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Ewing sarcoma of the clavicle: a case report

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The aim of this case study is to demonstrate an unusual location of Ewing Sarcoma and promote awareness of the effects of patient care regarding delay in diagnosis. A 23-year-old male presented with a painless soft tissue mass over the left clavicle of two months. Initial radiographs of the clavicle were reported negative. Approximately one year later the patient stated the mass had become painful and increased in size. Repeat radiographs demonstrated permeative destruction within the left clavicle with adjacent soft tissue mass. Follow up imaging of CT, MRI, and PET-CT characterized the lesion and demonstrated metastatic disease. Subsequent biopsy confirmed a diagnosis of primary Ewing sarcoma.

Sarcome d'Ewing de la clavicule: un rapport de cas
L'objectif de cette étude de cas est de présenter un emplacement inhabituel du sarcome d'Ewing et de promouvoir la sensibilisation aux effets des soins aux patients concernant le retard dans le diagnostic. Un homme de 23 ans s'est présenté avec une masse de tissu mou indolore sur la clavicule gauche présente depuis deux mois. Les radiographies initiales de la clavicule se sont révélées négatives. Environ un an plus tard, le patient a déclaré que la masse était devenue douloureuse et que sa taille avait augmenté. Des radiographies répétées ont montré une ostéolyse ponctuée au niveau de la clavicule gauche accompagnée d'une masse de tissu mou adjacente. Un suivi par imagerie au moyen de la tomographie par ordinateur, de l'IRM et de la tomographie par émission de positons (TEP) tomographie par ordinateur a permis d'identifier la lésion et de déceler une maladie métastatique. Une biopsie subséquente a confirmé un diagnostic de sarcome d'Ewing primaire. Le patient a été aiguillé pour une prise en charge en oncologie, comprenant de la

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The patient was referred for oncologic management including chemotherapy and radiation with initial remission post treatment. Unfortunately, the tumor recurred two years later. Timely diagnosis, appropriate management and referral of patients with suspicious presentation is critical to future outcomes.

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KEY WORDS: chiropractic, clavicle, delay of diagnosis, diagnostic imaging, Ewing sarcoma, management

chimiothérapie et de la radiothérapie, qui a entraîné une rémission initiale après le traitement. Malheureusement, la tumeur est réapparue deux ans plus tard. Un diagnostic rapide, une gestion appropriée et un aiguillage des patients présentant des signes suspects sont essentiels pour les résultats à venir.

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MOTS CLÉS : chiropratique, clavicule, retard de diagnostic, imagerie diagnostique, sarcome d'Ewing, gestion

Introduction

Ewing sarcoma is an aggressive tumor that can occur in both osseous and soft tissue structures. The most common locations involve the long bone, with the femur being the most common.[1] Ewing sarcoma is part of the small round blue cell tumor family, also known as the Ewing sarcoma family of tumors, which also includes primitive neuroectodermal tumor and Askin tumor.[2]

The clavicle is a rare site of primary bone tumors, which may be related to its development, lack of medullary cavity, and sparse vascular supply.[3] This case demonstrated an aggressive lesion in an unusual location and the importance of timely diagnosis.

Case presentation

A 23-year-old male presented to the Veterans affairs medical center with a painless soft tissue mass noted over the left clavicle that began approximately two months prior. An initial radiographic clavicle series was performed and read as negative (Figure 1) and no further imaging was recommended. Approximately six months later, the soft tissue mass had grown in size and become painful. The patient reported back to the primary due to the change in symptoms, and a second radiographic series of the clavicle was performed which demonstrated a moth eaten to permeative pattern of bony destruction with a laminated periosteal reaction on both the superior and inferior as-

