Acute Trauma Precipitating the Onset of Chest Wall Myxofibrosarcoma

Kyle D. Klingbeil^{1,2} · Sameera S. Vangara¹ · Raymond M. Fertig¹ · Jason L. Radick¹

Received: 17 July 2017 / Accepted: 8 May 2018 / Published online: 20 June 2018
© Indian Association of Surgical Oncology 2018

Abstract

A previously healthy, 47-year-old male presented to his primary care physician with the complaint of a nontender, palpable breast mass discovered coincidentally 1 month after being scratched in the same location by his pet cat. Family history revealed his father was diagnosed with a soft tissue sarcoma of the thigh, 6 months following a traumatic injury in the same location. Cat scratch disease was considered; however, *Bartonella Henselae* antibody testing was negative. Imaging studies revealed a subpectoral mass without rib involvement. Subsequent core biopsy revealed malignant fibrous histiocytoma, myxoid type, also known as myxofibrosarcoma. The patient underwent complete surgical resection with no complications. Medical advice recommended adjuvant radiation therapy due to the high risk of recurrence; however, the patient refused this option. Twenty-five months later, the patient remains in remission and in overall good health. This case describes the development of a chest wall tumor, diagnosed as myxofibrosarcoma, following acute trauma to the area. The association between acute traumatic injury and the development of a soft tissue sarcoma, as described in this case, continues to be widely reported, suggesting the possibility for an underlying causal mechanism. Future studies are required to unravel the pathogenesis in order to advance the management of this disease.

Keywords Myxofibrosarcoma · Chest wall tumor · Soft tissue sarcoma · Cat scratch disease · Malignant fibrous histiocytoma · Undifferentiated soft tumor sarcoma

Introduction

Soft tissue sarcomas (STS) are a class of malignant tumors that develop in extra-skeletal connective tissues. They account for 1% of adult malignancies, localizing to the extremities in 60% of cases [1]. There are over 100 different histologic subtypes of STS. The broad histopathologic spectrum is presumably due to embryonic mesenchymal cells having the capacity to mature into a wide variety of tissue types. Sarcomas that lack specific lines of differentiation are placed into a category known as undifferentiated soft tissue sarcomas (USTS), which were previously known as malignant fibrous histiocytomas (MFH) until

the World Health Organization (WHO) declassified them as a formal diagnostic entity [2]. Variants of USTS include round cell, spindle cell, and pleomorphic. Another variant, previously known as MFH myxoid type, is now classified as a distinct sarcoma subtype, called myxofibrosarcoma. In comparison with other sarcomas, the prognosis of myxofibrosarcoma is relatively good with a 5-year overall survival rate of 77%. However, there is a higher local relapse rate related to the local growth pattern of the tumor, commonly extending along vascular and fascial planes [3].

Case Presentation

We report a case of myxofibrosarcoma of the chest wall precipitated by acute trauma in a 47-year-old Caucasian male. The patient was previously healthy until receiving multiple, deep puncture wounds to the left breast from his pet cat. One month later, a palpable mass was discovered at the site of injury. He presented to a local clinic where cat scratch disease was suspected; however, a subsequent *Bartonella henselae* antibody test was negative.

✉ Kyle D. Klingbeil
kdk24@med.miami.edu

¹ Department of Medicine, University of Miami Miller School of Medicine, Miami, FL 33136, USA

² Department of Surgery, University of Miami Miller School of Medicine, Clinical Research Building, 1120 N.W. 14th St., Miami, FL 33136, USA

There was a significant family history of malignancy, including the patient's father who had a STS of the right upper thigh 6 months following a traumatic injury to the same area. The patient's past medical history was significant for obesity but was otherwise noncontributory. Physical examination revealed a left subpectoral chest mass with a transverse diameter of 6 cm. The mass was firm but mobile, located deep to the left nipple and elevated the breast. Bilateral axillary and cervical lymph nodes were unremarkable.

