Sternal Leiomyosarcoma: Primary or Secondary

Birincil veya İkincil Sternal Leiomyosarkom

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ABSTRACT

Primary leiomyosarcoma of bone is an extremely rare, aggressive and a diagnostically challenging tumor which occurs mainly in the long bones. Clinically and radiographically, it can mimic other malignancy and its diagnosis is based on histopathology, immunochemistry and electron microscopy findings. It can be perplexing to ascertain whether a biopsy confirmed leiomyosarcoma of bone is primary or secondary in origin. Most of the cases are predominantly secondary from a distant metastasis. The case presented here is an illustration and analysis of this diagnostic problem.

Keywords: Leiomyosarcoma, Sternum bone, Chest swelling

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ÖZET

Kemiğin primer leiomyosarkomu, esas olarak uzun kemiklerde ortaya çıkan, son derece nadir, agresif ve teşhis açısından zorlayıcı bir tümördür. Klinik ve radyografik olarak diğer maligniteleri taklit edebilir ve tanısı histopatoloji, immünokimya ve elektron mikroskobu bulgularına dayanır. Biyopsi ile doğrulanmış bir kemik leiomyosarkomunun köken olarak birincil mi yoksa ikincil mi olduğunu belirlemek şaşırtıcı olabilir. Vakaların çoğu ağırlıklı olarak uzak bir metastazdan ikincildir. Burada sunulan vaka, bu teşhis probleminin bir örneği ve analizidir.

Anahtar Sözcükler: Leiomyosarkom, Sternum kemiği, Göğüs şişmesi

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INTRODUCTION

Leiomyosarcoma (LMS) of bone is a spindle-shaped cell sarcoma of bone with smooth muscle differentiation first described in 1965 by Evans and Sanarkin. It is characterized by the morphologic impression of smooth muscle component in the tumor with the absence of osteoid element and positive smooth muscle imunohistochemical markers(1,2). Occurrence of leiomyosarcoma in the sternum is extremely rare as long bones are commonly involved.

This tumor has no age predilection, but it generally occurs in mean age of the fourth decade with an equal or slight male predominant gender distribution(1-3. Patient with primary bone LMS generally presents with pain followed by swelling and/or pathologic fracture(2,4,5).

Leiomyosarcoma of bone generally shows an indistinct tumor margin, permeative osteolysis pattern, endosteal erosion and cortical breakthrough on a plain radiograph(2,3,5). Computed Tomography (CT) scan is important for the identification of metastatic disease(4). An adequate assessment of the bone and soft tissue in the hallmark of magnetic resonance imaging (MRI). It is the preferred modality to delineate the intramedullary extent of the tumor and its neighboring neurovascular relationship(3,5,7).

The diagnosis of LMS of bone was established by its characteristic microscopic appearance and supported by the positive immunohistochemical staining for actin antibodies and typical electron microscopic features. Light microcopy shows the classic pattern of atypical spindle cells and elongated nuclei with blunted ends(3-5). Distinct smooth muscle differentiation comprising of cytoplasmic filaments with focal density, basement membranes and pinocytotic vesicles are demonstrated with electron microcopy(7). Among Immunohistochemical markers, most of the studies have described expression of smooth muscle actin (SMA), desmin or vimentin, common muscle actin and low molecular weight keratin in identification of smooth muscle origin(2,3).

The need to distinguish leiomyosarcoma as a primary source or secondary metastasis will necessitate in determining the modalities and treatment of choice; surgical excision with wide margins and radiotherapy for primary lesions as opposed to chemotherapy or radiotherapy for metastatic disease(2,4). Most of the published studies on bone LMS have reported dismal prognosis(2). Here we presented a case of sternal leiomyosarcoma and its radiological and histopathological features.

CASE REPORT

A 70-year-old gentleman presented with mild central chest swelling. He has underlying hypertension, diabetes mellitus, dyslipidemia and percutaneous coronary intervention (PCI) to ischemic heart disease. There was no history of trauma, any previous operation or radiation exposure. He complained of central chest discomfort with mild swelling over the sternal region for 2 weeks prior to admission and his performance status is ECOG 3.

Clinical examination revealed an ill-defined swelling measuring 2cm x 2cm on left upper parasternal region. It was non-tender and firm in consistency. Overlying skin over the swelling was normal in color and texture. No visible pulsations were seen. There was no palpable lymph node in the supraclavicular or axillary region. Laboratory test including routine hematological, biochemistry and tumor markers were within the normal range.