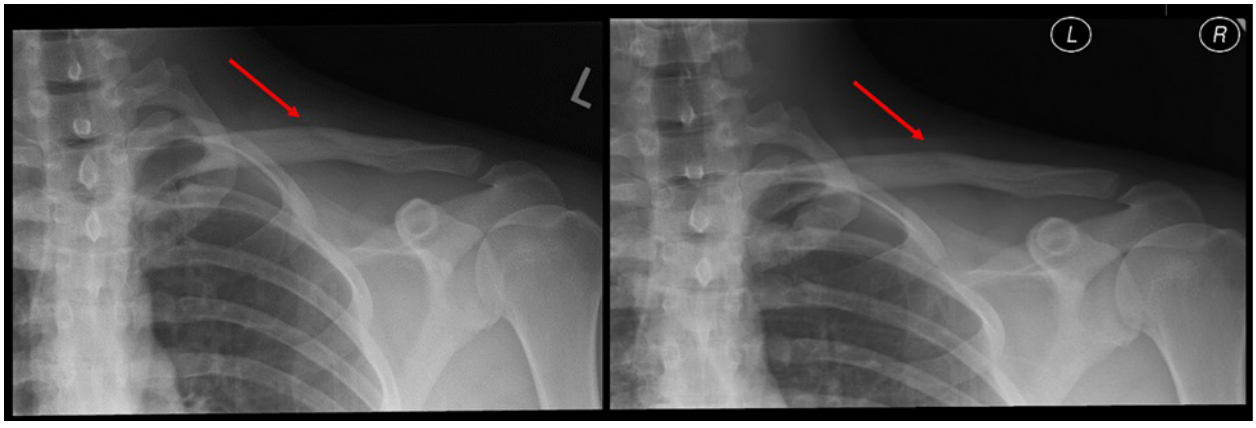

Figure 1.

I*nitial clavicle radiographs: AP and Axial views. Initial AP projection exhibits apparent ill-defined destruction cortex of the midshaft of the diaphysis of the clavicle on retrospective review. Initial axial clavicle projections exhibited a faint single lamination periosteal reaction at the superior cortex of the clavicle in the same region.*

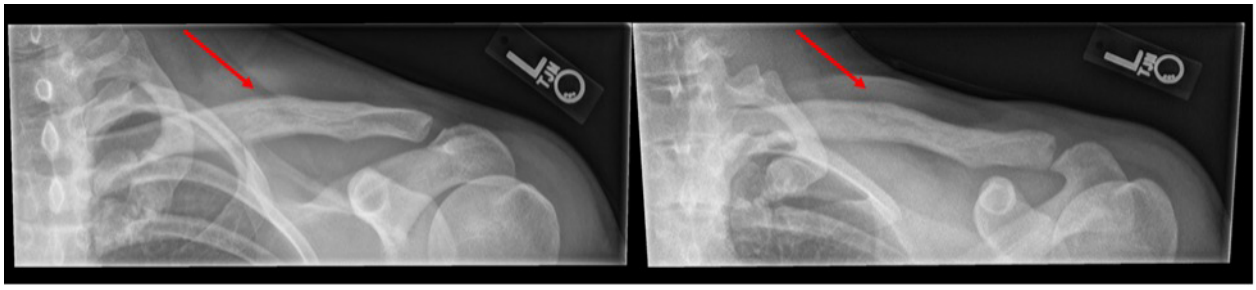

Figure 2.
Follow up AP clavicle radiographs 6 months later: AP and Axial views. Follow-up radiographs revealed an ill-defined moth eaten to permeative pattern of lytic destruction with a laminated periosteal reaction and cortical destruction.

pects of the clavicle (Figure 2). Mild prominence is noted within the soft tissues directly superior to the clavicle. Retrospectively, the initial study had questionable loss of the cortical margin on the superior aspect of the clavicle with a mild periosteal reaction.

Follow-up imaging was performed to further characterize the lesion and determine the extent of involvement to include computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) CT of the thorax. The CT study confirmed the permeative bony destruction of the left clavicle and demonstrated a soft tissue mass with attenuation similar to adjacent musculature (Figure 3).

