DIAGNOSIS OF ILIAC WING MASSES UNDER THE GUIDANCE OF CROSS SECTIONAL IMAGING FINDINGS: FROM THE DETAILS TO THE DIAGNOSIS

Original Artıcle

İLİAK KANAT KAYNAKLI KİTLELERDE KESİTSEL GÖRÜNTÜLEME BULGULARI EŞLİĞİNDE AYRINTIDAN TANIYA

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ABSTRACT

Objective: Our purpose was to collect data that would allow differentiation of lesions arising from iliac wings that cause similar changes in this flat bone and surrounding muscle and soft tissues and to present them in conjunction with relevant cases.

Material and Methods: 34 cases (23 men and 11 women, mean age: 38 years) with the diagnosis of iliac wing lesions with various histopathological diagnoses were included in this retrospective study. All cases underwent spiral or multidetector computerised tomography (CT) or magnetic resonance imaging (MRI) at 1.5 Tesla. Intravenous contrast enhancement has been used in 29 out of a total of 34 cases; gadolinium-based contrast agents (0.1 mmol/kg) have been used in 10 MRI scanning (0.1 mmol/kg) and non-ionic contrast agent (1-1.5 ml/kg) has been used in CT scanning. Only MRI scans were available in 11 patients, only CT images in 19 patients and both CT and MRI images in 4 cases.

Imaging findings of the cases were evaluated together with the review of published literature on histopathologic features of the lesions and findings that could provide a clue in differential diagnosis of iliac wing masses were recorded for each patient.

Results: Data for each lesion group and features of the cases were tabulated. Discriminative features were summarised in a separate table.

Conclusion: In patients with iliac wing lesions, history of a primary tumour or presence of an additional lesion in lumbosacral axis or other components of iliac bone similar to the original lesion (diffuse or multiple) should suggest metastasis. Lytic lesions with regular margins and multiple septa should suggest giant cell tumor if they show heterogeneous contrast enhancement and should suggest aneurysmal bone cyst if

they show haemorrhagic levelling. Specific features such as characteristic contrast enhancement (haemangioma), specific density (lipoma, cyst) and increased sclerosis (bone islands, sclerotic response to treatment of metastasis) would aid differential diagnosis of individual lesions. It must also be realised that scintigraphy can be used as an adjuvant imaging modality in other pathologies such as metastatic lesions, Paget's disease and osteoid osteoma.

Keywords:iliac wing; malignity; differential diagnosis.

ÖZET

Amaç:İliak kemik kanadından kaynaklanan, çoğu bu yassı kemik ile çevresindeki kas ve yumuşak doku planlarında birbirine benzer değişiklikler yapan lezyonların birbirinden ayırımını sağlayabilecek bilgileri toparlayarak ilgili olgular eşliğinde sunmayı amaçladık.

Materyal ve Metod: Retrospektif bu çalışmaya, birbirinden farklı histopatolojik tanıya sahip, iliak kanat lezyonlu ve tanısına ulaşılabilen 34 olgu (23 erkek , 11 kadın, ortalama yaş ;38 yıl) dahil edildi. Tüm olguların incelemeleri spiral ya da multidedektör bilgisayarlı tomografi (BT) ile veya 1.5 Tesla gücündeki manyetik rezonans görüntüleme (MRG) cihazlarında gerçekleştirilmişti. Toplam 34 olgunun 29'unda intravenöz kontrast madde (MRG incelemelerinde 10 olguda, gadolinum bazlı kontrast madde: 0.1 mmol/kg; BT için noniyonik kontrast madde; 1-1.5 ml/kg) kullanılmıştı. 11 hastanın MRG, 19 hastanın BT ve 4 olgunun da BT+MRG incelemelerine ulaşılabildi.

Tüm olguların görüntüleri, hiistopatolojik olarak tanımlanmış lezyonların literatür bilgileri eşliğinde değerlendirilerek, iliak kanat lezyonu ayırımında ipucu olarak kullanılabilecek özellikler tespit edilerek her olgu için kaydedildi.

Bulgular: Her lezyon grubu için tespit edilen değişik veriler, olguların özellikleri eşliğinde değerlendirilerek işlendi. Ayırt edici özellikler ayrıca diğer bir tablo içinde toparlandı.

