MAR Clinical Case Reports (2026) 7:3

Case Report

Radiation Induced Sarcoma in a Patient Treated for Primary Breast Cancer

Anam Mumtaz * [1], Bushra Rehman [2]

***Correspondence to**: Anam Mumtaz. Shaukat Khanum Memorial Cancer Hospital and Research Centre.

Received: 06 March 2026

Published: 01 April 2026

DOI: https://doi.org/10.5281/zenodo.19352461

Abstract

Introduction:

Radiation-induced sarcoma (RIS) is a rare, aggressive malignancy. Breast cancer survivors treated with radiotherapy constitute a large fraction of RIS patients. Literature says the 5-year survival rate of RIS patients was in the range of 27%–48%.Their rarity make the treatment strategy difficult to implicate.

***Purpose**:*

The aim of this study was to report how patient may present with radiation-induced malignancy and how they respond to 2nd or 3rd line therapy

CASE:

48 years old patient diagnosed as T2N1M0 stage IDC grade III. She was given adjuvant chemo and radiotherapy. After remaining 4 years in remission she presented with anterior chest wall mass more towards axillary tail region which turn out to be biopsy proven spindle cell sarcoma. Patient staging workup showed left adrenal gland replaced by mass which showed spindle cell malignancy on core biopsy. Patient was put on 2nd line chemotherapy to which tumor responded poorly and progressed. Currently she is on third line chemotherapy for radiation induced sarcoma.

Conclusion:

Radiation induced sarcoma is a rare but known complication of radiotherapy given as a part of cancer treatment. The role of chemotherapy for RIS remains ambiguous. No level 1 or 2 studies are available to address this question for RIS because of the rarity of this disease. Treatment of metastatic or irresectable disease is, at present, inadequate.

Case

48 years old, Asian female ,married ,having two children, peri-menopausal ,no known co-morbidities and strong family history of cancer (elder sister diagnosed with breast cancer at the age of 40 years, survived for 8 years after treatment ,died 7 years ago because of relapse, mother died of brain tumor 30 years ago),presented at out institute with history of left breast lump for 3 weeks.After complete workup she was staged according to AJCC T2N1M0.After breast conserving surgery and axillary lymphnode dissection she was offered standard chemotherapy,Later she received radiation to breast and supraclavicular fossa (radiation dose 250 cgy 21 fractions). After radiation she completed her 20 cycles of Herceptin. She remained in remission for 3 and a half year. Annual mammogram was unremarkable. Clinical examination showed skin thickening attributed to post radiotherapy changes.

After 4 years she presented in outpatient department with mass in chest wall. On examination there was mass on anterior chest wall in upper middle part of breast, approximately 5 x5 cm in size with skin eruptions.

CT scan was done for staging showed mass at left chest wall and a large retroperitoneal mass due obscuring left adrenal gland. Chest wall mass and adrenal mass was subjected to core needle biopsy. Histopathology of both left adrenal gland and left chest wall lesion revealed same mesenchymal tumor composed of pleomorphic spindle cells arranged in fascicles with interspersed numerous giant cells. The spindle cells had abundant eosinophilic cytoplasm, vesicular nuclei, and prominent nucleoli. The spindle cells showed moderate to marked atypia and 6-7mitoses/10HPF (figure 1 ,2 &3). An extensive panel of immunohistochemical stains were performed to determine lineage of cells.

The tumor cells showed focal positivity for desmin , GATA 3 and diffuse positivity for caldesmon and p16. The tumor cells were negative for cytokeratin. In view of desmin and caldesmon positivity and cytokeratin negativity, sarcoma with myogenic differentiation was favored. Figure (4,5,6,&7)

Mutidisciplinary team meeting concluded that it was a case of radiation induced sarcoma. Patient was offered second line chemotherapy consisting of GEM/DOCE – after 3 cycles mass still progressed. Patient chemotherapy was switched to IFOS. Patient is not responding to this regimen either, She developd bone and lungs metastasis despite 3rd line chemotherapy.

