p=0.021). However, in comparison to women, men with ER-positive BC were found to have higher mortality independently of tumor stage [15, 18]. Given that most male BCs express ER-beta whereas most female BCs express ER-alfa, one explanation could be that male BC has a different ER subtype than female BC [13]. ER status is an important predictor of overall survival in males with BC across the other studies [6, 15, 16, 18, 19], but surprisingly not in the research performed by Bielickova et al. where PR status was an independent predictor of overall survival in male BC patients [7]. In our study, PR and HER2 status were insignificant predictors of the overall survival of our patients, which is comparable with the study of Yao et al. [18]. Nevertheless, only a small portion of the BCs in our research had an evaluation of hormone receptor expression. Modern diagnostic procedures should be more widely used in all Serbian centers treating male BC patients, given the effect of this information on overall survival and the decision about the patient's subsequent care. Although the current guidelines recommend using similar algorithms for therapeutic decision-making in

male as in female BC patients, there is widespread concern that only a fraction of male BC patients are currently treated with adjuvant hormonal and radiation therapy [6, 8, 10].

The retrospective nature of the research and the missing data are the limitations of our study. Hopefully implementing the computer system in all medical centers will improve medical research in our country by providing more detailed data.

CONCLUSION

Male BC is a rare disease, but its incidence is rising. In comparison to women, men are typically diagnosed later in life and with more advanced disease. As IORS is the referral center for BC treatment in Serbia, and the fact that there are no systematic registers of this disease in our country, this study mirrors important epidemiological and clinical facts regarding this rare disease in the Serbian population. Our research indicates that patients with ER-positive tumors, who are diagnosed with the disease early and do not have any distant or local metastases have significantly better overall survival rates. Although part of our population did not have access to advanced diagnostic techniques, as they were not available in Serbia until recently, overall, the results we obtained are in line with those of other European centers. It is imperative for all medical centers in Serbia that encounter males with BC to adhere to current oncological guidelines and adopt a customized, multidisciplinary management approach.

ACKNOWLEDGMENTS

The authors thank Ivana Božić Antić, MD, PhD, endocrinologist, working in Euromedik, Department of Endocrinology, for the immense help in conceptualization, writing, and preparing this manuscript for publication.

Conflict of interest: None declared.

