Extraskeletal Osteosarcoma After Postoperative Radiotherapy for a Keloid: a Case Report

Noriko Aramaki-Hattori (nonkenken@gmail.com)
Keio University: Keio Gijuku Daigaku
Itsuo Watanabe
Tokyo Dental College Ichikawa General Hospital
Keisuke Okabe
Keio university Hospital
Shigeki Sakai
Keio University Hospital
Hideo Morioka
National Center for Child Health and Development
Kazuo Kishi
Keio University Hospital

Case report

Keywords: Osteosarcoma, Keloid, Postoperative radiation

Posted Date: December 29th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-134882/v1

Abstract

Background: The current standard treatment for keloids is a combination of surgery and postoperative radiotherapy with 8–25 Gy.

Case presentation: Our case was a 75-year-old patient who developed a swollen mass in her chest 20 years after excision of a chest keloid followed by 32 Gy postoperative radiotherapy. After resection of the swollen mass, pathology indicated extraskeletal osteosarcoma.

Conclusions: Six putative cases of carcinogenesis after postsurgical radiotherapy for keloid have been reported over the last 70 years. To our knowledge, this is the first case of post-keloid radiotherapy carcinogenesis that meets the definition of a radiation-induced sarcoma. The risk of secondary carcinogenesis after postsurgical radiotherapy for keloid is small but must be explained to the patient.

Background

Keloids are raised, red, growing and spreading fibrotic scar tissues. They form after injury and are due to abnormal wound-healing responses. Although keloids are benign and not life-threatening, the associated pruritus and pain can be very bothersome for the patient. Surgical resection alone associates with extremely high recurrence rates [1, 2]. Therefore, surgery followed by postoperative radiotherapy has become the standard treatment for keloids in recent years [1].

Case Presentation

A 75-year-old woman presented with a painful swollen mass in her chest. A biopsy was performed and the pathological evaluation revealed granulation tissue. However, approximately 2 months later, pain recurred at the same site and the mass was excised. The pathological findings were significant for bone formation in the mass (Fig. 1A). There were also numerous cells in the tissue that had p53-positive nuclei and were dividing (Figs. 1B and C). Extraskeletal osteosarcoma was diagnosed.

Examination of the patient's history revealed she had undergone mastopathy at age 25 and the resulting scar had developed into a keloid. At age 55 years, the keloid was fully extirpated and 32 Gy radiation was administered. The swollen mass observed at age 75 years was located within the radiation field (Fig. 2). Therefore, the final diagnosis was extraskeletal osteosarcoma after radiotherapy for a keloid.

The patient was referred to our hospital for advanced specialty care. The chest skin, the sternum, and the 2nd to 7th ribs were resected (Figs. 3A and B). For reconstruction, a vertical rectus abdominis flap and an intercostal arteriovenous blood supply were employed (Fig. 3C). Pathological evaluation of the excised tissue did not demonstrate any residual tumor. The postoperative course was uneventful. After 5 years, there was no evidence of sarcoma recurrence. While a keloid developed on part of the operative scar, it was successfully treated with steroid tape.

Discussion And Conclusions

Keloids are benign but can significantly affect patient quality of life. Since surgical resection alone associates with recurrence rates of up to 50–80% [1, 2], resection followed by postoperative radiotherapy has become the standard treatment for these scars over the last few decades. This treatment paradigm is supported by the fact that the risk of carcinogenesis from keloid radiotherapy appears to be very low: our PubMed literature search showed that over the last 70 years, only six cases of putative keloid radiotherapy-induced carcinogenesis have been reported. The tumors were fibrosarcoma, basal-cell carcinoma, thyroid carcinoma, breast-ductal carcinoma (two cases), and mucoepidermoid carcinoma. Five of these cases were summarized in a 2009 review [3] while the mucoepidermoid-carcinoma case was reported in 2012 [4]. The radiation doses ranged from 10.5 to 80 Gy. Three patients were children (9–13 years old) at the time of treatment. Most tumors took at least 8 years to develop. However, three cases cannot be definitively declared to be radiation-induced carcinomas. One was the fibrosarcoma case, which rose unusually quickly after radiotherapy (3.5 years). Moreover, the two breast-carcinoma cases had relevant family history and a history of oral hormone therapy, respectively. Thus, carcinogenesis after keloid radiotherapy is vanishingly rare and is likely to be even rarer with current keloid-treatment regimens, which carefully apply radiation at moderate doses of 8–25 Gy and stringently avoid treating children [5].