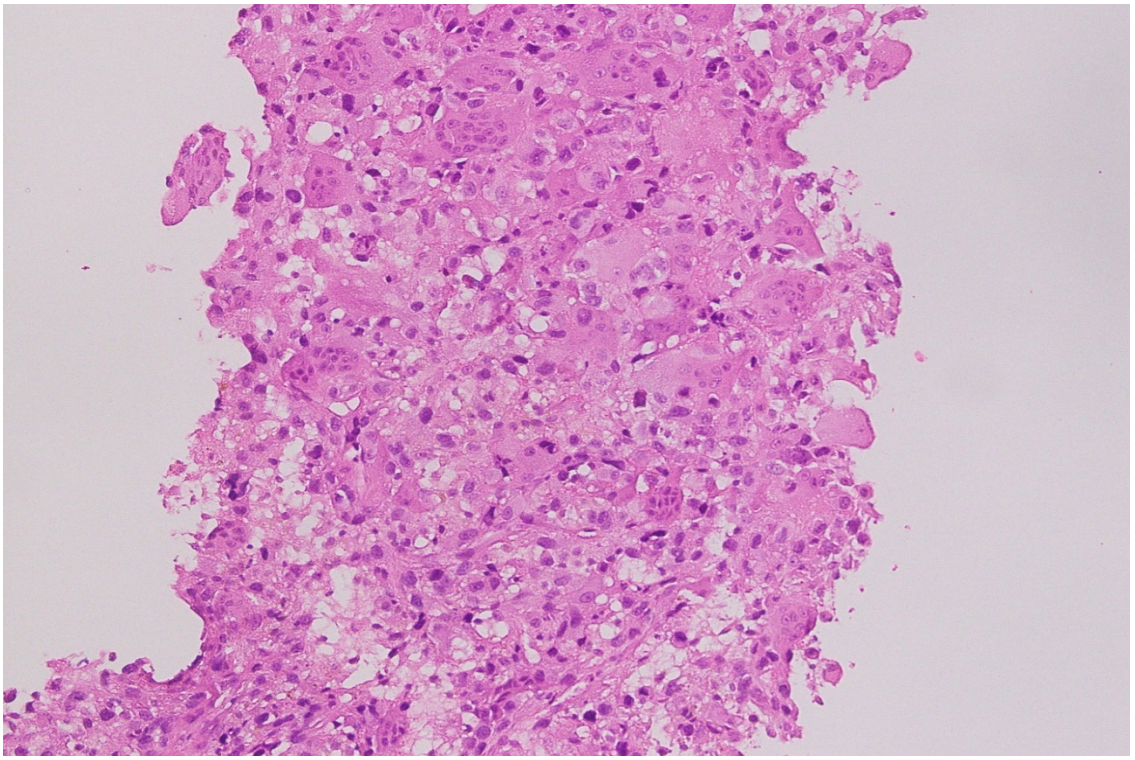

Figure 1 : Adrenal lesion (H&E stain 20X) the tumor shows pleomorphic spindle cells arranged in fascicles with interspersed numerous giant cells, moderate atypia and 6-7mitosis/10HPF.

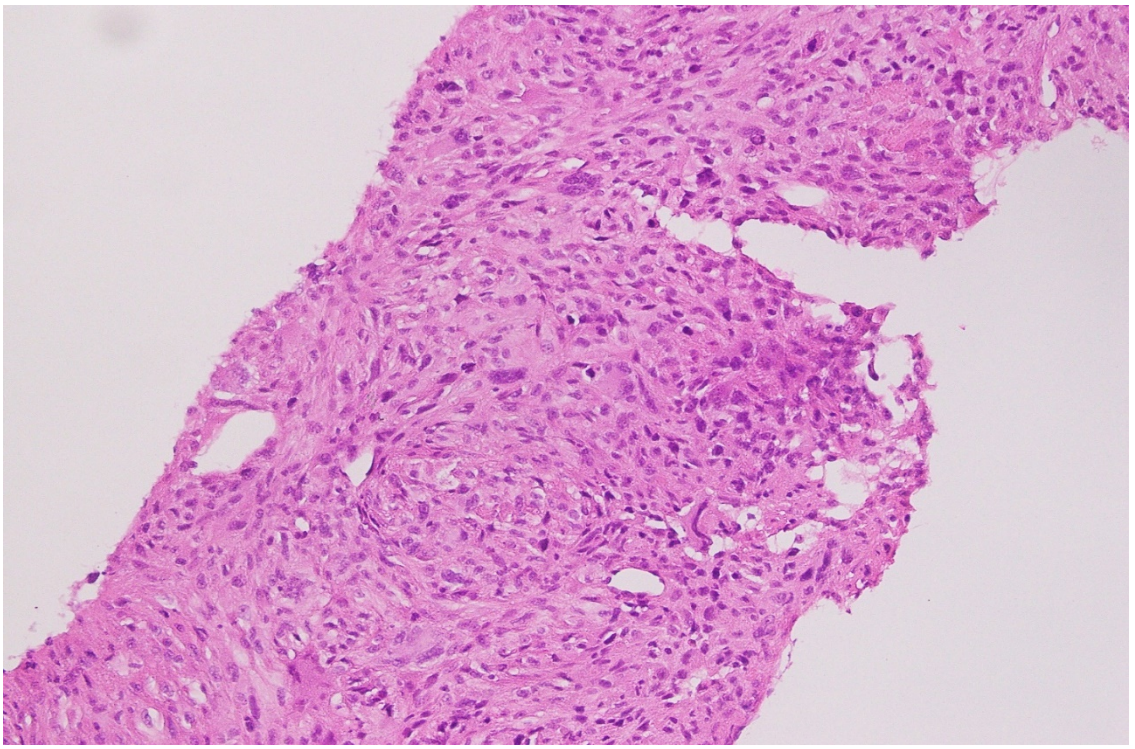

Figure 2: Anterior chest wall (H & E stain 20X) Similar morphology as adrenal lesion.