Sonuç: İliak kanatdan kaynaklanan lezyonlarda, primer tümör öyküsü, lumbosakral aksda veya iliak kemiğin diğer kompanentlerinde benzer natürde (diffüz veya multiple) ilave lezyon varlığı metastazı düşündürmelidir. Multiseptalı litik, düzgün sınırlı kitleler daha demarke olup heterojen kontrastlandığında dev hücreli tümör; hemorajik seviyelenme gösterdiklerinde ise anevrizmal kemik kisti düşünülmelidir. Karakteristik kontrast tutulumu (hemanjioma), tipik dansite değerleri (lipoma, kist gibi), skleroz artışı (kemik adacığı, metastazlarda tedaviye sklerotik yanıt gibi) özellikler, bireysel olarak her lezyonun ayırımında yararlı olacaktır. Bunun dışında metastatik lezyonlar, Paget hastalığı, osteoid osteoma gibi patolojilerde sintigrafinin de yardımcı inceleme modalitesi olarak kullanılabileceği bilinmelidir.

Anahtar Kelimeler: iliak kanat;malignite;ayırıcı tanı.

OBJECTIVE-INTRODUCTION

Radiologic appearance of iliac wing masses may mimic each other as is the case in other bone tumours (1-4). Although rare and common pathologies that affect iliac wings such as soft tissue lesions, metastatic lesions or those originating from bone structures, metabolic or systemic disorders have been described in the literature in detail, were could not find any study about identification and characterisation of a primary tumour originating from iliac wings. There are numerous attractive imaging findings most of which are, however, case-specific and complicating better clarification of the situation compared to local masses. In this study, we aimed to elucidate and present important features that need to be

considered in differential diagnosis of the masses originating from iliac wings by reviewing archived images together with the histopathologic findings. Furthermore, we included representative images for each case group in order for the readers to become familiar with radiologic appearance of specific lesion groups.

MATERIAL AND METHODS

By reviewing the archived data of the last 5 years, cases that have been histopathologically diagnosed with a tumour that originates from iliac wings and in whom cross sectional imaging findings were available, were included in this study (34 cases; 23 men, 11 women, mean age; 38 years).

A detailed literature review has been conducted for each lesion including histopathologic features. Cross sectional imaging findings of each lesion were re-evaluated; findings were compared with the current literature and clues that would be considered specific to that lesion were recorded.

Cross sectional imaging studies of all cases has performed using spiral or multidetector computerized tomography or 1.5 Tesla MRI system. Intravenous contrast enhancement had been used in 29 out of 34 cases (gadolinium-based contrast agent in MRI scan of 10 cases: 0.1 mmol/kg; non-ionic contrast agent for CT: 1-1.5 ml/kg). Only MRI scans were available in 11 patients, only CT images in 19 patients and both CT and MRI images in 4 cases.

The patients were grouped under the name of the bone lesion affecting iliac wings: aneurysmal bone cysts (n=2), giant cell tumour (n=2), chondrosarcoma (n=1), round cell tumour (n=7), metastasis (n=6), multiple myeloma (n=1), lipoma (n=2), cyst (n=1), alterations in exaggerated healed old fracture line (n=1), congenital anomalies (variation) (n=3), infection-osteomyelitis (n=2), Paget's disease (n=1), fibrous dysplasia (n=1), osteochondroma (n=1).

RESULTS

The following discriminative features were described under the main headings representing each lesion group.

Osseous septa and haemorrhagic small levelling in CT/MRI were typical characteristics for aneurysmal bone cysts (n=2) whereas cases of giant cell tumour with a similar appearance were characterized by the presence of solid component and contrast enhancement in these components (**Figure 1**).