Radiation-induced sarcomas were defined by Cahan et al. in 1948 [5]; the definition was then modified by Arlen et al. in 1971 [6]. Thus, a tumor is considered to be a radiation-induced sarcoma if (i) its histology differs from that the primary tumor that required radiotherapy, (ii) it lies within the therapeutic irradiation area, and (iii) the duration between radiotherapy and tumor detection is relatively long. Our case meets all of these criteria and thus appears to be the first reported case of keloid radiotherapy-induced extraskeletal osteosarcoma.

In our case, the radiotherapy dose was 32 Gy, which is greater than current keloid-radiotherapy doses. Thus, the risk of extraskeletal osteosarcoma after this therapy is very low. Nevertheless, this case indicates that we should be aware that radiation therapy for keloids does carry a risk of carcinogenesis. Patients with keloids should be told of this risk and advised that long-term follow-up will be required if they undergo keloid resection followed by radiotherapy.

Declarations

Ethics approval and consent to participate

According to the Ethics Committee of Keio University School of Medicine, Japan, case studies do not require ethical approval for publication. The patient was treated according to the tenets of the Declaration of Helsinki.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and the accompanying images. A copy of the written consent is available for review by the Editor-in Chief of this journal.

Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

None.

Author contributions

NA-H analyzed and interpreted the pathology data and made the diagnosis of extraskeletal osteosarcoma. NA-H, I W, K O, H M and KK performed the radical resection. NA-H and S S wrote and revised the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We thank Dr. Yinka Zevering of SciMeditor Medical Writing Services for manuscript assistance.

References

1. Ogawa R, Tosa M, Dohi T, Akaishi S, Kuribayashi S. Surgical excision and postoperative radiotherapy for keloids. Scars Burn Heal. 2019;5:2059513119891113.
2. Siotos C, Uzosike AC, Hong H, Seal SM, Rosson GD, Cooney CM, Cooney DS. Keloid excision and adjuvant treatments: a network meta-analysis. Ann Plast Surg. 2019;83:154-162.
3. Ogawa R, Yoshitatsu S, Yoshida K, Miyashita T. Is radiation therapy for keloids acceptable? The risk of radiation-induced carcinogenesis. Plastic Recon Surg. 2009;124:1196-1201.
4. Fortson JK, Rosenthal M, Patel V, Lawrence GE, Lin JS. Atypical presentation of mucoepidermoid carcinoma after radiation therapy for the treatment of keloids. Ear Nose Throat J. 2012;91:286-288.
5. Cahan WG, Woodard HQ, Higinbotham NL, Stewart FW, Coley BL. Sarcoma arising in irradiated bone. Report of eleven cases. Cancer. 1948;1:3-29.
6. Arlen M, Higinbotham NL, Huvos A, Marcove RC, Miller T, Shah IC. Radiation-induced sarcoma of bone. Cancer. 1971;28:1087-1099.