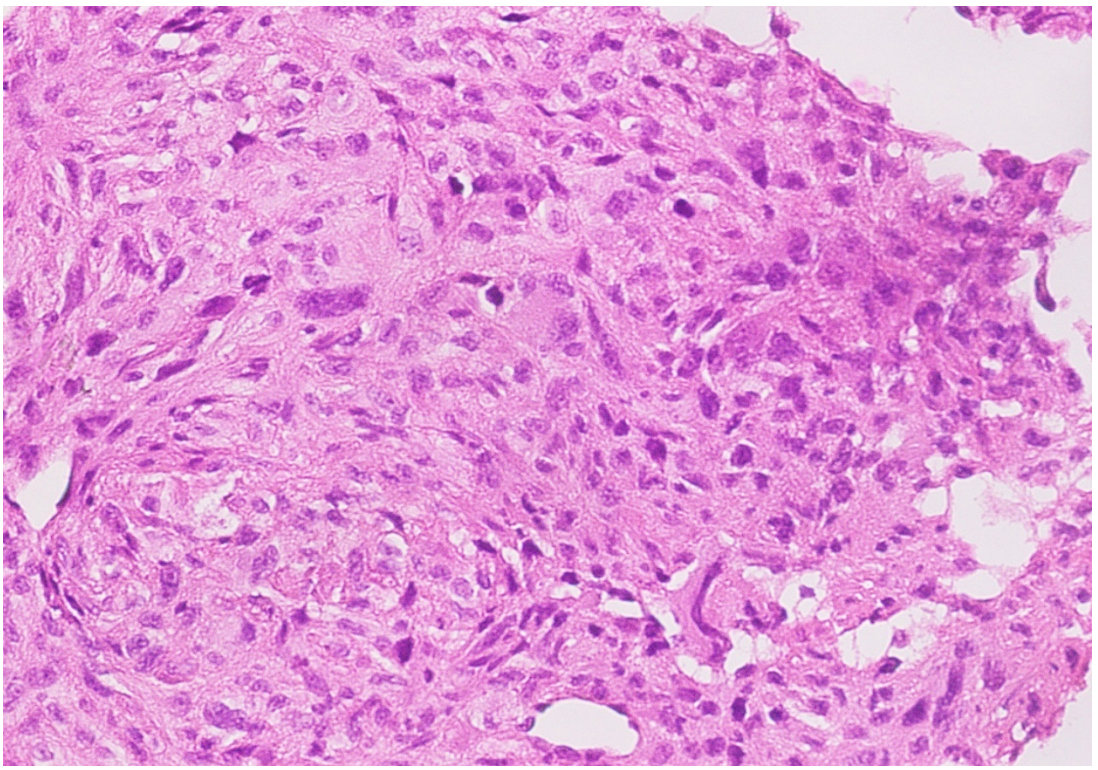

Figure 3: Anterior chest wall (H & E stain 40X)