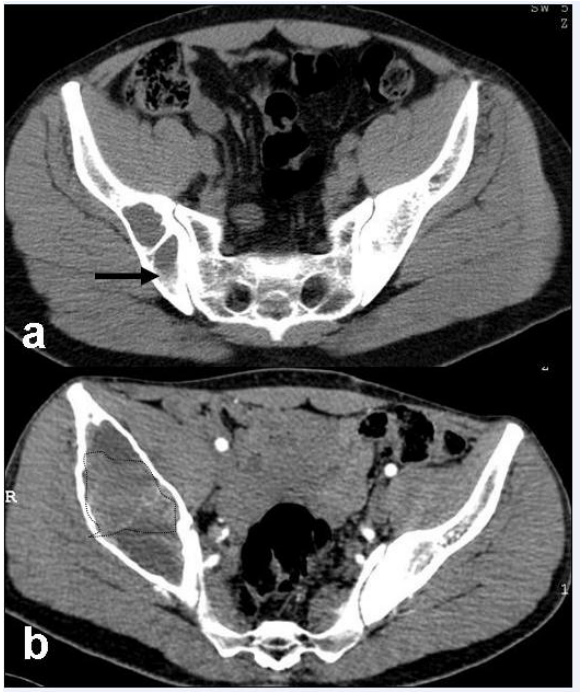

Figure 1. *a) Haemorrhagic levelling in aneurysmal bone cyst (arrow), b) Contrast uptake in giant cell tumour (circled area).*

Lesions that were grouped under the same name of round–small cell tumour such as Ewing sarcoma (n=2), NHL (n=3) and osteosarcoma (n=1) and radiological findings for permeative expansion. These findings were remarkable for the preservation of the anatomic integrity or at least shadow of the skeleton despite space-occupying and lytic character of the

giant mass lesion crossing the bone wing (**Figure 2**).

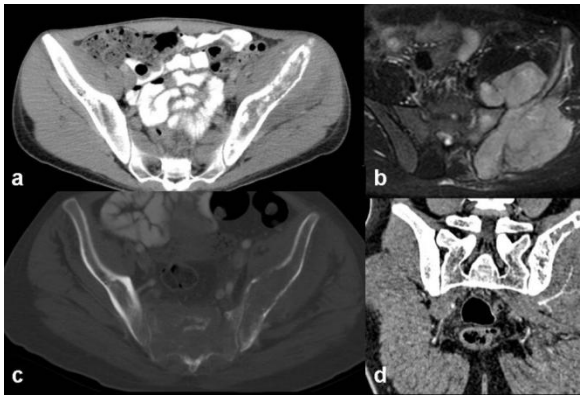

Figure 2. *Iliac wing masses enlarging with permeative destruction pattern. a) Non-Hodgkin lymphoma, b) Osteosarcoma, c) Primary neuroectodermal tumour, d) Ewing Sarcoma. It is remarkable that skeletal anatomy is preserved in these high-grade malignant tumours even despite the wide extension.*

In cases with osteochondroma (n=4), cartilage cap that was lining the surface of egzostotic hypertrophy with corticomedullary connection had more clear appearance in MRI sections but also had a typical appearance in appropriate multidetector CT sections obtained from fitting planes. Giant osteochondromas, regardless of whether they were sessile or pedinculated had hypertrophic expansion with a connection bundle and cauliflower appearance.

In cases with prostate (n=2), bladder (n=2), stomach (n=1), renal cell carcinoma (n=1), detection of iliac wing mass with retrospective examination was easy and informative. One case with prostate carcinoma had sclerotic iliac lesions and elevated PSA levels (5.6 ng/ml); other case had diffuse heterogeneous signal intensity in MRI images of bone-bone marrow accompanied by positive biopsy result (metastasis of an adenocarcinoma arising from right peripheral zone of prostate with capsule invasion).

In contrast enhanced sections during portovenous phase, metastatic renal cell lesion had a contrast uptake pattern similar to that of primary renal mass (lytic, expansive iliac wing mass with soft tissue component). In general, other metastatic lesions appeared as lytic and destructive mass lesions. In one case of signet ring cell carcinoma of the stomach, presence of multiple lumber spinal axis lesions similar to iliac wing lesions was in support of metastasis.

In one patient known to have a slowly expanding mass with internal calcifications in right iliac bone that is connected with periacetabular area, previous histopathological findings were corresponding to chondrosarcoma. In time, the lesion showed dedifferentiation and infiltration that was involving iliac wing. Micro calcifications scattered within the soft tissue component of the lesion was reflecting common pattern of chondrosarcoma.

In cases with intraosseous lipoma (n=2) and iliac wing cyst (since they were originating from a flat bone), the lesions had caused expansion of iliac wing and partly lobulated contours and deformity instead of typical non-expansive configuration. However, density measurements in CT and fat-supressed MRI sections that were developed to detect lesions with fat components easily recognised the lesions. In these cases, typical tissue composition was determined; the lesions did not show contrast enhancement and lesion contours had a narrow transition zone (**Figure 3**).