Figures

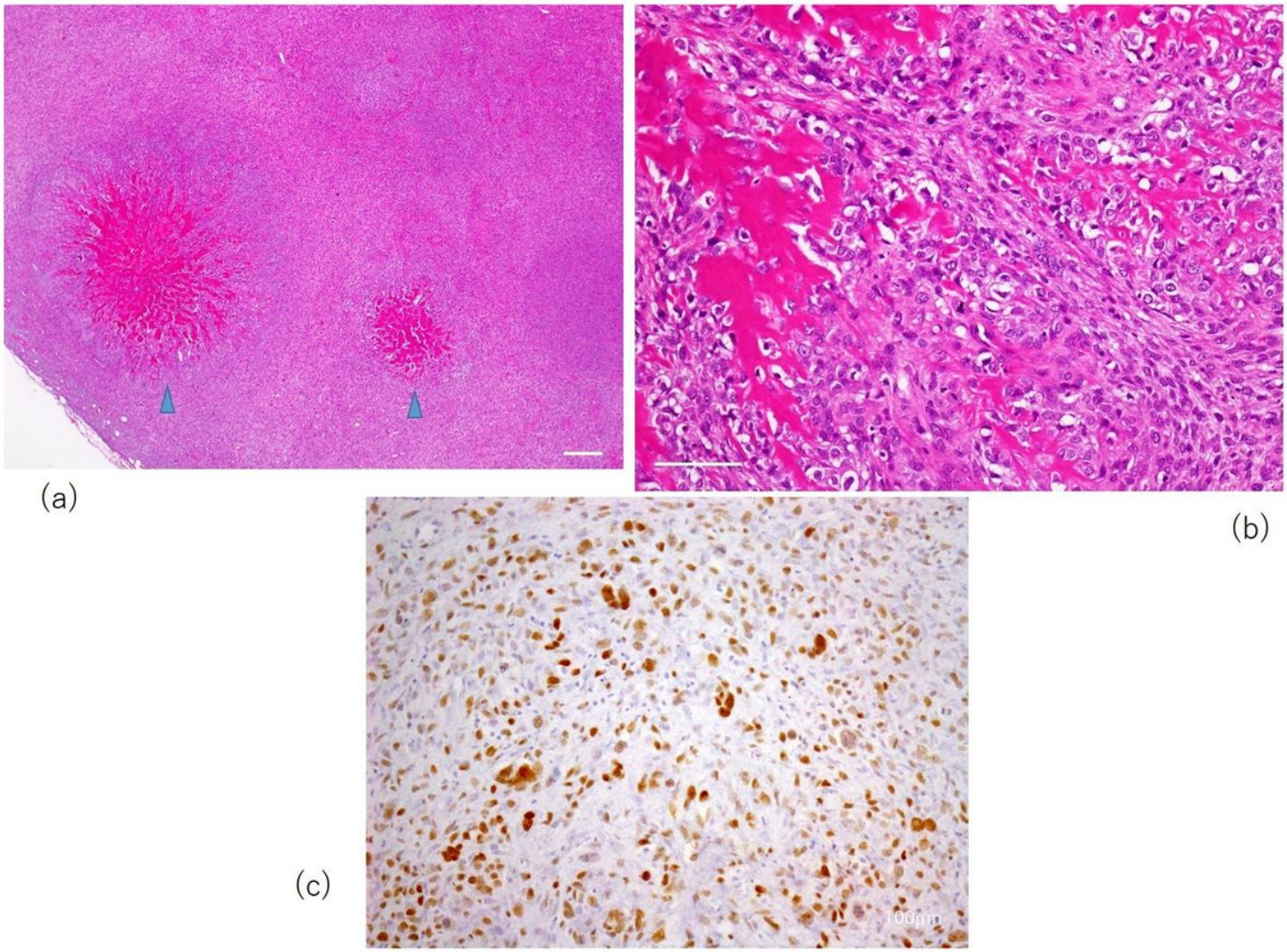

Figure 1

Histology of the swollen mass near the chest midline after it was excised. (A, B) Hematoxylin-eosin staining of the mass. Bars=100 mm. The blue arrowheads in (A) indicate areas where bone is forming. (C) Immunostaining for p53.