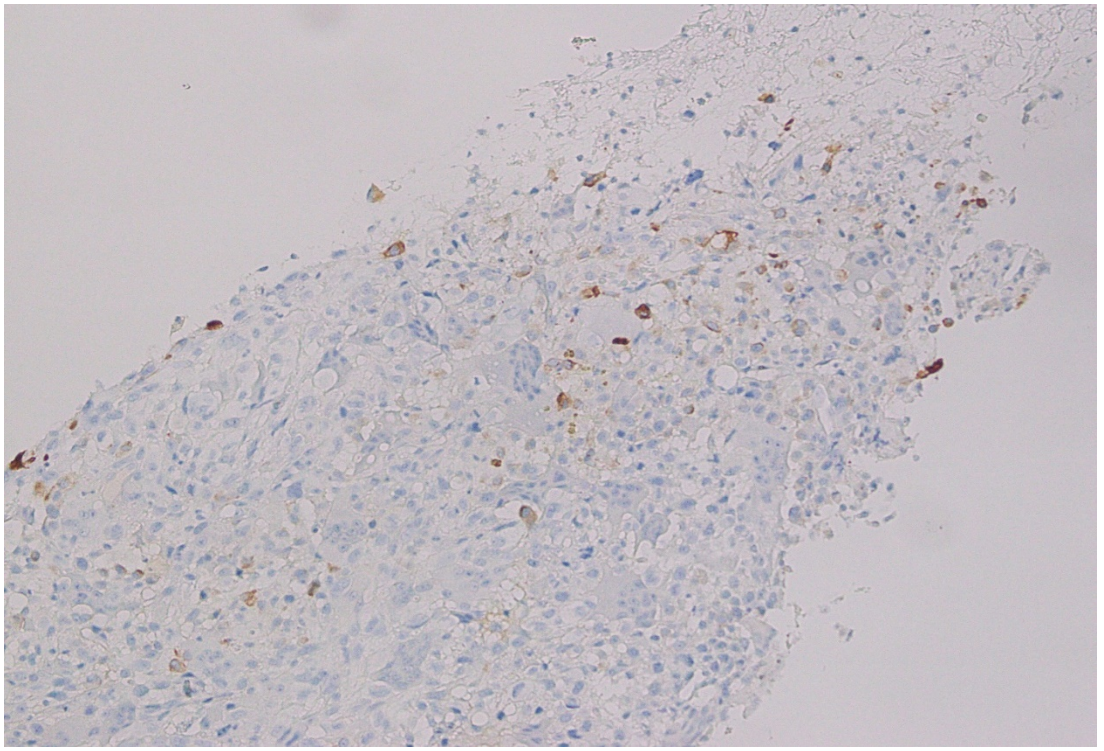

Figure 4: Desmin is focal positive in tumor cells

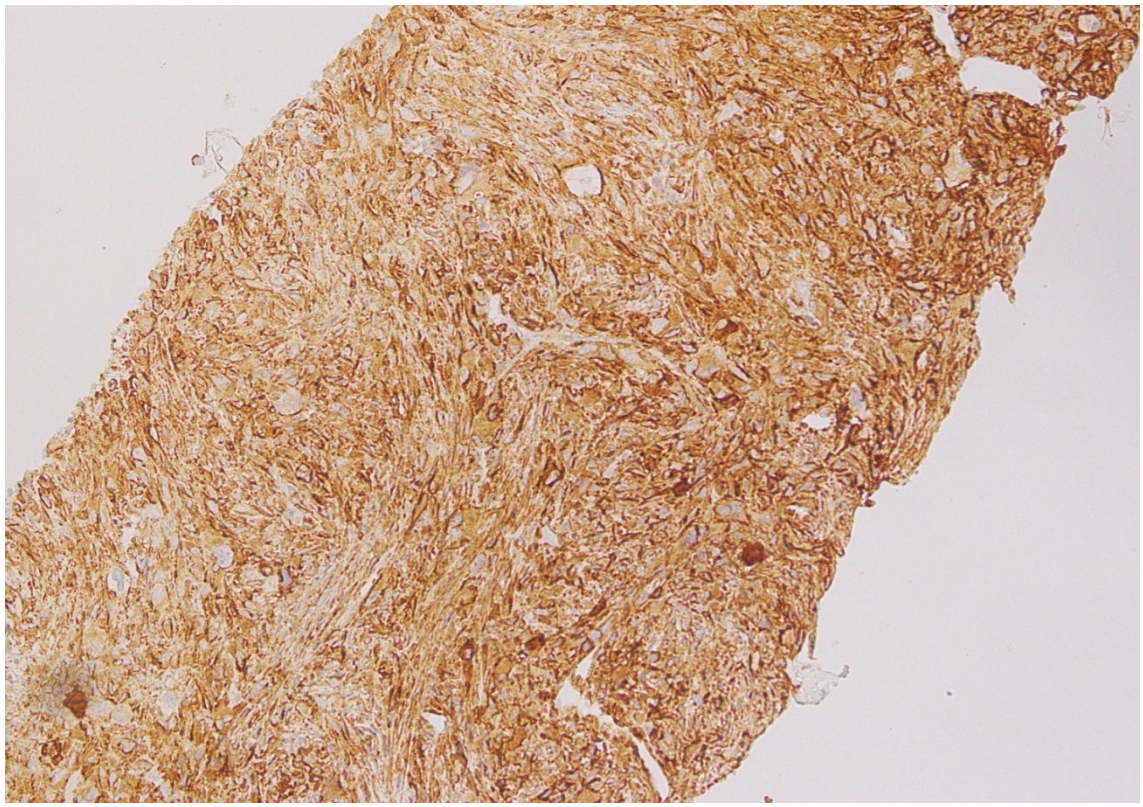

Figure 5: Caldesmon is diffuse positive in tumor cells