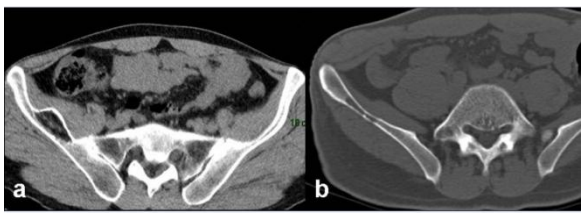

Figure 3. *a) Lesion that is shifting flat medulla in a case of intraosseous lipoma and (b) elongated homogenous hypodense lesion (cyst) in the shape of medulla that is originating from iliac wings have a narrow transition zone and density characteristics have supported the pre-diagnoses (lipoma: -170 HU, cyst: 19 HU).*

Atypical lesions were also determined in the study patients. In one of these cases, as far as we understand by retrospectively reviewing using our study method, despite homogeneous hypodense nature and sclerotic regular rim, the diagnosis of multiple myeloma was consistent with sclerotic perilesional alterations indicating secondary (reactional) response to chemotherapy.

Hypertrophic ossification developed in one case with a fracture has caused an appearance of osteosarcoma in axial images by causing irregular periosteal reaction. However, fracture was able to be distinguished by observation of displaced fracture line in 3D images constructed from thin slices retrieved from the archived data and presence of trauma history (**Figure 4**).

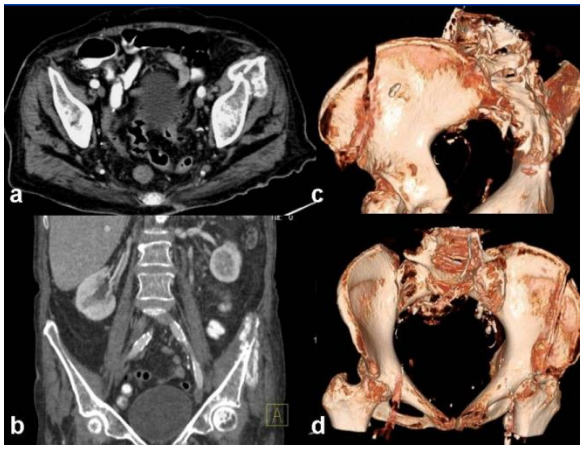

Figure 4. *Changes in left iliac wing of a patient that has forgotten history of trauma have created an appearance mimicking a neoplastic lesion in axial (a) and coronal (b) images. However, fracture line can clearly be visualised in three-dimensional images constructed from oblique (c) and anterior (d) images with appropriate window-colour adjustment.*

Left hip joint tuberculous arthritis was diagnosed in one case with non-specific heterogeneous sclerotic-lytic (mixed) changes in iliac wing contours and another case had a picture of pyomyositis extending to right periiliac muscle layers accompanying to pyogenic arthritis of the right hip. In both cases, the diagnosis was established by laboratory investigation, history, clinical features and synovial fluid aspiration (**Figure 5**).

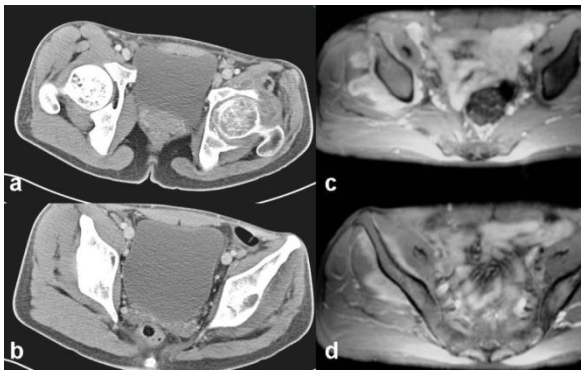

Figure 5. *Two cases of infection originating from hip joint with iliac periosseous involvement. a, b) inflamed soft tissues extending from the left hip joint to the base of the left iliac wing (tuberculous arthritis), in sections superior to the joint at the right side, periarthritic inflammation (pyomyositis) show continuity towards upper part.*

In one case with a Paget's disease that was diagnosed by the involvement of iliac wing, mixed sclerotic changes in the left iliac wing, although they were non-specific, persisted in long-term follow-up and the condition was correctly diagnosed as Paget's disease due to lack of any other finding suggestive of metastasis and presence of scintigraphy findings.

