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European Journal of Radiology Extra xxx (2006) xxx–xxx



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## A case of sternal involvement in an early relapse of hodgkin disease verified with ultrasound guided core needle biopsy

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Received 3 January 2006; received in revised form 30 July 2006; accepted 9 August 2006

### Abstract

Sternal involvement in Hodgkin lymphoma rarely occurs at the initial stages of the disease but is one of the possible locations that should be considered. Although several imaging diagnostic modalities exist, none of them provides histological information. In this case report we present a 33-year-old man with an early relapse of the disease involving the sternum suspected from the data obtained by contrast enhanced CT and scintigraphy. An ultrasound image guided core needle biopsy was used to provide us with histological confirmation of sternal infiltration by the primary disease. Although CT, MRI, PET and scintigraphy are preferred for the diagnosis, follow-up and biopsy guidance of tumor lesions involving or adjacent to the chest wall or sternum, ultrasound examination can provide additional information and may assist in the obtainment of an adequate biopsy specimen especially in the cases with a superficial malignant bony lesion with an anterior cortical break.

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**Keywords:** Hodgkin disease; Core needle biopsy; Ultrasound image guided biopsy

### 1. Introduction

Hodgkin disease is a malignancy of lymphatic tissue with 62,000 new cases reported in 2002 [1]. Therapeutic regimens used nowadays lead to complete remission in 95% of the cases with lower stages of the disease [2]. Refractory and relapsed cases are referred to high dose chemotherapy regimens followed by stem cell transplantation [3].

Secondary bone involvement is observed in 5–20% of the cases [4]. Bone infiltration may arise from invasion of neoplastic cells from adjacent nodal structures involved in the disease, or be a consequence of a systemic spread of the malignancy [5]. There are important diagnostic difficulties in cases of bone involvement in Hodgkin disease, since other possibilities leading to bone destruction and infiltration have to be considered: acute or chronic osteomyelitis, primary neoplasm of the bone, metastasis due to another

neoplasm, Paget disease, eosinophilic granuloma, etc. [6]. These different conditions may be indistinguishable by the conventional imaging techniques. For the aforementioned reason histological confirmation is needed in such cases to establish a definite diagnosis. There are three widely used opportunities to obtain a biopsy specimen for pathological examination—open surgery, fine needle aspiration and core needle biopsy. The latter two techniques have the advantage of being minimally invasive for the patient. In order to get better needle positioning and for safety reasons, the performance of core needle biopsy may be assisted by a guiding imaging technique (most often CT and fluoroscopy, sometimes ultrasound).

### 2. Case report

A 33-year-old man was referred to our institution for a diagnostic workup with complaints of pain in his left arm at rest and exertion. At the physical examination enlarged lymph

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55 nodes in the left supraclavicular region became apparent.  
 56 After the exclusion of cardiac disease the patient was referred  
 57 to an open surgery biopsy of a single left supraclavicular  
 58 lymph node. The pathological examination of the specimen  
 59 verified Hodgkin disease with nodular sclerosis subsequently  
 60 confirmed by immunohistochemical evaluation. Contrast  
 61 enhanced CT was performed as part of the usual staging  
 62 procedures revealing a retrosternal mass in the anterior medi-  
 63 astinum with 20/30 mm dimensions (Fig. 1). No other sites  
 64 of involvement were evident after the complete diagnos-  
 65 tic workup (CT of thorax and abdomen, sonography of the  
 66 abdomen, bone marrow biopsy). The patient was classified as  
 67 stage II B supradiaphragmatic according to the Ann-Arbor cri-  
 68 teria [7]. Conventional chemotherapy regimen (COPP/ABV)  
 69 was started including six cycles with cyclophosphamid, vin-  
 70 cristine, vinblastine, natulan, bleomycine, prednisolone, far-  
 71 morubicine (so called "hybrid" regimen) combined with  
 72 supradiaphragmatic radiotherapy. After an uneventful thera-  
 73 peutic course the patient was in complete remission for 7  
 74 months. Due to pain complaints localized in the sternal region  
 75 contrast enhanced CT of the chest was performed revealing  
 76 osteolysis and destruction of the mid-third of the sternum  
 77 (Fig. 2). Note that the sternum is infiltrated just anteriorly  
 78 to the disappeared mediastinal tumor mass which existed at  
 79 the first CT scans (Fig. 1). We performed a bone scintigra-  
 80 phy scan after i.v. load with  $Tc^{99}$  with apparent fixation  
 81 of the radiopharmaceutic in the anterior chest region on the  
 82 transverse plain. No other sites of involvement of the skele-  
 83 ton were found. After careful review of the follow up CT  
 84 scans (performed after the chemotherapy and radiotherapy  
 85 regimens had been completed) we found that the sternum  
 86 had been infiltrated from the left border but unfortunately it