The MRI demonstrated high signal intensity within the marrow of the clavicle with an adjacent high signal intensity of the surrounding soft tissue mass resulting in

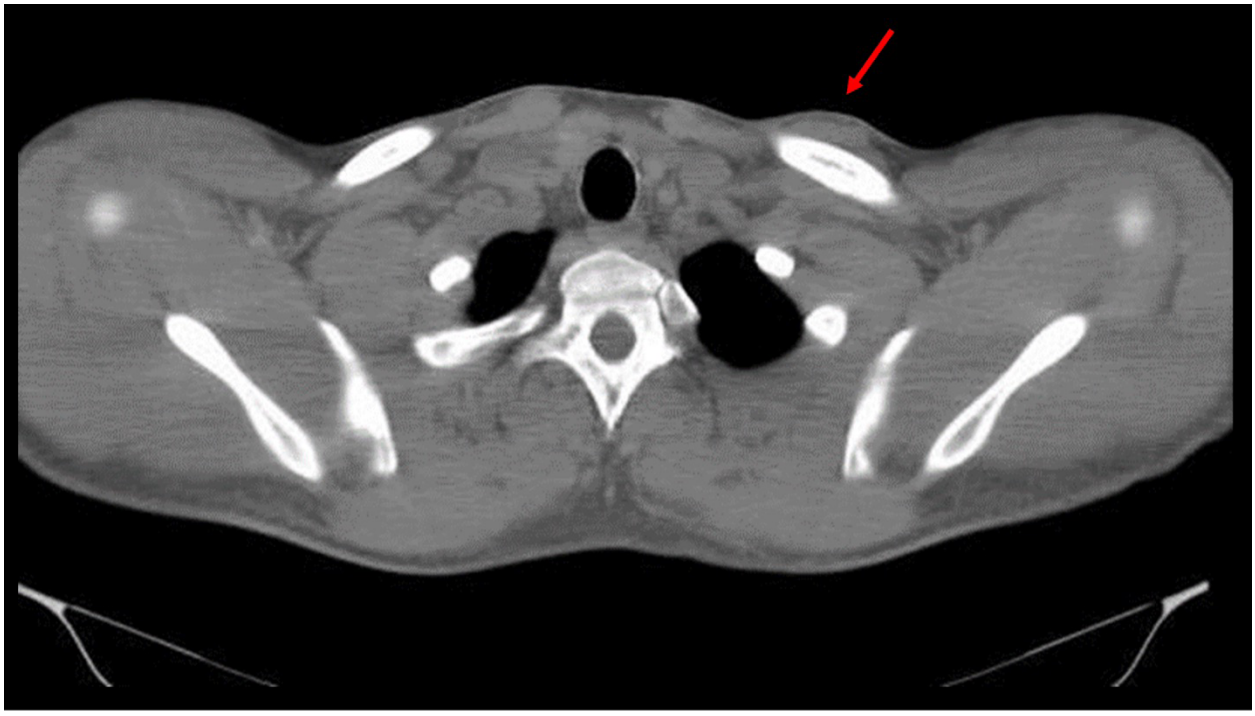

Figure 3.
Axial CT of the clavicle. Axial CT demonstrated the permeative pattern of osseous destruction with an adjacent soft tissue mass.

mass effect on the adjacent soft tissue planes on the T1 sequence with fat suppression. The laminated periosteal reaction is also well noted on this study (Figures 4a and 4b).