REFERENCES

1. Konduri S, Singh M, Bobustuc G, Rovin R, Kassam A. Epidemiology of male breast cancer. Breast. 2020;54:8-14 [DOI:10.1016/j.breast.2020.08.010] PMID: 32866903
2. Miller KD, Nogueira L, Devasia T, Mariotto AB, Yabroff KR, Jemal A, et al. Cancer treatment and survivorship statistics, 2022. CA Cancer J Clin. 2022;72(5):409-36 DOI: 10.3322/caac.21731 PMID: 35736631
3. Gonzalez-Nunez C, Mohar A, Reynoso-Noveron N, Alvarez-Gomez RM, Chavarri-Guerra Y, Aguilar-Villanueva S, et al. Clinical characteristics of male patients with breast cancer in the Latino population. Breast Cancer Res Treat. 2024.Online ahead of print. DOI: 10.1007/s10549-024-07525-1 PMID: 39470849
4. Chen Z, Xu L, Shi W, Zeng F, Zhuo R, Hao X, et al. Trends of female and male breast cancer incidence at the global, regional, and national levels, 1990-2017. Breast Cancer Res Treat. 2020;180(2):481-90 DOI: 10.1007/s10549-020-05561-1 PMID: 32056055
5. Gucalp A, Traina TA, Eisner JR, Parker JS, Selitsky SR, Park BH, et al. Male breast cancer: a disease distinct from female breast cancer. Breast Cancer Res Treat. 2019;173(1):37-48 [DOI:10.1007/s10549-018-4921-9] [PMID: 30267249
6. Cardoso F, Bartlett JMS, Slaets L, Van Deurzen CHM, Van Leeuwen-Stok E, Porter P, et al. Characterization of male breast cancer: results of the EORTC 10085/TBCRC/BIG/NABCG International Male Breast Cancer Program. Annals of Oncology. 2018;29(2):405-17 [DOI: 10.1093/annonc/mdx651] [PMID: 29092024
7. Bielcikova Z, Holanek M, Selingerova I, Sorejs O, Kolarova I, Soumarova R, et al. Treatment and Prognosis of Male Breast Cancer: A Multicentric, Retrospective Study Over 11 Years in the Czech Republic. Oncologist. 2024;29(6):e750-e62 [DOI: 10.1093/oncolo/oyae031] [PMID: 38431780]
8. Lee J, Lee KS, Sim SH, Chae H, Sohn J, Kim GM, et al. Impacts of Subtype on Clinical Feature and Outcome of Male Breast Cancer: Multicenter Study in Korea (KCSG BR16-09). Cancer Res Treat. 2023;55(1):123-35 [DOI: 10.4143/crt.2021.1561] [PMID: 35344650]
9. Majstorovic N, Simic S, Matejic B, Cudanov M. Assessment of required resources for implementation of national breast cancer screening program in Serbia. Srp Arh Celok Lek. 2014;142(1-2):59-66 [DOI: 10.2298/sarh1402059m] [PMID: 24684033]
10. Cardoso F, Kyriakides S, Ohno S, Penault-Llorca F, Poortmans P, Rubio IT, et al. Early breast cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-updagger. Ann Oncol. 2019;30(8):1194-220 [DOI:10.1093/annonc/mdz173] PMID: 31161190
11. Scott-Conner CE, Jochimsen PR, Menck HR, Winchester DJ. An analysis of male and female breast cancer treatment and survival among demographically identical pairs of patients. Surgery. 1999;126(4):775-80 [PMID: 10520928]
12. Khan NAJ, Tirona M. An updated review of epidemiology, risk factors, and management of male breast cancer. Med Oncol. 2021;38(4):39 [DOI: 10.1007/s12032-021-01486-x] PMID: 33721121
13. Zheng G, Leone JP. Male Breast Cancer: An Updated Review of Epidemiology, Clinicopathology, and Treatment. J Oncol. 2022;2022:1734049 [DOI: 10.1155/2022/1734049] [PMID: 35656339]
14. Duso BA, Trapani D, Marra A, D'Amico P, Guerini Rocco E, Fusco N, et al. Pharmacological management of male breast cancer. Expert Opin Pharmacother. 2020;21(12):1493-504 [DOI: 10.1080/14656566.2020.1763305] [PMID: 32496137]
15. Wang F, Shu X, Meszoely I, Pal T, Mayer IA, Yu Z, et al. Overall Mortality After Diagnosis of Breast Cancer in Men vs Women. JAMA Oncol. 2019;5(11):1589-96 [DOI: 10.1001/jamaoncol.2019.2803] [PMID: 31536134]
16. Leone J, Zwenger AO, Leone BA, Vallejo CT, Leone JP. Overall Survival of Men and Women With Breast Cancer According to Tumor Subtype: A Population-based Study. Am J Clin Oncol. 2019;42(2):215-20 [DOI: 10.1097/COC.0000000000000497] PMID: 30499840
17. Isik D, Kinikoglu O, Turkoglu E, Surmeli H, Buyukmurat N. Male breast cancer in a single-center experience: Diagnosis, clinicopathological features, and treatment strategies. North Clin Istanb. 2024;11(5):434-9 [DOI: 10.14744/nci.2024.32815] PMID: 39431041
18. Yao N, Shi W, Liu T, Siyin ST, Wang W, Duan N, et al. Clinicopathologic characteristics and prognosis for male breast cancer compared to female breast cancer. Sci Rep. 2022;12(1):220 [DOI: 10.1038/s41598-021-04342-0] PMID: 34997151
19. Huang M, Xiao J, Yan C, Ling R, Wang T. Clinicopathologic Features and Prognoses of Male Patients With Breast Cancer. Am J Mens Health. 2024;18(5):15579883241284981 [DOI: 10.1177/15579883241284981] PMID: 39365001

Table 1. Initial clinical disease stage in the study population

Initial clinical disease stage	**N (%)***
I	11 (8.9)
IIa	34 (27.4)
IIb	8 (6.5)
IIIa	5 (4.0)
IIIb	42 (33.9)
IV	4 (3.2)
Unknown	20 (16.1)
Total	124 (100)

Table 2. Types of surgery performed in the patients eligible for surgical treatment

Type of surgery	**N (%)**
Modified radical mastectomy - Madden	84 (70)
Simple mastectomy	5 (4.2)
Sparing surgery	13 (10.8)
Unknown	18 (15)
Total	120 (100)