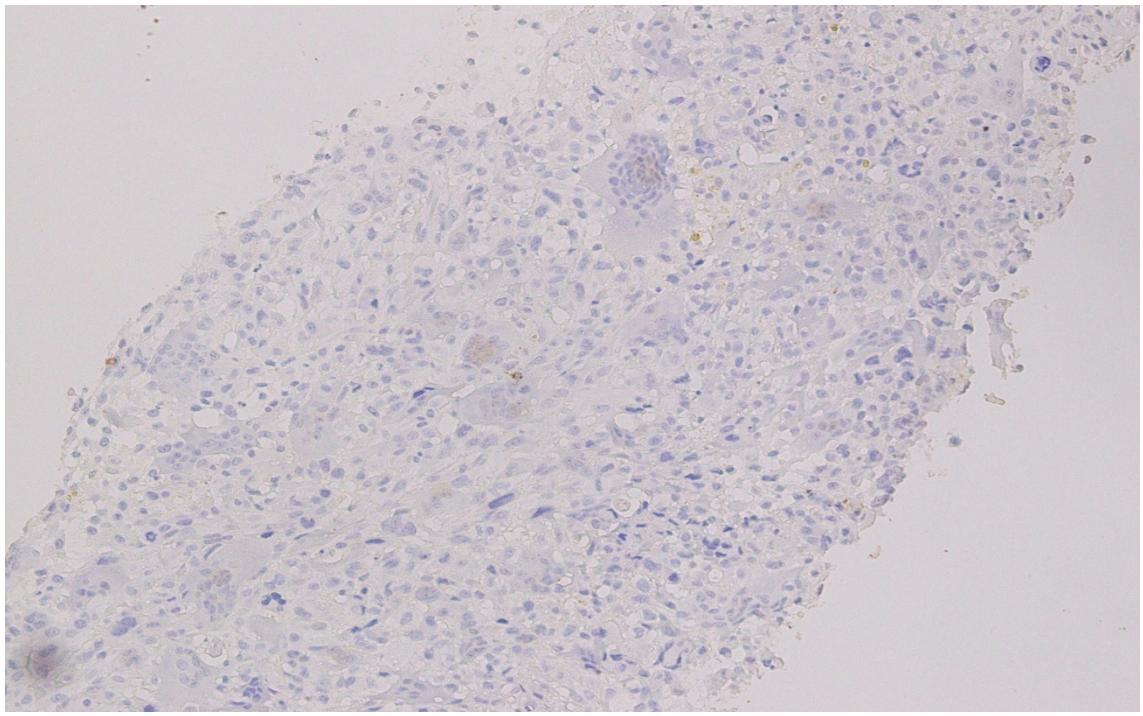

Figure 6: CK is negative in tumor cells

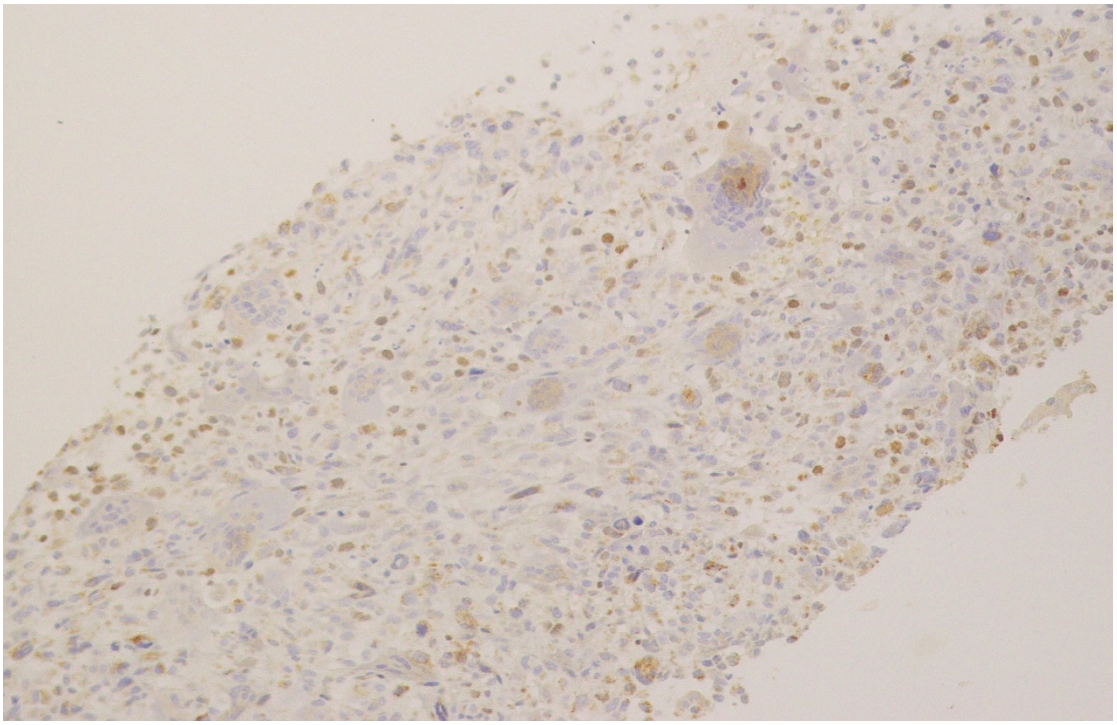

Figure 7: GATA 3 is positive in few tumor cells