The PET CT demonstrated metastasis to the right ilium, right scapula, and C4 vertebral body (Figure 5a and 5b). The MRI of the cervical spine demonstrated low signal intensity on T1 and high signal intensity on T2 with the

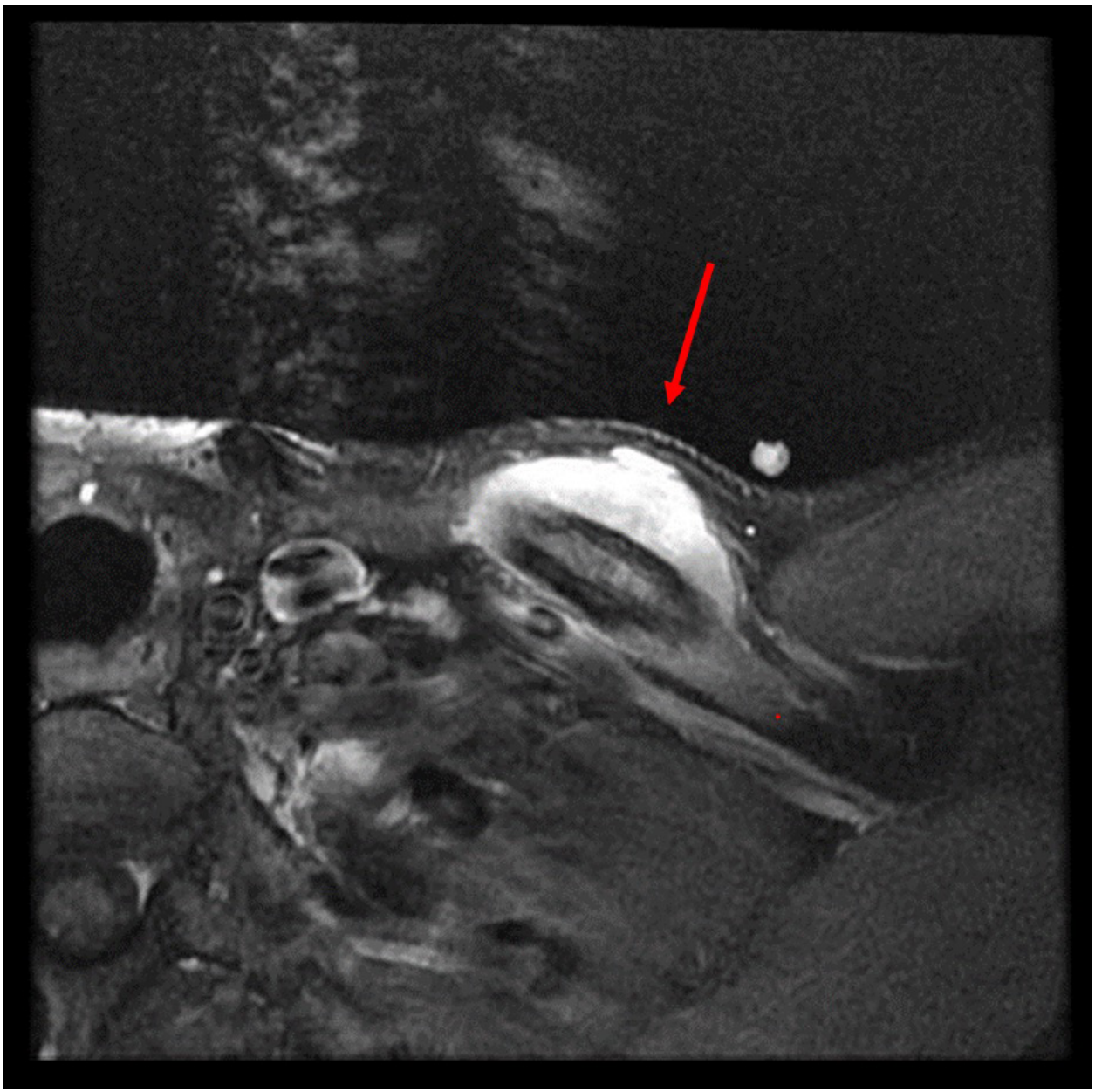

Figure 4a.

Axial T1 fat suppression with contrast MRI. Large homogenous contrast-enhancing soft tissue mass with heterogeneous medullary and various areas of cortical enhancement about the midshaft of the clavicle. Similar findings were noted throughout the length of the clavicle (not shown).