An MRI of the chest wall revealed a well-defined solid mass measuring $6.5 \times 3.0 \times 6.2$ cm deep to the left pectoral muscles without rib involvement or edema in surrounding tissues, shown in Fig. 1. A core needle biopsy by ultrasound guidance revealed a high-grade myxofibrosarcoma. The ultrasound image is shown in Fig. 2. Surgical resection was recommended. Laboratory investigations including CMP, CBC, and coagulation studies were all within normal limits. The patient then underwent an en bloc resection with a 2-cm margin arising from the pectoralis minor muscle. The pectoral nerves were spared. No rib involvement was present; thus, no chest wall resection was performed. A primary muscle reconstruction was performed, covering a 5-cm defect.

Pathology showed a $7.2 \text{ cm} \times 3.4 \text{ cm} \times 6.5 \text{ cm}$ high-grade malignant fibrous histiocytoma, myxoid type, with all margins free of malignancy. No lymph nodes were present within the tissue samples. Immunohistochemical staining revealed positive staining for vimentin. Ki-67 stain revealed a high proliferative index $> 80\%$. Negative staining was seen in AE1/AE3, SMA, and SYN. Following the surgery, medical advice recommended adjuvant radiation therapy due to the high risk of local recurrence. However, the patient refused and opted for alternative therapies including nutritional supplementation.

During post-operative follow-up, the patient has endorsed a fifty-pound weight loss secondary to dietary modifications and routine exercise. Twenty-five months post-operatively, the patient remains in remission and in overall

Fig. 1 MRI of the chest wall revealing a well-defined solid mass within the left pectoral muscles

Fig. 2 Ultrasound imaging of the left pectoral mass

good health. The patient will continue routine checkups for evaluation of recurrence.

Discussion

The association between acute traumatic injury and the development of soft tissue sarcoma has been documented as early as 1901 [4]. Ineffective wound repair by dysfunctional fibroblasts is thought to play a crucial role in accelerating the formation of malignancy in those genetically predisposed [5]. Knockout models in mice have demonstrated that acute traumatic injury can induce STS [6]. Similarly in humans, STS has been reported in sites of surgical scars, burn scars, and repeated trauma [7].

Nonetheless, STS and its association with acute trauma remain controversial. Future research is required to elucidate the potential role of altered tissue repair mechanisms in the tumorigenesis of STS. Detailed genetic studies may help to narrow down pathogenic variants, providing opportunities for future knockout models. This case contributes to a better understanding of the management and outcomes of myxofibrosarcoma. It also provides a rare example of STS presenting as a chest wall mass following acute trauma. By understanding the inciting events and underlying mechanisms that activate these tumors, the development of targeted treatments may begin to aid in tumor prevention.

Compliance with Ethical Standards

Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare that they have no conflict of interest.

References

1. Salo JC, Lewis JJ, Woodruff JM, Leung DH, Brennan MF (1999) Malignant fibrous histiocytoma of the extremity. *Cancer* 85(8):1765–1772
2. Edited by Fletcher CDM MF, Lyon (2002) World Health Organization classification of tumors: pathology and genetics of tumors of soft tissue and bone. IARC Press
3. Sanfilippo R, Miceli R, Grosso F, Fiore M, Puma E, Pennacchioli E, Barisella M, Sangalli C, Mariani L, Casali PG, Gronchi A (2011) Myxofibrosarcoma: prognostic factors and survival in a series of patients treated at a single institution. *Ann Surg Oncol* 18(3):720–725. <https://doi.org/10.1245/s10434-010-1341-4>
4. Willan RJ (1930) Sarcoma and trauma. *Br J Surg* 18(70):321–325. <https://doi.org/10.1002/bjs.1800187014>
5. Nakanishi H, Tomita Y, Yoshikawa H, Sato N, Ochi T, Aozasa K (1999) Frequent p53 gene mutations in soft tissue sarcomas arising in burn scar. *Japanese J Cancer Res : Gann* 90(3):276–279
6. Van Mater D, Ano L, Blum JM, Webster MT, Huang W, Williams N, Ma Y, Cardona DM, Fan CM, Kirsch DG (2015) Acute tissue injury activates satellite cells and promotes sarcoma formation via the HGF/c-MET signaling pathway. *Cancer Res* 75(3):605–614. <https://doi.org/10.1158/0008-5472.can-14-2527>
7. Sinkovics JG (2007) Adult human sarcomas. I. Basic science. *Expert Rev Anticancer Ther* 7(1):31–56. <https://doi.org/10.1586/14737140.7.1.31>