Table 3. Pathohistological tumor types in our study population

Pathohistological tumor type	**N (%)**
Ductal invasive carcinoma	87 (70.2)
Lobular invasive carcinoma	8 (6.5)
Tubular carcinoma	1 (0.8)
Medullary carcinoma	1 (0.8)
Mixed DCI + LCI	4 (3.2)
DCIS	4 (3.2)
Multiple carcinomas	1 (0.8)
Unknown	18 (14.5)
Total	124 (100)

Table 4. Frequency of tumor sizes in our study population

Tumor size (pT)	**N (%)**
T1	34 (27.4)
T2	39 (31.5)
T3	3 (2.4)
T4	21 (16.9)
Unknown	27 (21.7)
Total	124 (100)

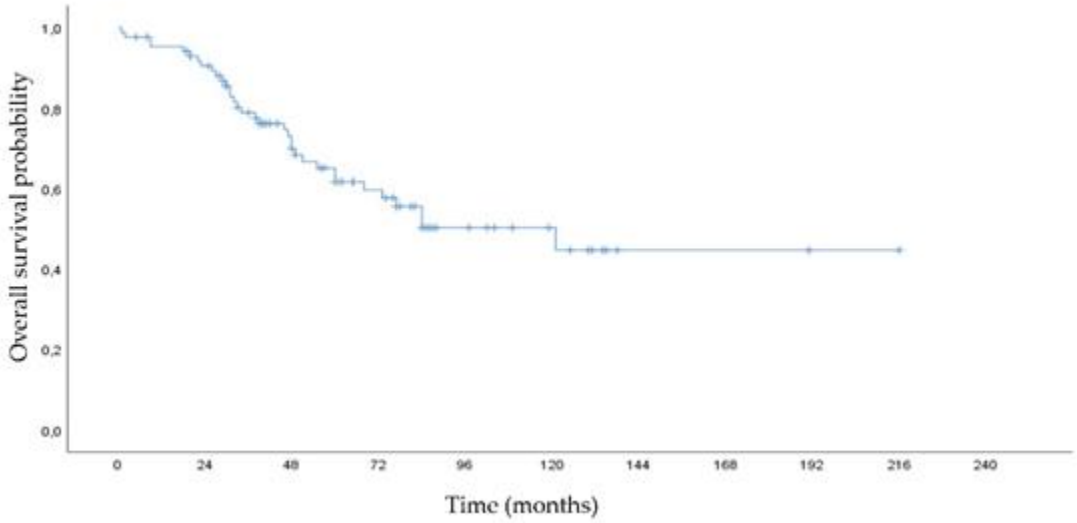

Figure 1. Overall patient survival in the study population

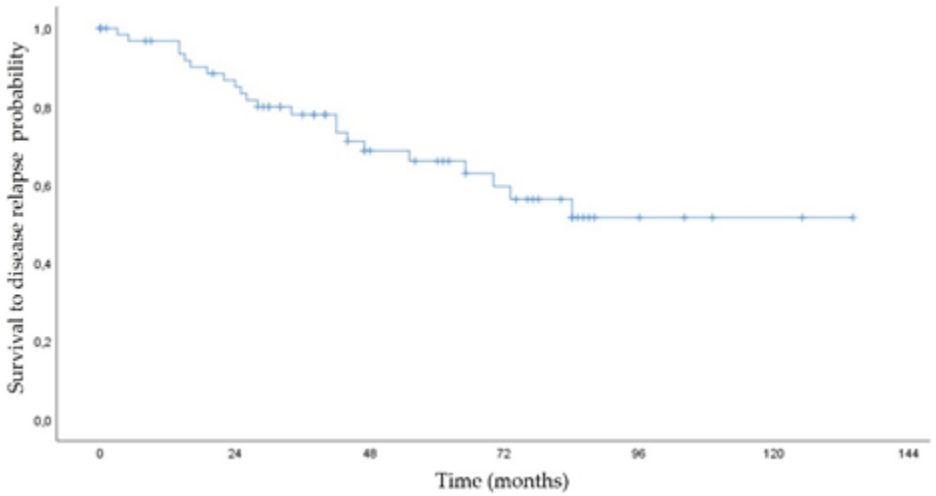

Figure 2. Survival to disease relapse in the study population

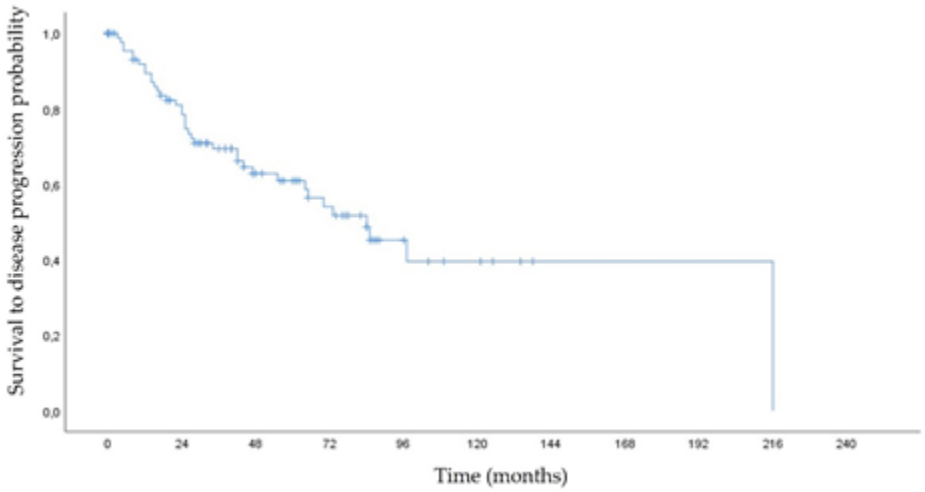

Figure 3. Survival to disease progression in the study population

Table 5. Univariate and multivariate Cox regression analysis of overall survival in male breast cancer patients

Univariate regression analysis	**HR**	**95% CI**	**p**
Initial disease stadium	6.367	2.603-15.573	**<0.001**
Pathohistological T stadium	2.316	1.050-5.107	**0.041**
Pathohistological N stadium	1.012	1.001-1.022	**0.027**
Distant metastasis	3.447	1.646-7.217	**0.001**
Positive ER status	0.097	0.025-0.375	**0.001**
Adjuvant therapy	0.417	0.210-0.828	**0.012**
Adjuvant hormonal therapy	0.413	0.208-0.820	**0.012**
Systemic therapy	3.899	1.671-0.099	**0.002**
Multivariate regression analysis			
Positive ER status	0.058	0.005-0.650	**0.021**

Table 6. Univariate and multivariate Cox regression analysis of survival to disease progression in male breast cancer patients

Univariate regression analysis	**HR**	**95% CI**	**p**
Initial disease stadium	3.637	1.717-7.703	**0.001**
Positive ER status	0.251	0.070-0.903	**0.034**
Adjuvant therapy	0.478	0.244-0.935	**0.031**
Multivariate regression analysis			
Initial disease stadium	3.620	1.008-13.003	**0.049**