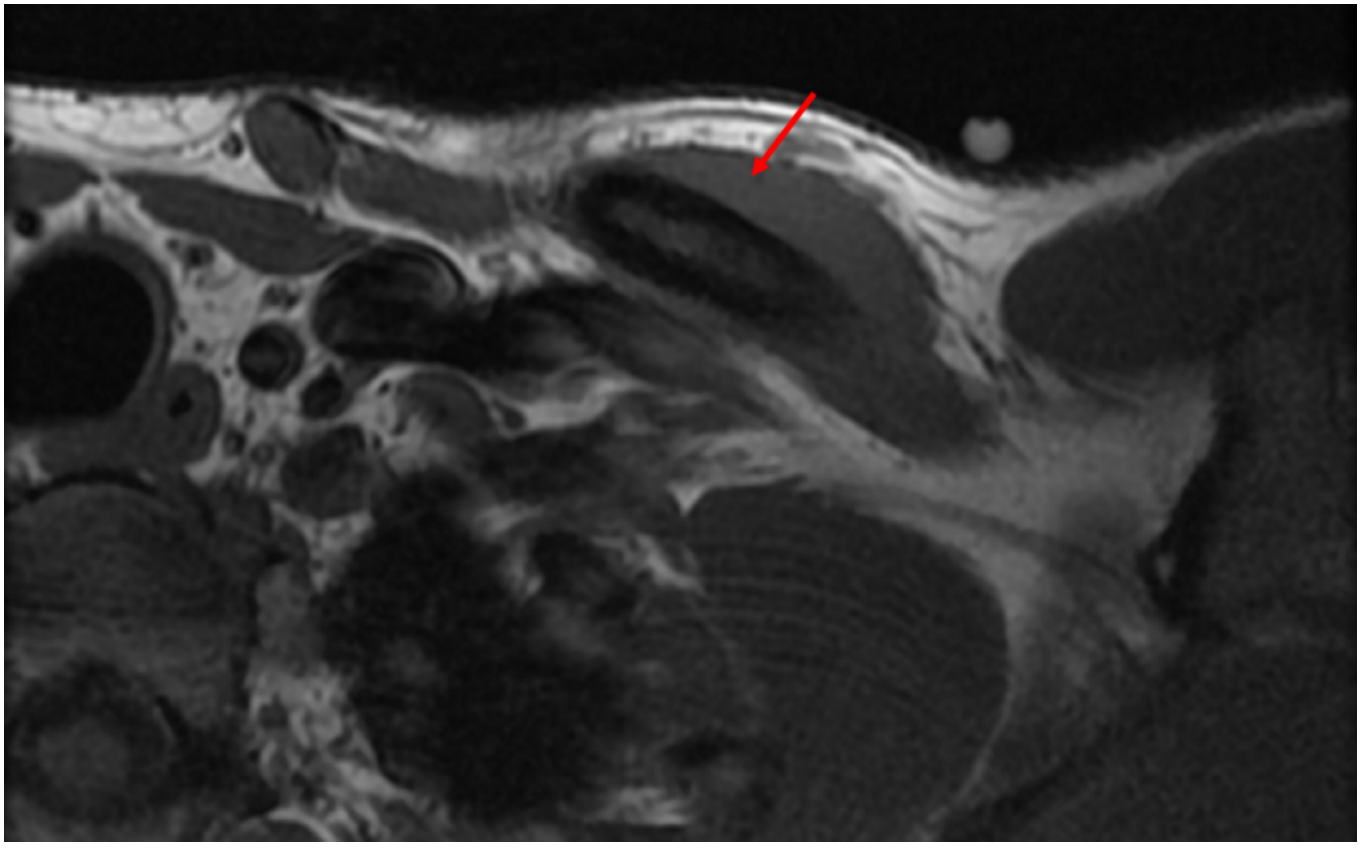

Figure 4b.
Axial T1 fat suppression without contrast MRI. Large soft tissue mass with diffusely low signal noted in the medullary aspect of the midshaft of the clavicle. Again, similar findings were seen throughout the length of the clavicle (not shown).