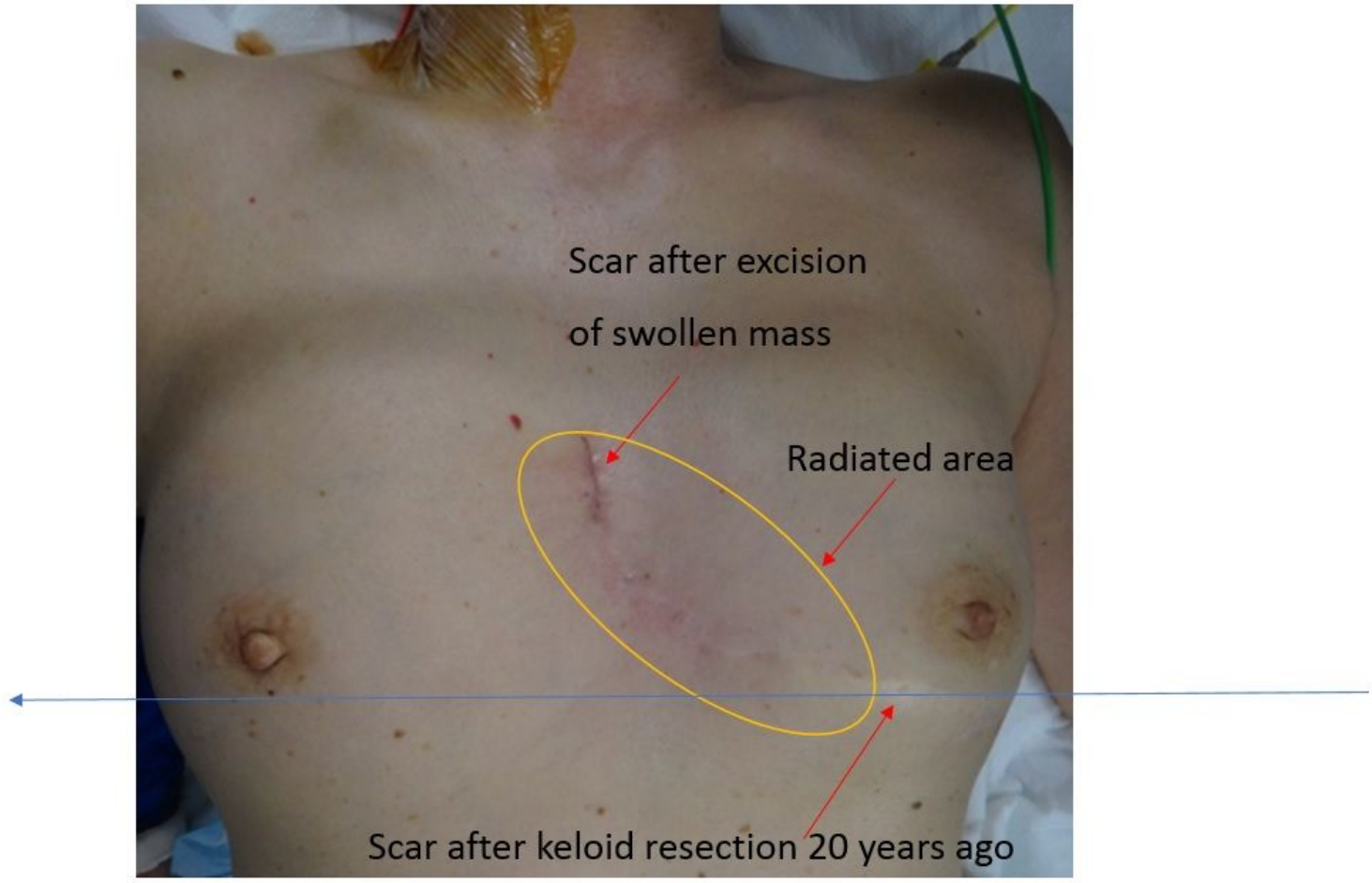

Figure 2

View of the patient's anterior chest prior to radical resection to remove possible residual osteosarcoma. The keloid excision site, which was irradiated 20 years earlier using the radiation field shown by the yellow ellipse, is shown at the bottom of the left breast. The scar near the midline that was left after excision of the swollen mass is also shown.