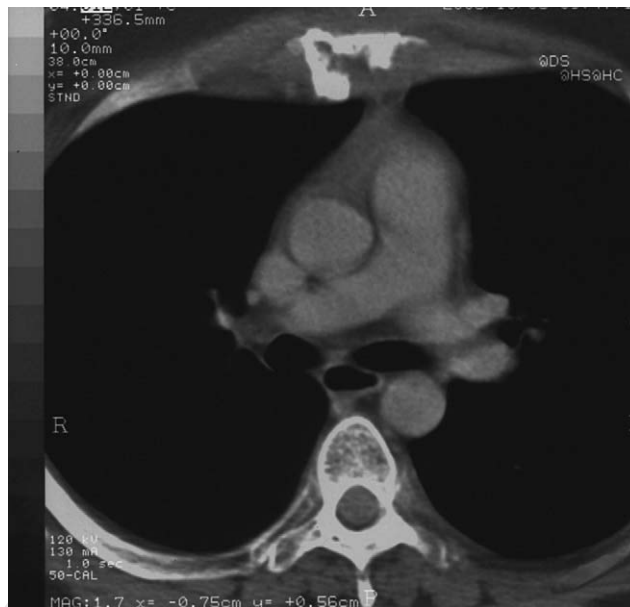


Fig. 2. Contrast enhanced CT of thorax revealing osteolysis and destruction of the mid-third of the sternum.

was unrecognized (Fig. 3). To exclude other possible causes  
 of sternal destruction we proceeded to a core needle biopsy.  
 In our institution most of these procedures are performed  
 under ultrasound guidance when the tumor mass is adjacent  
 or involving the chest wall and the image quality is sufficient  
 The transducer and the preset are chosen according to the  
 scanning depth that is needed in the particular patient. With  
 this patient we used a 10 MHz linear transducer and superfi-  
 cial preset for adequate visualization of the soft tissues and

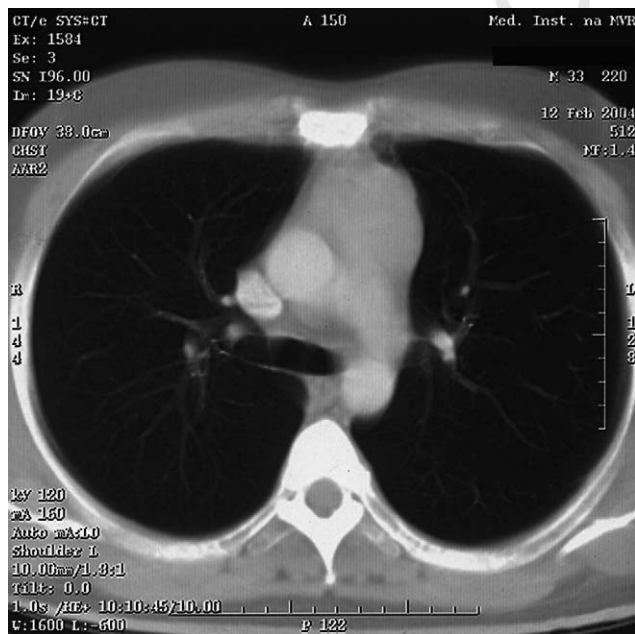


Fig. 1. Contrast enhanced CT of thorax revealing a retrosternal mass in the anterior mediastinum.

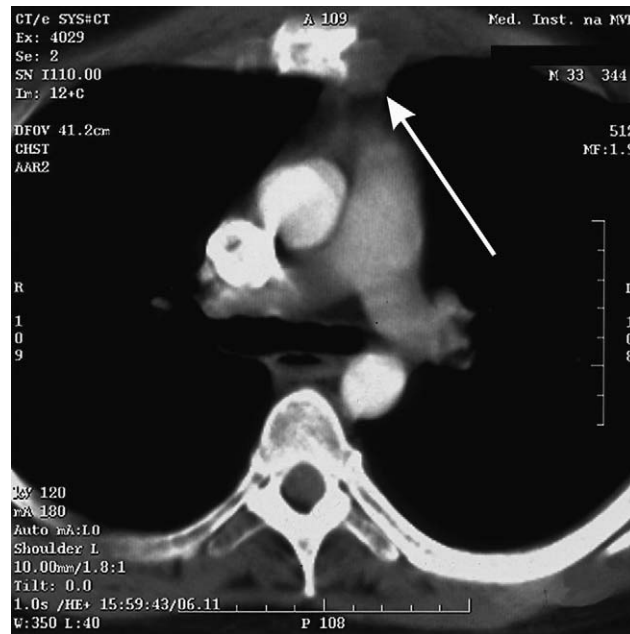


Fig. 3. Contrast enhanced CT of thorax revealing a mass infiltrating the left border of the sternum.

