Sarcomas of the Breast

Mallory A. Duncan, MD[a], Meeghan A. Lautner, MD, MSc[b,*]

KEYWORDS

• Breast sarcoma • Angiosarcoma • Radiation-associated sarcoma
• Radiation-induced sarcoma

KEY POINTS

- Sarcoma of the breast is very rare.
- Diagnosis of breast sarcoma is similar to that of invasive or in situ breast cancer, but treatment is very different with fewer options.
- Angiosarcoma of the breast after radiation treatment of invasive or in situ carcinoma is also rare, but incidence may begin to increase with increasing use of breast-conservation therapy.

INTRODUCTION

Sarcomas of the breast are a rare and diverse group of mesenchymal-derived malignancies with unique natural history, treatment, and prognosis compared with the more common carcinoma-type malignancies of the breast. Primary breast sarcomas account for less than 1% of all breast malignancies and less than 5% of all sarcomas.[1] The estimated incidence is 4.6 new cases per million women per year.[2] Because of the rarity of this disease and the inherently small number of cases, no prospective randomized controlled studies have been feasible. Instead, the knowledge and common clinical practices relating to this rare and potentially aggressive disease process are largely guided by small population retrospective studies, case reports, and extrapolated data from larger prospective studies on extremity soft tissue sarcomas.[3] This article highlights the unique considerations in clinical presentation, diagnosis, treatment, and prognosis of breast sarcoma.

CAUSE AND RISK FACTORS

Breast sarcomas are nonepithelial tumors arising from the mesenchymal tissue of the breast.[4] Sarcomas of the breast comprise a variety of subtypes and can be a challenge to diagnose initially because they mimic benign breast disease or benign

Disclosure Statement: The authors have nothing to disclose.
[a] Department of General Surgery, UT Health San Antonio, 7703 Floyd Curl Drive, Mail Code 7737, San Antonio, TX 78229, USA; [b] Department of Surgery, University at Buffalo, 100 High Street, C317, Buffalo, NY 14203, USA
* Corresponding author.
E-mail address: meeghanl@buffalo.edu

Surg Clin N Am 98 (2018) 869–876
https://doi.org/10.1016/j.suc.2018.03.013
surgical.theclinics.com

cutaneous disease. Most primary breast sarcomas present in women in their fourth to sixth decade of life as a unilateral, large, painless, solitary, mass that grows rapidly and may be difficult to differentiate from a fibroadenoma.[5] The size of the mass at the time of diagnosis is on average from 3 to 5 cm, but it can range from 1 to 20 cm. There is no known predisposition for laterality or quadrant of the breast. Other concerning signs, such as nipple discharge, nipple inversion, and skin retraction or dimpling (excluding angiosarcomas), are rarely seen.[5] Unlike epithelial carcinomas of the breast, which metastasize via lymphatic spread, breast sarcomas demonstrate hematologic metastasis most commonly to the lungs, bones, and liver.

TYPES OF SARCOMA OF THE BREAST

Primary breast sarcomas arise from the hormone-responsive periductal stroma and are referred to as stromal sarcomas.[6,7] The other subtypes of primary breast sarcomas are named based on their type of cell origin and include angiosarcoma, fibrosarcoma, leiomyosarcoma, osteosarcoma, liposarcoma, chondrosarcoma, malignant histiocytoma, and Kaposi sarcoma. Of the primary breast sarcomas, angiosarcoma is the most common subtype.[8] Therefore, this article provides a review of primary breast sarcomas with specific emphasis on angiosarcoma. The overall most common type of breast sarcoma is secondary breast sarcoma, particularly secondary angiosarcoma, which is closely associated with previous high doses of radiation, particularly adjuvant radiation therapy for breast carcinoma and mantle radiation for treatment of Hodgkin lymphoma.[9] The risk of secondary angiosarcoma increases with higher dose of radiation, radiation therapy concurrent with chemotherapy, radiation exposure in childhood, and genetic conditions like BRCA-1.[10] BRCA mutations may result in a genetic predisposition to radiation-associated sarcoma development because BRCA-1 and -2 are DNA repair genes, and high doses of radiation in mutation carriers would allow a rare escape from cell death and formation of secondary tumors.[11]

ANGIOSARCOMA

Angiosarcomas are malignant vascular neoplasms of the breast that can have an aggressive clinical course with higher recurrence rates and lower overall survival that the other sarcoma subtypes.[5] Angiosarcoma of the breast is very rare with an overall incidence of 0.002% to 0.05% and can be divided into 2 types. Primary breast angiosarcoma arises from the breast parenchyma, but its cause is not well known. Secondary breast angiosarcoma, whose incidence is 0.01% to 0.02% per year, is thought to arise as a result of the breast radiation component of treatment of ductal carcinoma in situ or invasive carcinoma.[12] These lesions arise from the dermis, are less likely to involve the underlying breast tissue, and are often confused with benign cutaneous cause.[13,14] The cause is related to double-stranded DNA damage caused by radiation, which then results in genome instability that may lead to sarcoma development.[11]

Primary angiosarcoma of the breast typically occurs in young women aged 30 to 40 and will present as an ill-defined breast mass within the parenchyma, which is usually high grade.[5,14] Diagnosis is made by an abnormal mammogram, ultrasound, or MRI resulting in a core biopsy. A single-institution retrospective review performed by the MD Anderson Cancer Center identified that radiation therapy–naive angiosarcoma of the breast occurred in younger patients who were more likely to have distant metastasis at presentation. The early outcomes for these patients were more favorable compared with the patients who had received prior radiation therapy; however, the late overall survival was not statistically different.[12] Treatment modalities for the patients with primary angiosarcoma varied among type of surgery and adjuvant therapy