

Primary Breast Sarcoma: A Retrospective Single Institution Study of Clinicopathologic Features, Treatment and Prognosis

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Introduction

- Primary breast sarcomas (PBS) are a rare and heterogeneous group of cancers with limited research, publications and treatment algorithms.
- Previous PBS studies showed that the median overall survival was 108 months.
- Reports using SEER data cannot report on many of the clinicopathologic features of the tumor that may affect outcome, such as surgical margins, and treatment specifics.
- Single institution studies have been performed; however, these have been small due to the rarity of these malignancies.

Objective

- To determine factors associated with survival of primary breast sarcoma patients at a single institution.
- To develop a database of primary breast sarcoma cases from a single institution.

Methods

- Retrospective review of data on patients with:**
 - Primary breast sarcoma
 - Underwent primary surgery at MD Anderson Cancer Center from 01/2000 to 12/2020
- Statistical analysis:**
 - Univariable and multivariable Cox hazard-ratio modeling.
- Clinicopathologic factors examined included:**
 - Patient demographics
 - Clinical features
 - Pathological features
 - Treatment strategies

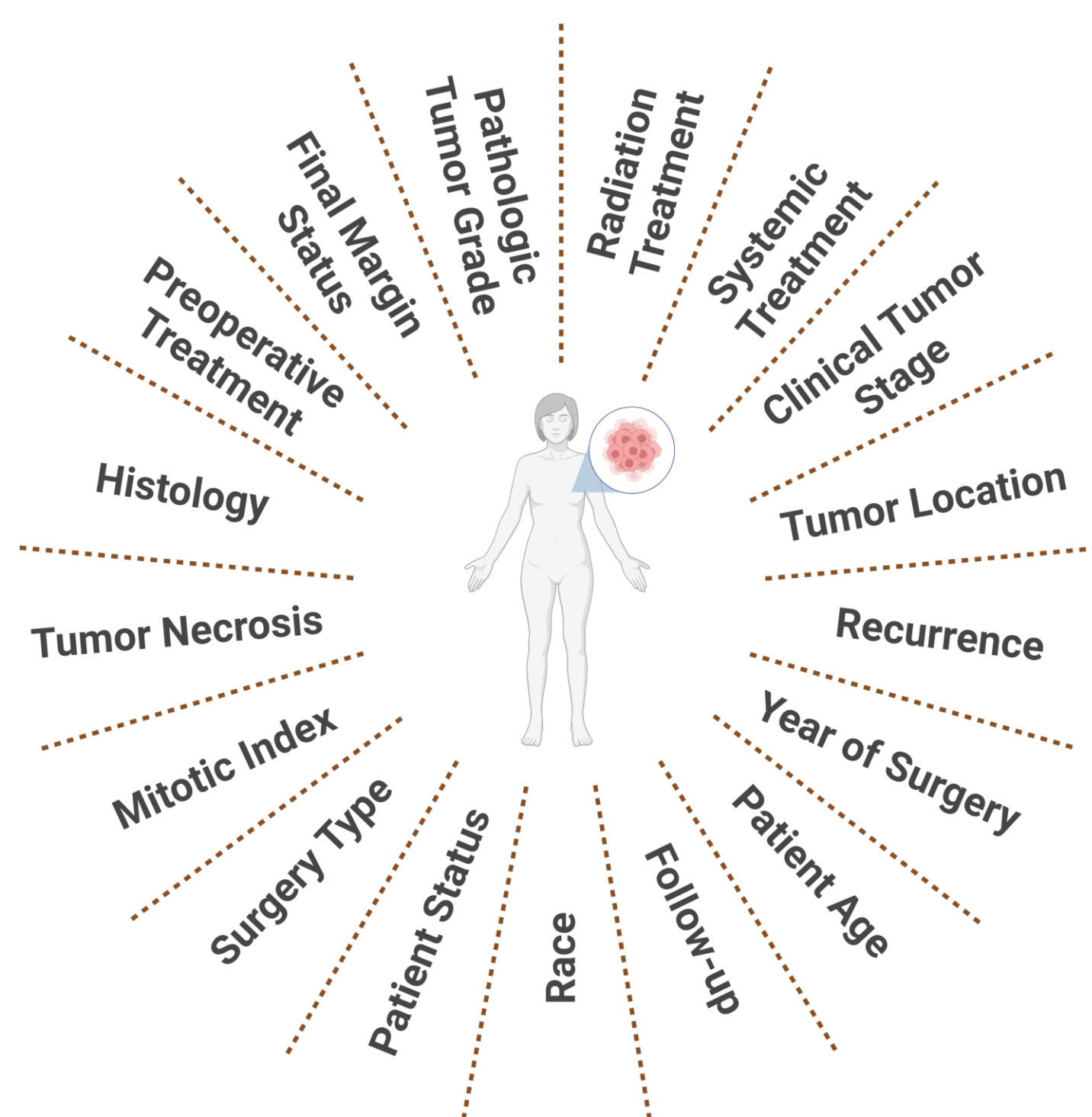


Figure 1. Patient demographics and tumor characteristics examined.