Contrast enhanced thorax CT showed soft tissue swelling at the left side of sternal area with mild erosive changes of the underlying sternum, spiculated nodular lesions with 0.7cm-1.0cm diameter on the middle and lower lung lobes of right lung and mild T5 vertebrae compression with sclerotic and degenerative changes.

Positron emission tomography-computed tomography (PET-CT) showed the ^{18}F-fludeoxyglucose (FDG)-avid soft tissue lesion at the upper left sternal edge with bony erosion of the underlying sternum measuring 3.0cm x 3.3cm x 3.6cm in metabolic size with maximum standardized uptake value (SUV_{max}) of 10.8, FDG-avid (at least 4) small to moderate foci at right liver lobe at segment VIII with SUV_{max} 7.3 and a focus at segment III, focal FGD avid lesion at the colorectal area with mild concentric bowel wall thickening with SUV_{max} 9.5cm and multiple FDG avid sclerotic bone lesions at upper and lower sternum with SUV_{max} 7.5, thoracic vertebras and right inferior pubic ramus up to the right posterior with SUV_{max} range between 3.8-5.2. The nodules on the right middle and lower lobes are non FDG-avid.

Subsequently, excision biopsy of sternal mass was planned. Intraoperatively, we detected the tumor at the left upper sternal edge arising from the 2nd and 3rd intercostal muscle above the rib and invading the sternal bone itself and the ribs next to it.

Analysis of the biopsy specimens and additional special stains revealed features diagnostic of leiomyosarcoma. Macroscopically, the sternal mass appears as a pale brownish mass, partially encapsulated, firm and lobulated in consistency. Microscopically, the hypercellular sarcomatous tumor composed of high-grade malignant cells characterized by fascicles of pleomorphic spindle to oval cells with elongated cigar shaped nuclei. Immunohistochemical studies show the malignant cells are strongly positive for desmin with patchy positivity for SMA. They are negative for CKAE1/AE3, S100, MyoD1. CD34 and EMA.

Following excision biopsy of the sternal mass, patient was well. A multi-disciplinary meeting was held involving the oncologist, cardiothoracic surgeon, pathologist and radiologist. Considering a stage 4 disease and poor performance status (ECOG 3), palliative chemotherapy and radiotherapy was planned for this patient.

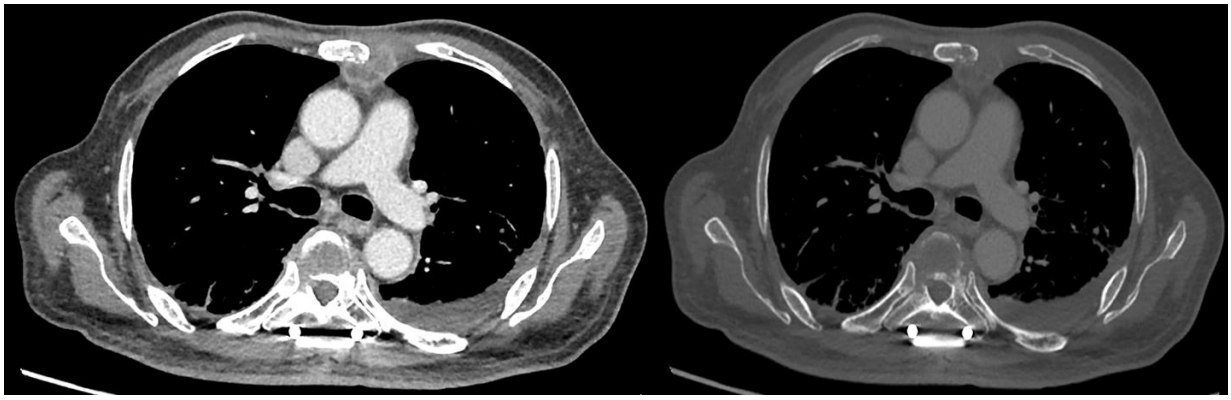


Figure 1. Axial images of the contrast enhanced CT thorax in mediastinal and bone window showing left parasternal enhancing lesion with adjacent bone destruction.