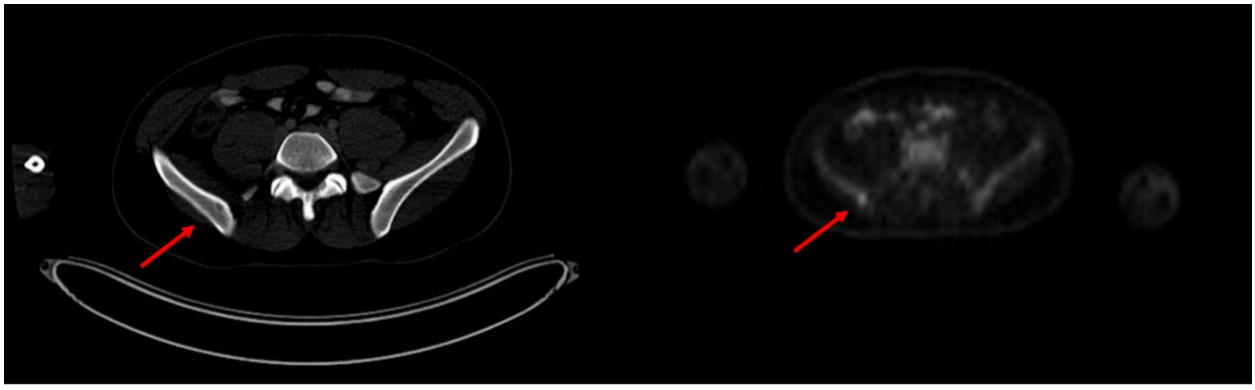

Figure 5a.
Axial PET-CT. Circular hypoattenuating lesion about the medial aspect of the posterior portion of the ilium measuring approximately 6.2mm x 3.5 mm (arrow), consistent with osseous metastasis.

left aspect of the vertebral body and transverse process of C4. Increased uptake was also noted in the lymph nodes of the upper cervical spine which was suspected to be a reactive or inflammatory reaction rather than a true site of metastasis (Figure 6).