Results

Variables	PBS (%) N=34	RIS (%) N=28
Race		
White or Caucasian	28 (82.4)	21 (75)
Other	6 (17.6)	7 (25)
Age at diagnosis, year		
Mean	55	62
Median (range)	57.5 (21-86)	67 (31-80)
Clinical LN involved		
No	28 (82.4)	27 (96.4)
Yes	6 (17.7)	1 (3.6)
Tumor location		
Central	3 (8.8)	3 (11.1)
Inner	7 (20.6)	7 (25.9)
Outer	14 (41.2)	12 (44.4)
Other	10 (29.4)	5 (18.5)
Method of diagnosis		
FNA/core biopsy	30 (88.2)	22 (78.6)
Excisional/incisional biopsy	4 (11.8)	6 (21.4)
Type of surgery		
Segmental mastectomy	11 (32.4)	1 (3.6)
Total mastectomy	23 (67.7)	27 (96.4)
Preoperative treatment		
None	14 (41.2)	8 (28.6)
Chemotherapy/radiation	20 (58.8)	20 (71.4)
Tumor histology		
Angiosarcoma	3 (8.8)	14 (50)
Phyllodes	7 (20.6)	0
Spindle cell sarcoma	4 (11.8)	10 (35.7)
Others	20 (58.8)	4 (14.3)
Tumor necrosis		
No	7 (25.9)	6 (33.3)
Yes	20 (74.1)	12 (66.7)
Final tumor size, cm		
Mean	7	4.1
Median (range)	4.6 (0-28.3)	4 (0-10.8)
Mitotic index, mitoses per 10 HPF		
0-9	7 (35)	7 (50)
10-19	4 (20)	3 (21.4)
>19	9 (45)	4 (28.6)
Tumor grade		
G1	1 (2.9)	1 (3.7)
G2	3 (8.8)	2 (7.4)
G3	24 (70.6)	15 (55.6)
GX	6 (17.7)	9 (33.3)
Pathological LN involvement		
No	32 (94.1)	28
Yes	2 (5.9)	0
Adjuvant chemotherapy		
No	25 (73.5)	21 (75)
Yes	9 (26.5)	7 (25)
Adjuvant radiation therapy		
No	23 (67.7)	27 (96.4)
Yes	11 (32.4)	1 (3.6)
Final margin		
Close (<5mm)	8 (24.2)	10 (35.7)
Negative	21 (63.6)	15 (53.6)
Positive	4 (12.1)	3 (10.7)
Follow up time (month)		
Mean	46.4	59
Median (range)	37.6 (0.4-129.6)	56.3 (2.3-143.0)
OS		
No	25 (73.5)	16 (57.1)
Yes	9 (26.5)	12 (48.9)
DDS		
No	27 (79.4)	28
Yes	7 (20.6)	0
LRR		
No	30 (88.2)	20 (71.4)
Yes	4 (11.8)	8 (28.6)

Abbreviations: LN = lymph node, cm = centimeter(s), HPF = high-power field, GX = unknown/unclassified grade, mm = millimeter(s), OS = overall survival, DSS = disease-specific survival, LRR = locoregional recurrence.

Table 1. Characteristics of patients with primary breast sarcoma (PBS, N=34) and radiation-induced breast sarcoma (RIS, N=28).

Variables	HR	p	95% CI
Final tumor size	1.1	0.03	1.02 1.2
Excisional/ Incisional biopsy	20.4	0.003	2.7 152.6
Type of surgery	---	NS	---
Preoperative treatment	---	NS	---
Adjuvant chemotherapy	---	NS	---
Adjuvant radiation therapy	---	NS	---

Table 2. Multivariable analysis for factors associated with overall survival in patients with PBS.

Variables	HR	p	95% CI
Final tumor size	1.3	0.007	1.1 1.5
Excisional/ Incisional biopsy	152.3	0.005	4.6 5026.2
Type of surgery	---	NS	---
Preoperative treatment	---	NS	---
Adjuvant chemotherapy	---	NS	---
Adjuvant radiation therapy	---	NS	---

Table 3. Multivariable analysis for factors associated with DSS in patients with PBS.