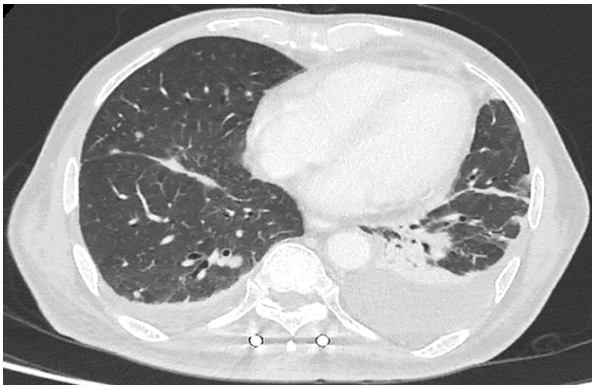


Figure 2. Axial image of the CECT thorax showing few lung nodules in both hemithorax and bilateral pleural effusion.

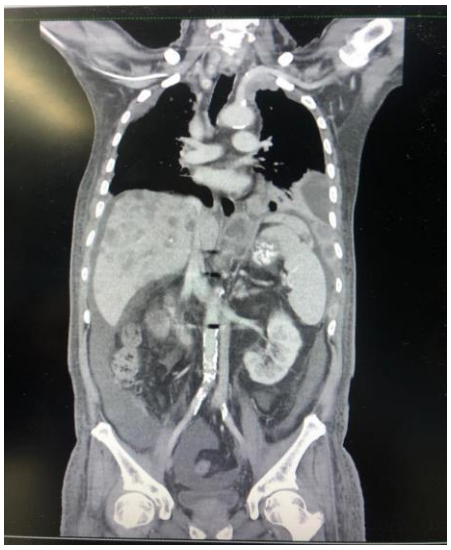
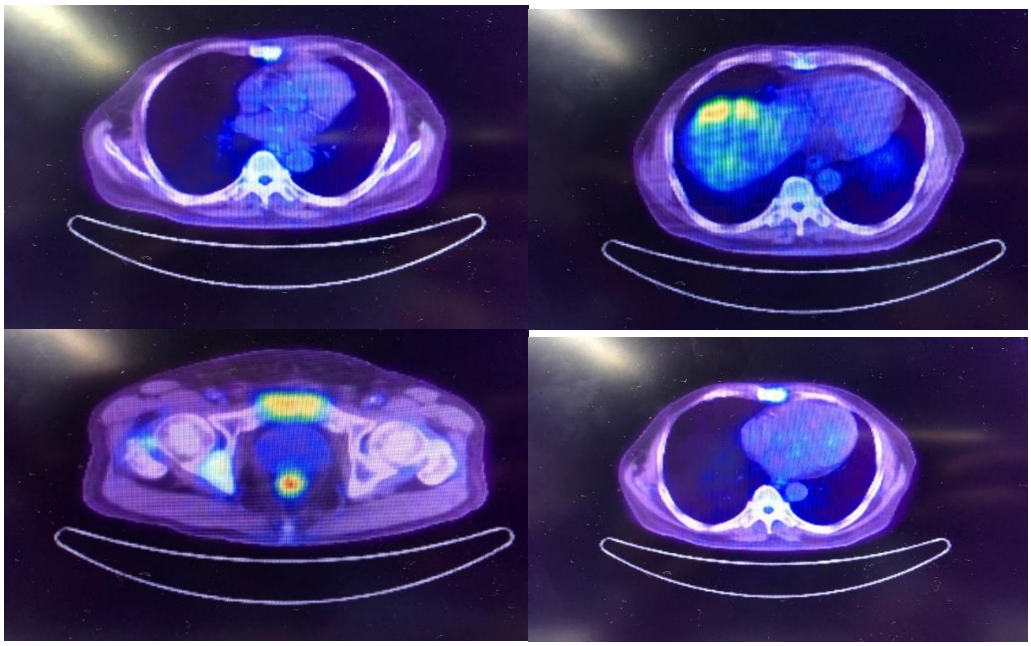


Figure 3. Coronal cut of the CECT Abdomen showing multiple liver and lung metastasis