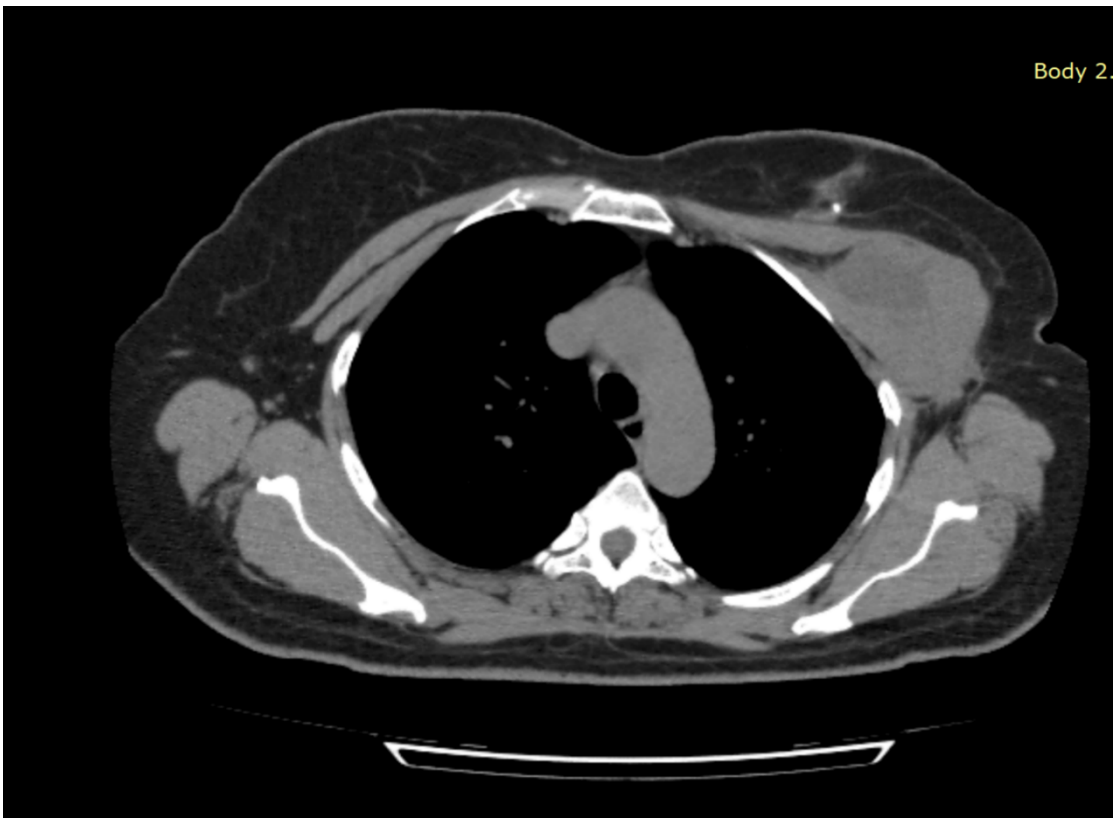

Image 1: CT scan showing left chest wall lesion involving pectoralis muscles, Intact intercostal muscles