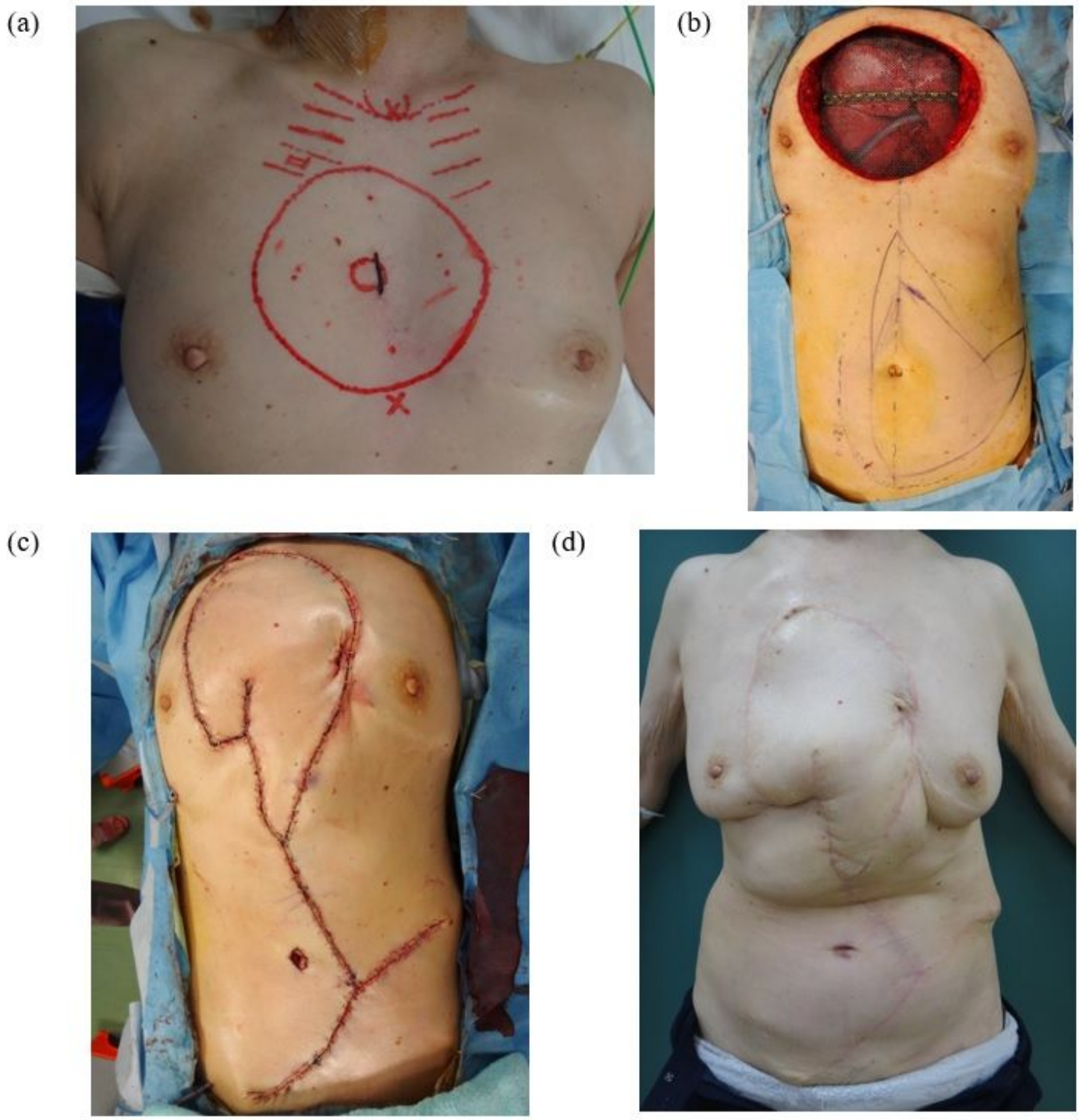

Figure 3

View of the patient (A) just before surgery, (B) after resection of the chest skin, sternum, and 2nd to 7th ribs, (C) just after reconstruction of the chest wall, and (D) 2 years after surgery.