Variables	HR	p	95% CI
Positive final margin	10.3	0.02	1.4 78.6
Type of surgery	---	NS	---
Preoperative treatment	---	NS	---
Adjuvant chemotherapy	---	NS	---
Adjuvant radiation therapy	---	NS	---

Table 4. Multivariable analysis for factors associated with LRR in patients with PBS.

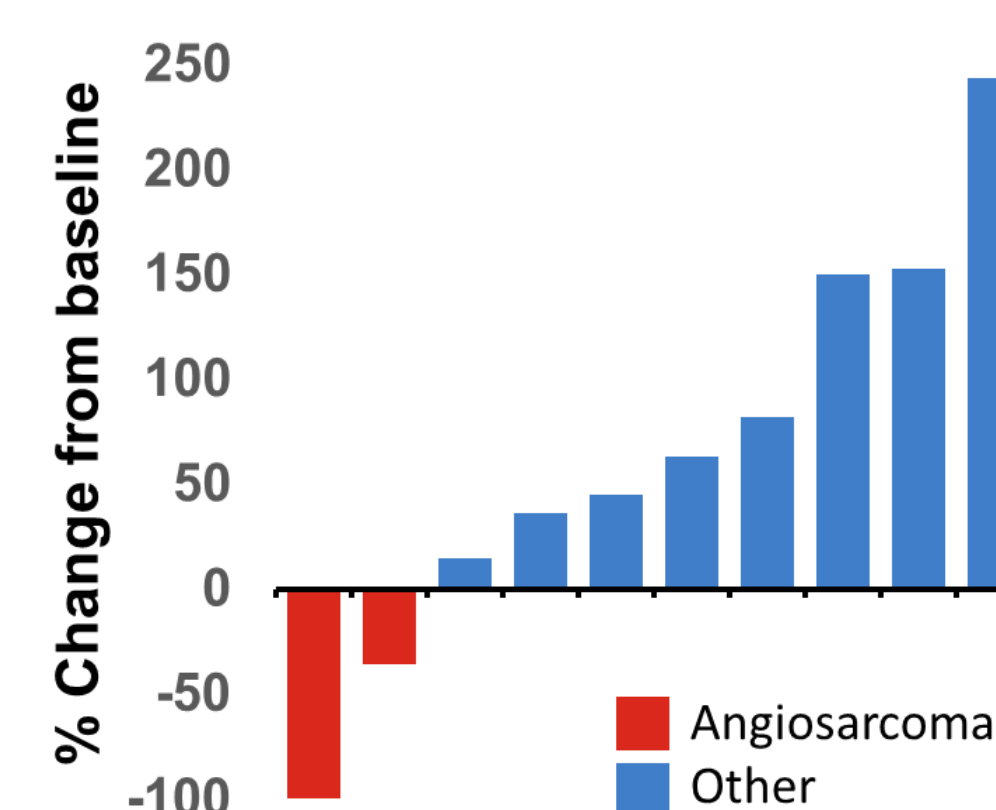


Figure 2. Waterfall plot showing percent change in tumor size from clinical size to pathologic size in PBS patients with neoadjuvant chemotherapy (NAC) (n=10).

Discussion

- Final tumor size was the only factor significantly associated with poor prognoses for PBS patients (HR: 1.1, p : 0.03).
- Excisional/incisional biopsy was found to be a significant factor associated with OS (p : 0.003), and positive margins were found to be significantly associated with LRR (p : 0.02); however, the data is unreliable as the confidence interval is too wide in range as a result of minimal data.
- No clinicopathological factors were found to be significantly associated with outcomes for breast sarcomas that were radiation-induced.
- There was no significant difference in OS, DSS or LRR based on different treatment strategies (type of surgery, neoadjuvant or adjuvant treatment).
- Preliminary data suggested that NAC was not effective in patients with PBS, except possibly in the cases of angiosarcoma.

Conclusion

Our data confirms that increased tumor size is associated with decreased survival for patients with PBS. Interestingly, our data also suggests that different treatment strategies did not affect patient outcomes. However, more patients are needed in the database to make the results more significant due to the inherent heterogeneity of breast sarcomas.

Future Steps

- Include more patients to expand database, resulting in better reliability.
- Identify genetic mutations that could be associated with outcomes in breast sarcomas and provide better insight into mechanism of disease progression.
- Determine factors that select patients for the most effective clinical protocols for the treatment of their primary breast sarcoma.
- Find alternative and better-targeted strategies for primary breast sarcoma patients.

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