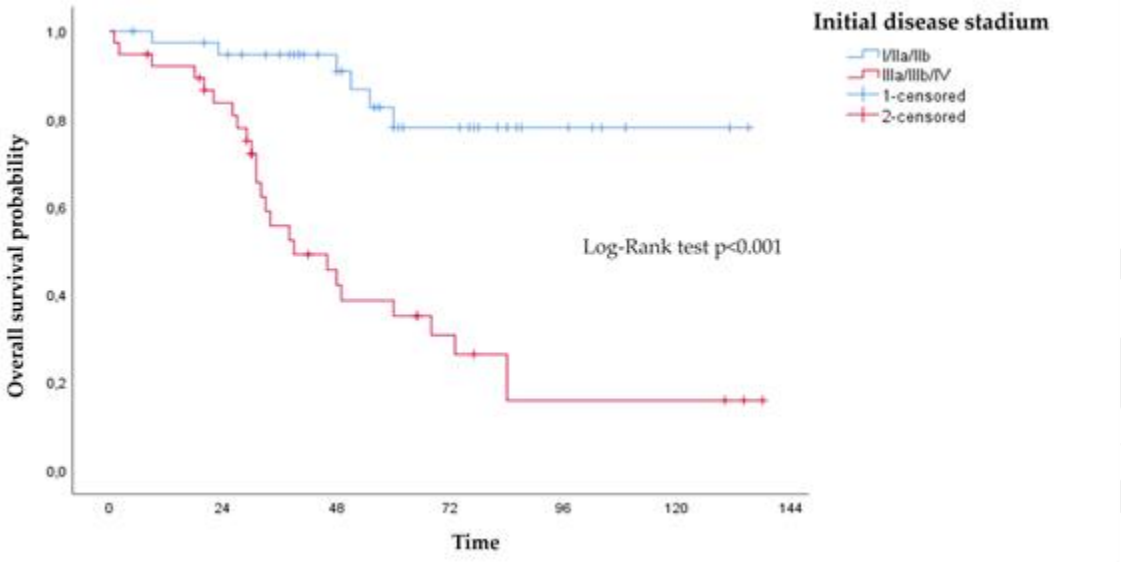

Figure 4. Kaplan-Meier curve of overall survival concerning disease stage

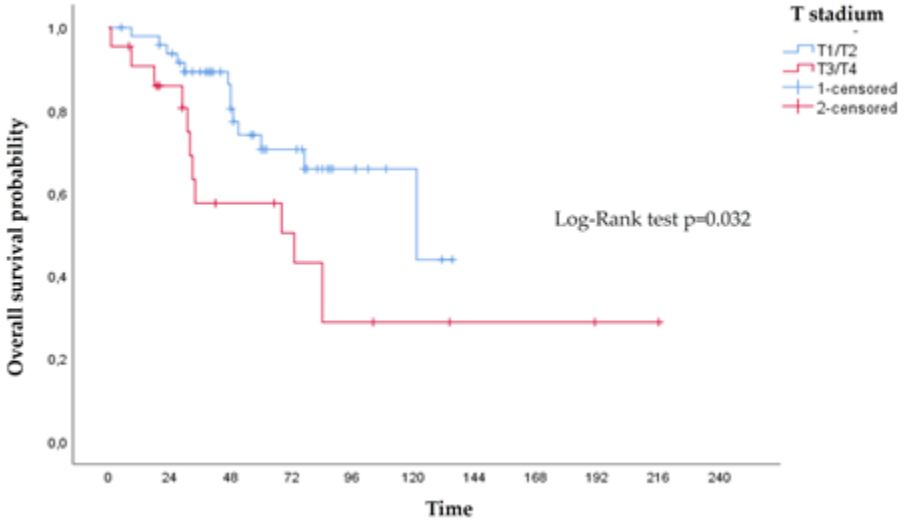

Figure 5. Kaplan-Meier curve of overall survival in relation to tumor size

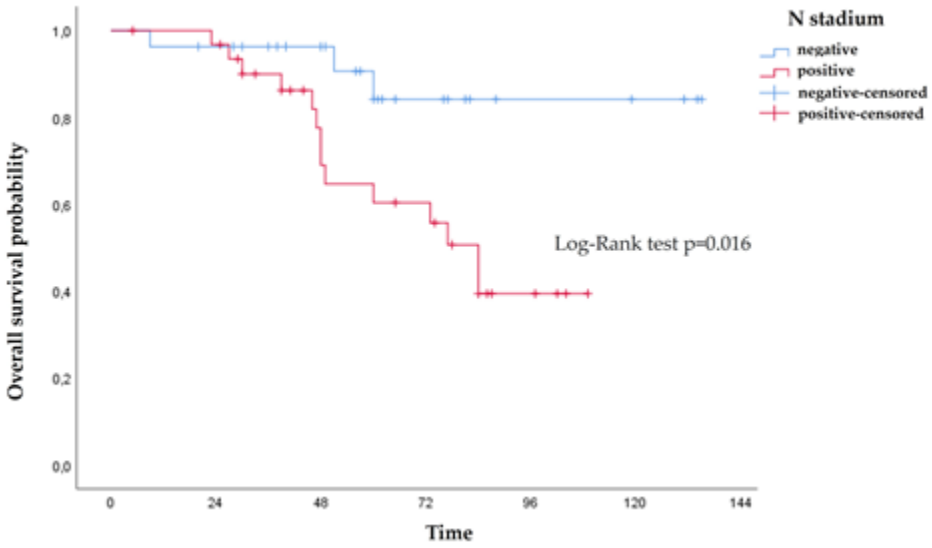

Figure 6. Kaplan-Meier curve of overall survival concerning axillary lymph node status