The initial working diagnosis based on imaging was

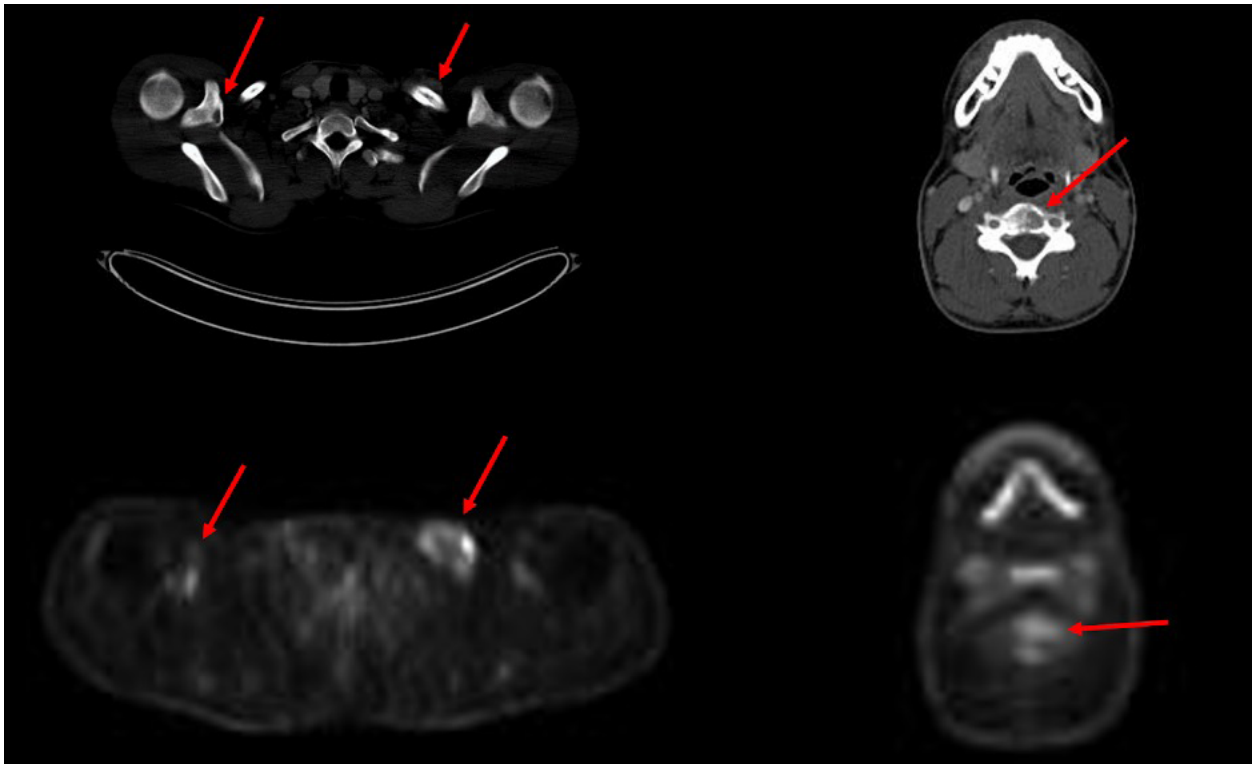

Figure 5b.

Axial PET-CT at the levels of the clavicle and C4. Images demonstrate primary lesion of the left clavicle as well as right scapular metastasis (arrows on left image) and metastasis to the C4 vertebral body (arrow on right image).

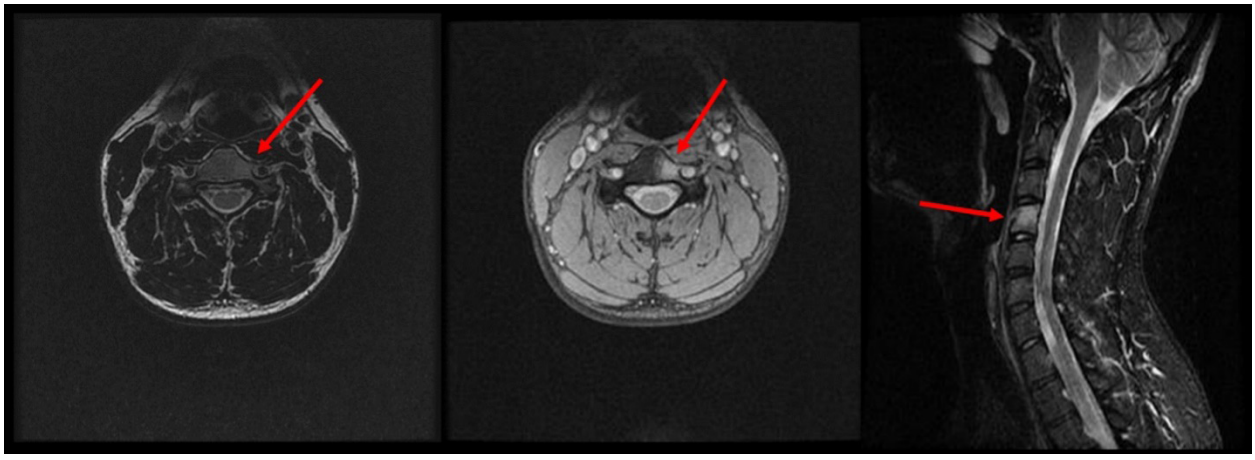

Figure 6.

Cervical MRI. Axial and sagittal MRI images with metastasis to the C4 vertebral body and left transverse process.

osteosarcoma. The lesion was then biopsied and demonstrated crushed small round blue cells within both the osseous and soft tissue components, which is consistent with Ewing Sarcoma. The fluorescence in situ hybridization (FISH) test was positive for the EWSR1 gene rearrangement, which changed the final diagnosis to Ewing Sarcoma.