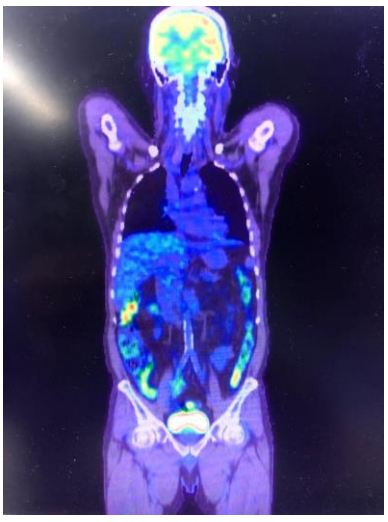


Figure 4. PET scan showing hypermetabolic activities involving sternum, liver and lung

DISCUSSION

Leiomyosarcoma (LMS) is an aggressive soft tissue sarcoma which originates from the smooth or involuntary muscle cells. It represents 7% to 10% of all soft tissue sarcoma and typically occurs within the uterus, gastrointestinal, retroperitoneum and mesentery(3). LMS can also occur in bone particularly in long bones in lower extremity(2). Most commonly at the metaphyseal region of the femur or tibia(2,5). Other sites are also involved including craniofacial skeleton, pelvic bones, radius, clavicle, sternum, phalanx and vertebra(1,2).

Primary LMS of bone is a rare phenomenon with unknown aetiology. There are two main postulated hypotheses about the origin of primary LMS of bone, the main is that it arises from the muscle layer (tunica media) of the blood vessels. Another hypothesis that it arises from a multipotent mesenchymal stem cell or intermediate cellular forms (eg, myofibroblastic origin) capable of smooth muscle differentiation(2-6). In our patient, Immunohistochemical studies show the malignant cells are strongly positive for desmin with patchy positivity for SMA that further confers the diagnosis of primary LMS. Staging of leiomyosarcoma is crucial in treatment selection and in providing prognostic information. The Enneking system of surgical staging of bone and soft tissue tumor is the most widely used staging system and has been adopted by the Musculoskeletal Tumor society and is based on grade, site and metastasis which uses histologic, radiologic and clinical criteria(8). Similar to other types of soft tissue sarcoma, the most frequent sites of metastasis are the lungs, followed by the axial skeleton and the liver(3,5). However, for our patient, upon diagnosis, the tumor has actually metastasized to liver and adjacent rib, making the resection of primary LMS of sternum difficult with poor surgical outcome keeping in mind patients poor ECOG status and stage 4 disease.

It may be difficult to determine which one is the tissue of origin if both bone and soft tissue together are infiltrated by this tumor(5). The tumor may be considered to have originated from intraosseous if its epicenter is primarily within the bone and the volume of tumor tissue is more than 70% in the bone than in the soft tissue(2,5). In this present case, we therefore considered the tumor to be sternal LMS with its epicenter within the sternum in spite of the adjacent 2nd and 3rd intercostal muscle involvement.

The optimal management of primary bone LMS is wide surgical removal of the primary lesion with the aim to obtain a clear surgical margin with a curative intent. Most studies have reported that bone LMS are aggressive and radio resistant(1,2,4). The role of neoadjuvant and adjuvant chemotherapy is debatable and have not provided in improved prognosis(2-5). Chemotherapy represents the principal approach in metastatic LMS although the role is limited. Cisplastin, doxorubicin, or doxorubicin-based chemotherapy and dacarbazine constitutes the most active agents for the treatment of bone sarcoma, and generally are used in the first line metastatic setting(4). The most important prognosis indications are the integrity of surgical resection and its malignancy potential. Studies done by Brewer et al imply that prognosis is based on the stage of diagnosis with stage 2b tumors having a 60% survival at 5 years and 43% survival at 10 and 15 years(1).

An in-depth review and analysis of the case history and previous pathology were made, and we concluded a diagnosis of primary sternal leiomyosarcoma with metastasis to lung, liver, and bone. Sternal mass excision was done and unfortunately patient succumbed to death while on palliative treatment.

CONCLUSION

Leiomyosarcoma of bone are rare aggressive tumors which definitive diagnosis can only be made by pathologic evaluation after mass resection. The diagnosis of sternal leiomyosarcoma is very challenging as patient may present late following the initial presentation. In our patient, once the diagnosis was established, the tumor has already metastasized to lung, liver and bone. This shows the aggressiveness of this tumor in our patient. A multidisciplinary approach should be advocated upon diagnosis to improve the treatment plan for such patient and treatment approach should be individualized based on disease presentation.

Conflict of interest

No conflict of interest was declared by the authors.

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