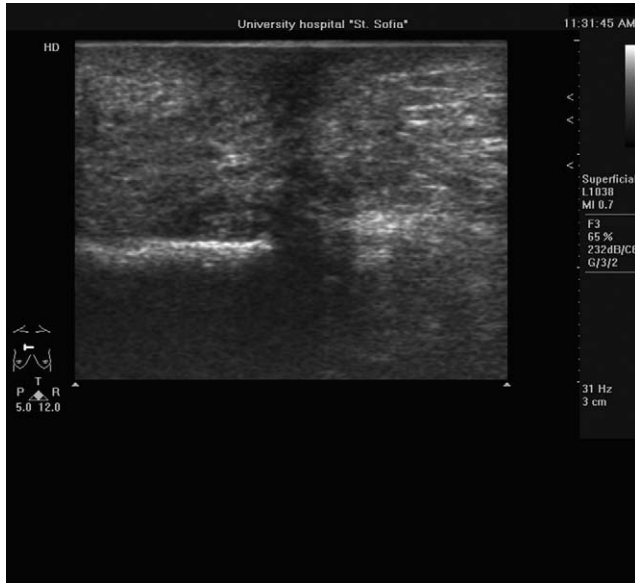


Fig. 4. Sonography of sternum with 10 MHz linear transducer revealing loss of the “cortical reflex” at the right part of the image.

the sternum (Fig. 4). The intact anterior sternal cortex as a linear bone structure reflects ultrasound waves and creates a prominent distal shadowing (left half of Fig. 4). In our case in the mid-third of the sternum an area with complete ultrasound penetration and loss of distal shadowing was apparent (right half of Fig. 4), which was decided to be a sequel of destruction and infiltration by the primary disease of the anterior sternal cortex. Consequently a core needle biopsy in that area was performed with 14G “true-cut” needle. We used a particular needle with a preliminary defined penetration depth, which was limited before the procedure to 20 mm for safety reasons—the pulmonary trunk and the right venticle outflow tract were just posterior to the punctured area of the sternum (Fig. 5). Pathological examination of the new specimen verified sternal infiltration by Hodgkin disease with nodular

sclerosis. The patient was prepared and referred for high dose chemotherapy regimen followed by stem cell transplantation.

### 3. Discussion and Conclusions

We present a patient with sternal involvement in an early relapse of Hodgkin disease with nodular sclerosis and local recurrence from adjacent malignant mass. Malignant bone masses rarely appear in the initial stages of the disease but the sternum is one of the possible locations [4,9]. This possibility should always be considered in patients with prominent pain in the sternal region especially when adjacent tumor mass is present. Although CT, MRI, PET and scintigraphy are widely used for the diagnosis, biopsy guidance and follow-up of tumor lesions involving or adjacent to the chest wall or sternum [10], in some cases an ultrasound examination can provide additional information and may assist in the obtainment of adequate biopsy specimen [11–20]. An ultrasound guided sternal biopsy has some important advantages. The operator gets a real time image of the whole procedure. Thus, the safety of the procedure and the obtainment of the specimen are significantly improved, especially in particular cases when critical structures (vessels, heart, etc.) are adjacent to the region that is punctured by the core needle. Another benefit is the lack of radiation exposure for the patients and operators. The major disadvantage of the ultrasound guided bone biopsy is the probability of misdiagnosing malignant bony lesions situated profoundly and without an anterior cortical break because of the prominent distal shadowing provided by the intact cortex structure and due to technical reasons.

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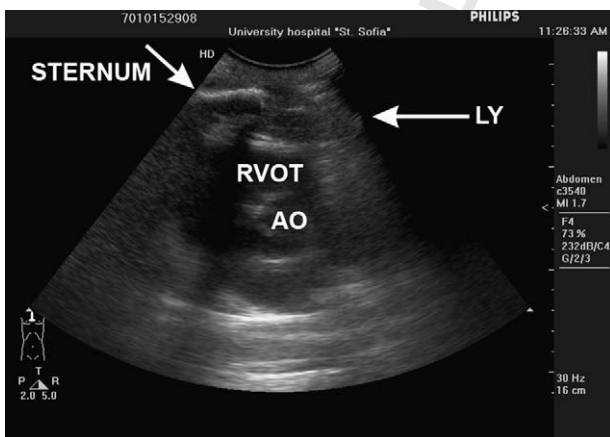


Fig. 5. Sonography of the sternum, the tumor mass (LY) and the heart with 5 MHz sector transducer using abdominal preset revealing the close proximity of the right ventricular outflow tract (RVOT) to the punctured area.

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