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Correlation between radiological assessment and histopathological diagnosis in retroperitoneal tumors: Analysis of 291 consecutive patients at a tertiary reference sarcoma center

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Abstract

Objectives: Aim of study was to assess the correlation between computed tomography scan (CT) findings and histopathology.
Material and methods: Data were collected on consecutive patients with suspected retroperitoneal sarcoma (RPS) referred to a tertiary sarcoma center. Patients underwent contrast enhanced multi-detector CT scans. Radiological features of lesions were classified according to the presence of a fatty (Group A) mass, or non-fatty (Group B) mass, both subdivided according to homogeneity and intralesional high-contrasted appearance. Radiological classification was compared with histopathological diagnosis. Sensitivity, specificity, positive/negative predictive value (PPV, NPV) were analyzed.
Results: Of 291 patients, 103/291 (35.4%) masses were classified in Group A and 188/291 (64.6%) in Group B. Diagnosis of mesenchymal tumor was obtained in 231/291 cases (79%) and non-mesenchymal tumor in 60/291 (21%). Sensitivity and specificity of Group A for liposarcoma were 76.7% and 92.0%; PPV and NPV were 86.4% and 85.6%. Sensitivity of Group B for a mesenchymal tumor was 55.4% and specificity was 0%; PPV and NPV were 68.1% and 0%.
Conclusions: None of radiological criteria were sufficient to anticipate a specific diagnosis, with the only exception of well differentiated liposarcoma and angiomyolipoma. In a series of suspected RPS, 21% of the lesions were finally non-mesenchymal tumors.

Keywords: Soft tissue sarcoma; Retroperitoneal sarcoma; Diagnosis; Liposarcoma; Surgery

Introduction

Retroperitoneal soft tissue sarcomas (RPS) are rare tumors with non-specific modes of presentation. The annual incidence is 0.3–0.4 cases per 100,000 inhabitants[1,2] and peak incidence occurs during the fifth decade of life.[3] RPS are often detected as an incidental finding during radiological assessment for another clinical problem, although some cases present as a palpable clinical mass. The presence of an isolated retroperitoneal mass on imaging may be caused by a number of differential diagnoses and diagnostic certainty can be difficult based on imaging criteria alone. Differently, the more common solid retroperitoneal malignancies,

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arising from the renal/urinary tract and exocrine pancreas, have characteristic diagnostic features on imaging,[4,5] but less common tumors are more difficult to exclude.

The presence of a retroperitoneal mass is frequently detected by abdominal ultrasound (US), but the use of Multi-Detector Computed Tomography (MDCT) or Magnetic Resonance Imaging (MRI), are necessary to characterize and fully assess the lesion.[6,7] Current published data available on the radiological assessment of RPS have focused mainly on liposarcoma.[8–16] Radiological assessment of the lesion includes axial size, fat content, margin status, involvement of major vessels, and the presence of septations. Accurate radiological assessment can help to distinguish cases of suspected RPS, but identification of subtypes is challenging. In well-differentiated liposarcoma, the absence of an area of focal nodular/water density has been suggested as diagnostic of the subtype and pre-operative biopsy omitted.[15] Nonetheless, histopathological assessment is currently required to establish the subtype of RPS and determine management.[17,18] There are no published data on the capability of radiological assessment to predict histopathological subtype of suspected RPS identified on contrast-enhanced CT scan.

The aim of this study was to assess the correlation between contrast-enhanced MDCT findings and histopathological diagnosis, with specific focus on predictive capability, in a series of consecutive patients presenting with solid retroperitoneal masses at a tertiary reference sarcoma center.

Materials and methods

Data was collected from a prospectively maintained database on consecutive patients with an isolated retroperitoneal mass (suspected to be RPS) primarily referred to a tertiary sarcoma center between 2005 and 2012. Patients with radiological diagnoses of primary renal malignancies or pancreatic masses were excluded from analysis.

In all cases, histopathological diagnosis was confirmed by two expert pathologists. Tumor specimen was obtained either by percutaneous biopsy performed by radiologist as initial diagnostic step, or as surgical resection specimen for those who were operated on.

All patients underwent contrast-enhanced thoraco-abdominal MDCT scanning. Studies which were not performed at the referring institution were reviewed and scans were repeated if unavailable or difficult to interpret due to image quality. The protocol for MDCT imaging was as follows: scans were performed with a 16 and 128 detectors CT scanner (Somatom Sensation 16 and SOMATOM Definition Flash; Siemens Healthcare, Forchheim, Germany). Scans obtained with a collimation 16 × 0.75 mm for Sensation and 128 × 0.6 mm for Definition Flash were reconstructed to a 5 mm slice thickness. The peak tube voltage was 120 kVp and the tube current was automatically adjusted by CAREDose4D. For all patients, 120 ml of IV contrast medium (Iopamidol 370, Bracco, Milan, Italy) was injected at a rate of 3 ml/s. Although the studies had multiphase scans, only the venous phase images (80 s scan delay) were reviewed for the purpose of present study. The MDCT images of all patients in the series were reviewed retrospectively using soft tissue window settings on PACS workstations (Syngo imaging, Siemens) by 2 senior radiologists, who have dedicated experience in soft tissue tumors. At the time of imaging review, these radiologists were blinded to the final histopathological diagnosis and assessment of images was performed using a new classification proposed here.

On the basis of previous multidisciplinary experience, a classification system was devised for the assessment of isolated retroperitoneal masses suspected to be sarcomatous in origin. Firstly, retroperitoneal tumors were categorized into two main groups, according to the presence (Group A - fatty lesions) or absence (Group B - non-fatty lesions) of a hypodense fatty component, identified as forming a significant part of the mass and concordant with the subcutaneous adipose tissue. Each group was subdivided and four categories were identified and defined according to characteristic features. Group A lesions were classified according to the homogeneity of the mass and the presence of intralesional high-contrasted images:

- Group A1: homogeneous mass with complete fat attenuation throughout the lesion, plus thin septa;
- Group A2: heterogeneous fatty mass characterized by ground-glass opacities more dense than fat but less dense than muscle, plus thick intralesional septa, without intralesional vessels;
- Group A3: heterogeneous mass with ground-glass opacities more dense than fat but less dense than muscle, plus thick septa, and with intralesional vessels;
- Group A4: heterogeneous fatty mass with solid nodules present within the lesion.

Group B lesions were subdivided into four groups, according to homogeneity pattern and contrast-enhancement appearance. Contrast-enhancement was considered high if the density in the venous phase was comparable to major vessels, and moderate if comparable to muscle tissue. The following subcategories were identified:

- Group B1: homogeneous mass with high contrast-enhancement;
- Group B2: homogeneous mass with moderate contrast-enhancement;
- Group B3: heterogeneous mass with high contrast-enhancement;
- Group B4: heterogeneous mass with moderate contrast-enhancement.

The radiological classification was compared with final histopathological diagnosis. Single histopathological types were grouped into mesenchymal tumors and non-mesenchymal tumors. Mesenchymal tumors included