The patient was referred back to the primary care physician with subsequent oncology referral for staging and treatment. Treatment included chemotherapy and radiation therapy. Following treatment the patient went into remission. Reoccurrence of the tumor occurred two years later, again treated with chemotherapy. The patient has since passed due to related complications.

Discussion

This case demonstrated a primary malignant tumor of the left clavicle. The clavicle is an unusual location for Ewing sarcoma. Almost half of the patients who develop Ewing sarcoma are between the ages of 10 to 20 years old, with up to 70% being under the age of 20.[4] Clinical presentation of this lesion typically includes pain and swelling in the region, as well as general constitutional symptoms.[5] In our case, the primary presentation was a soft tissue mass with a delayed onset of pain.

The most common locations, which account for 86% of cases, include the pelvis, extremities, and ribs.[6] The clavicle accounts for 1% of involved sites,[5] making our case an unusual location.

Radiographs, computed tomography, magnetic resonance imaging, and nuclear imaging should be utilized in the diagnosis of Ewing Sarcoma.[7] Typical imaging features include an aggressive moth-eaten or permeative destructive pattern with a laminated periosteal reaction.[5] Cortical destruction is often noted, however may not be obvious on radiographs[4]. Lytic lesions are often accompanied by a large soft tissue component that often does not contain calcification.[6] Biopsy is utilized to recognize round blue cells.[8] Cytogenetic testing to identify the specific chromosomal aberration may also be performed.[4,8]

The most common sites of metastasis secondary to Ewing sarcoma include lung, bone, or a combination.[6] Metastasis to bone occurs in 40%.[2,6] Metastasis occurs to the lungs in 80% of cases, however this was not present in our patient, also an interesting component of this case.[2,6]

A study by Yu *et al*.[3] found that of tumorous lesions of the clavicle 61.7% were malignant, with metastatic disease, plasma cell myeloma, and osteosarcoma being the most common. The mean age of this study was 53.5 years old, which is outside our patient demographic, however osteosarcoma was the initial working diagnosis for this lesion.[3] This study also found that malignant tumors had a lower incidence of periosteal reaction, but with a higher incidence of a soft tissue mass.[3] Interestingly a study by Kapoor, Tiwari, and Kapoor[9] found Ewing Sarcoma to be the most common primary malignant lesion of the clavicle in patients aged 12-22 years old, in contrast to our case where the patient was just outside this demographic.

The most common location for the EWSR1 gene rearrangement is on chromosome 22 and 11, which leads to the EWSR1 and FL1 gene fusion that is responsible for 80% of Ewing sarcomas.[4]

Unfortunately, delayed diagnosis with Ewing Sarcoma occurs frequently with the average time between initial presentation and diagnosis being 3.7-6.3 months.[10] Up to 21% of patients have metastasis at the time of presentation.[7,10] A study done by Bacci *et al*.[7] found that the time to diagnosis did not correlate with the stage of disease, however patients with metastatic disease at the time of presentation were often diagnosed sooner than with localized disease. Five-year survival rate for patients with metastatic disease is approximately 0-34%.[2] Osseous metastatic disease carries a poor prognosis.[2] In this case, the delay in diagnosis was approximately seven months, and there was evidence of osseous metastatic disease at diagnosis.

Management for aggressive clavicular lesions can include en bloc resection, which Li *et al*.[11] found resulted in good tumor control, however less favorable outcomes still occurred if metastatic disease was present.[11] Ewing Sarcoma is more sensitive to chemotherapy and radiation when compared with an osteosarcoma.[12] These were the only treatment modalities used in our case.

This case emphasizes the importance of delay in diagnosis and possible treatment options. It is important as treating clinicians to utilize all diagnostic imaging and physical exam findings when unusual patient symptomatology presents.

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