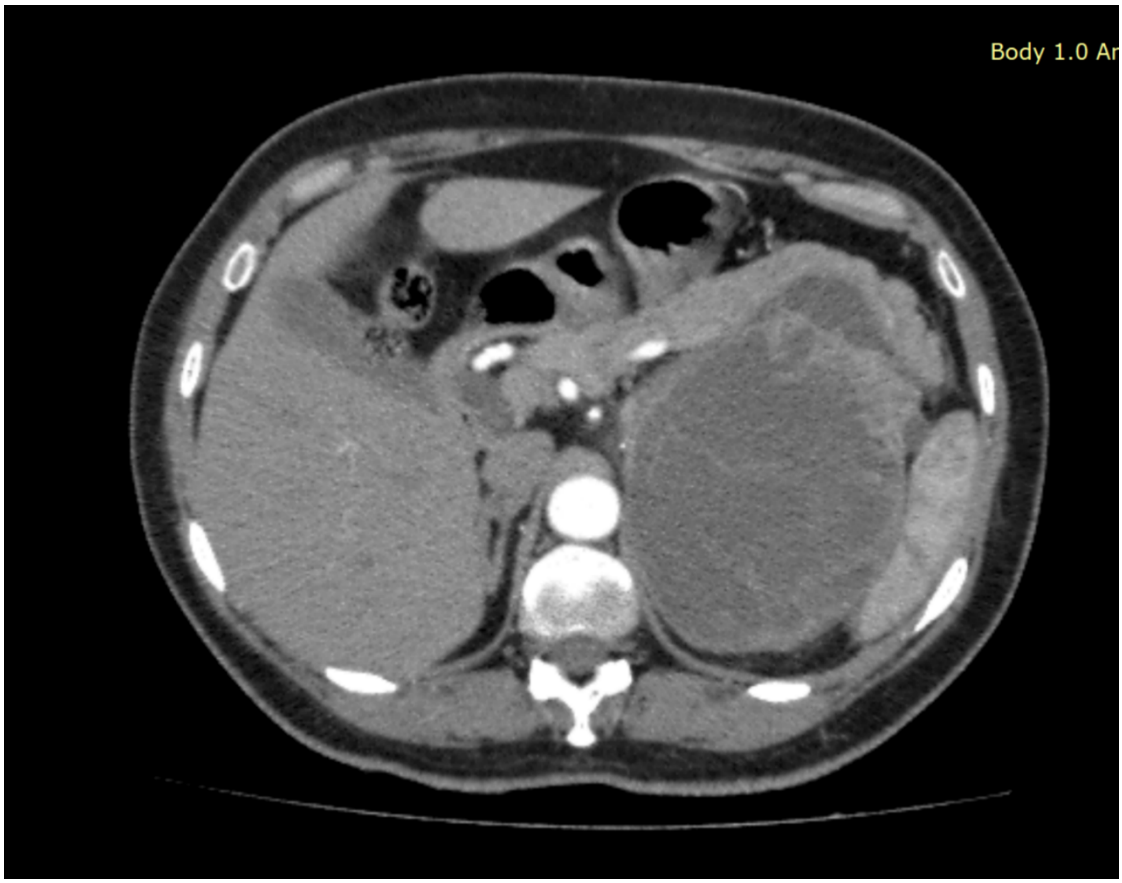

Image 2: CT scan showing left adrenal mass

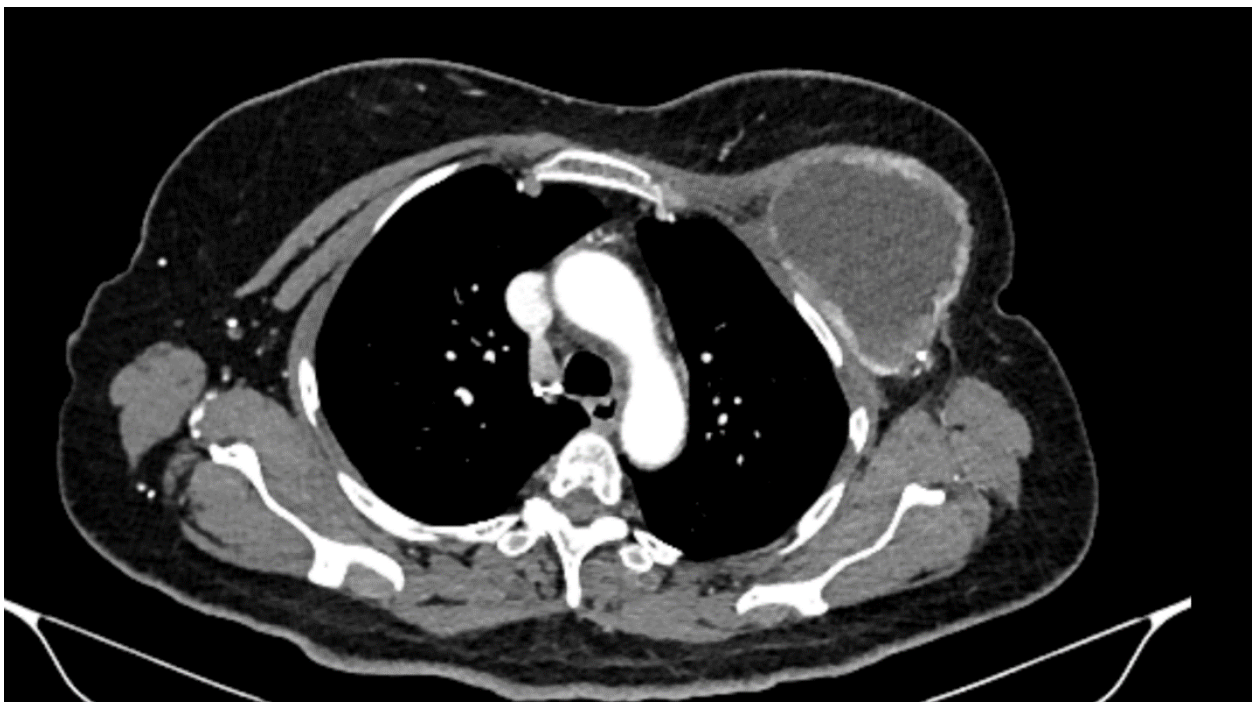

Image 3 : Showing post treatment necrosis in chest wall mass

Image 3 & 4: showing post treatment necrosis in chest wall mass and adrenal mass

Discussion

Post-radiation sarcoma (PRS) is a nosologic entity comprising of any sarcoma that arises in an irradiated body site after a latent period (1,2). The most common primary tumors for which PRS is associated includes breast carcinoma, Hodgkin lymphoma, cervical carcinoma, and bone and soft tissue sarcomas (3).

Conservative surgery and radiotherapy are well-established treatments for breast cancer, but many trials are in progress to attempt to define the most acceptable procedure (4). This is an era of adopting patient friendly newer modalities regarding the treatment of cancer patients. Breast cancer patients generally require chemotherapy, surgery, and radiation therapy as part of their treatment. Emerging concepts have categorized patients into groups benefitting from chemotherapy or radiotherapy or both as both modalities have various complications.

Patients treated for breast cancer usually receive radiation to chest wall, supraclavicular fossa, and axilla by radiation oncologists after carefully deliberating benefits and associated risks. Smaller radiation fields are currently being used. Axilla is rarely treated by both surgery and radiotherapy (RT) nowadays, which significantly reduces the incidence of lymphedema (5)As in our case axillary clearance was done surgically and radiation to axilla was omitted.

Over the years, radical mastectomy with adjuvant RT has become less popular in the management of breast cancer. Conservative surgery followed by RT is now treatment of choice, with proven effectiveness (6)

Radiotherapy is associated with increased risks for development of secondary soft tissue sarcomas, particularly angiosarcoma (7,8). There is variable time lapse between diagnosis of breast cancer and subsequent development of secondary STS. It has been reported to be between 2 to 30 years (9). In our case sarcoma appeared after 4.5 years of completion of treatment for breast cancer.

Radiation induced sarcoma usually presents with early metastasis. They commonly metastasized to lungs and lymph nodes (10). The most common RIS location is the chest wall (11). In our case, sarcoma appeared at irradiated chest wall and metastasized to adrenal gland.

The median overall survival (OS) after the diagnosis of secondary STS (at all sites) was 31 months, with a 5-year OS rate of 38%(9). Despite the significantly higher risk of STS after RT in patients with breast cancer, the absolute incidence of these neoplasms is low (9).

Because of rarity of soft tissue sarcomas in breast associated with radiation therapy, there is scant evidence of effective treatment strategies. Hence it is difficult to treat. Unfortunately, chemotherapy with anthracyclines /taxanes or surgery has been found to be only minimally effective in sarcomas with a reported response rate ranging from 17 to 34% (12).The most active chemotherapy agents for metastatic soft tissue sarcoma are doxorubicin and ifosfamide. OS was also longer for patients receiving gemcitabine-docetaxel than single-agent gemcitabine(12).However our patient didn't respond to chemotherapy. Despite 3rd line chemotherapy she developed metastasis in lungs and bones

Conclusion

Radiation induced sarcoma is a rare but known complication of radiotherapy given as a part of cancer treatment. The role of chemotherapy for RIS remains ambiguous. No level 1 or 2 studies are available to address this question for RIS because of the rarity of this disease. Treatment of metastatic or irresectable disease is, at present, inadequate. Such patients are routinely enrolled in trials of therapy for primary soft-tissue sarcomas. The aim of this study was to report how patient may present with radiation induced malignancy and how they respond to 2nd or 3rd line therapy.

References

1. Cahan WG, Woodard HQ, et al. Sarcoma arising in irradiated bone; report of 11 cases. Cancer. 1948;1:3-29

2. Martland HS, Conlon P. Some unrecognized dangers in the use and handling of radioactive substances. JAMA. 1925;85:1769-1776

3. Robinson E, Bar-Deroma R, Rennert G, Neugut AI. A comparison of the clinical characteristics of second primary and single primary sarcoma: a population based study. J Surg Oncol. 1992;50:263-266

4. Veronesi U, Luini A, Del Vecchio M, Greco M, Galimberti V, Merson M, Rilke F, Sacchini V, Saccozzi R, Savio T, et al. Radiotherapy after breast-preserving surgery in women with localized cancer of the breast. N Engl J Med. 1993 Jun 3;328(22):1587-91. doi: 10.1056/NEJM199306033282202. PMID: 8387637.

5. Meek AG. Breast radiotherapy and lymphedema. Cancer. 1998 Dec 15;83(12 Suppl American):2788-97. doi: 10.1002/(sici)1097-0142(19981215)83:12b+<2788::aid-cncr27>3.3.co;2-9. PMID: 9874399.

6. Harris JR, Recht A, Connolly J, Cady B, Come S, Henderson IC, Koufman C, Love S, Schnitt S, Osteen R. Conservative surgery and radiotherapy for early breast cancer. Cancer. 1990 Sep 15;66(6 Suppl):1427-38. doi: 10.1002/1097-0142(19900915)66:14+<1427::aid-cncr2820661420>3.0.co;2-w. PMID: 2205374.

7. Glazebrook KN, Magut MJ, Reynolds C. Angiosarcoma of the breast. AJR Am J Roentgenol. 2008 Feb;190(2):533–8.

8. Cabete J, Lencastre A, Fidalgo A, Lobo L, João A, Serrão V. Postradiation cutaneous angiosarcoma of the breast: a diagnosis to keep in mind. Breast J. 2014 Jan–Feb;20(1):89–90.

9. Mery CM, George S, Bertagnolli MM, Raut CP. Secondary sarcomas after radiotherapy for breast cancer: sustained risk and poor survival. Cancer. 2009 Sep 15;115(18):4055-63. doi: 10.1002/cncr.24462. PMID: 19526590.

10. The rapid onset of cutaneous angiosarcoma after radiotherapy for breast carcinoma.Otis CN, Peschel R, McKhann C, Merino MJ, Duray PH Cancer. 1986 Jun 1; 57(11):2130-4.

11. Frequency of certain established risk factors in soft tissue sarcomas in adults: a prospective descriptive study of 658 cases.Penel N, Grosjean J, Robin YM, Vanseymortier L, Clisant S, Adenis ASarcoma. 2008; 2008():459386.

12. Randomized Phase II Study of Gemcitabine and Docetaxel Compared With Gemcitabine Alone in Patients With Metastatic Soft Tissue Sarcomas: Results of Sarcoma Alliance for Research Through Collaboration Study 002Robert G. Maki, J. Kyle Wathen, Shreyaskumar R. Patel, Dennis A. Priebat, Scott H. Okuno, Brian Samuels, Michael Fanucchi, David C. Harmon, Scott M. Schuetze, Denise Reinke, Peter F. Thall, Robert S. Benjamin, Laurence H. Baker, and Martee L. HensleyJournal of Clinical Oncology 2007 25:19, 2755-276

13. Sheth GR, Cranmer LD, Smith BD, Grasso-Lebeau L, Lang JE. Radiation-induced sarcoma of the breast: a systematic review. Oncologist. 2012;17(3):405-18. doi: 10.1634/theoncologist.2011-0282. Epub 2012 Feb 14. PMID: 22334455; PMCID: PMC3316927.