There was no pathologic finding in corticomedullary density of a total of three cases with increased osseous thickness of the iliac wing and (hypertrophic) anterior iliac horn variation one of which had Klippel-Trenaunay Syndrome; however, there was an increase in total volume. These asymmetric and variable changes have been able to be diagnosed by physical examination and anamnesis.

In one case with a typical iliac wing thickening that has fusiform ground glass appearance, these expansive changes were causing left lateral shifting of the bladder and other pelvic structures. Typical ground glass appearance and fusiform expansion with regular contours were consistent with fibrous dysplasia.

DISCUSSION

Iliac wing is a flat bone that appears as a simple anatomic structure surrounded by bands of muscle and radiologic appearance of its lesions resemble each other and can be confusing. However, the clues that we found retrospectively in our case groups supported by histopathological data, in addition to known radiological features of the above-mentioned tumour, would aid establishing prediagnosis-diagnosis and increase the accuracy.

Iliac bone wing that is used in determination of bone age and as one of the reference points for scintigraphic uptake is affected by many osseous pathologies as reported in the literature. As discussed in our study, differential diagnosis is possible in almost every case provided that clinical data, laboratory findings and imaging characteristics are taken into consideration together with the anamnesis in addition to other features mentioned earlier. Many discriminative features have been reported for other lesions in the literature in addition to those reported for 34 cases in our study (5-7). Unfortunately, none of the studies have investigated the incidence of mass lesions originating from or affecting iliac wings although there are studies reporting incidence rates separately for sacrum, pelvis and even for inguinal canal and iliopsoas compartment (8, 9).

Systematic-statistical analysis would be difficult and perhaps implausible due to the fact that tumour arising from sacrum, soft tissues, intrapelvic organs, systemic disorders and metastatic lesions can affect the whole compartment. Rather than attempting to make statistical analysis or to calculate incidence rate, our purpose in our study was to reveal pathologic changes occurring in various neoplastic disorders of this compartment (iliac wing) that has only been subjected to case reports until now. We attempted to support the case reports with the established knowledge on the tumours of skeletal system and cited references (for lesions not having radiologic images). Diagnostic clues and lesion characteristics that could be useful in differential diagnosis are summarised in **Table I**.

*In the presence of primary tumour and/or similar lesions (multiple): ***metastasis*** (10)
*Lytic, expansile, solitary lesion with irregular contours: ***sarcoma** -radial periosteal reaction: osteosarcoma (11, 12) -cartilaginous matrix and calcification, slow progression: chondrosarcoma (13, 14) -giant, infiltrative soft tissue mass: pleomorphic soft tissue (15)
*Expansion with permeative growth: ***small-round cell tumours*** (16-19)
*Multicomponent and haemorrhagic levelling, expansive mass with regular margins: ***aneurysmal bone cyst***(20, 21)
*Multicomponential, expansile mass with solid contrast and regular margins: ***giant cell tumor*** (22)
*Medullar sclerosis with spiculed contours: ***bone islands*** (23)
* Simple, homogeneous cystic lesion with narrow transition zone: ***cyst, eosinophilic granuloma, malignant tumour-metastasis irresponsive to the treatment*** (24-26)
*Specific MRI features due to signal void fenomanen caused by tubulonodulary tortuous vessels: ***haemangioma*** (27)
*Corticomedullary connection, cartilage cap: ***osteochondroma*** (28)
*a demarcated nidus formation (hypodense or sclerotic): ***osteoid osteoma*** (29)

Table I. *Discriminative features of lesions originating from iliac wings.*

In the current study, we presented features of patients with iliac wing lesions in a wide spectrum together with the typical figures. Besides 34 cases with various pathologies, diagnostic and other lesion-specific features that could be encountered were summarised in accordance with the literature data. CT and MRI provides accurate diagnosis when combined with anamnesis, clinical findings, treatment history and laboratory data particular if contrast enhancement is employed. Considering the features observed in our case groups, radiologic diagnosis was possible excluding rare cases in which scintigraphy would be useful (i.e. Paget's disease, osteoid osteoma).

In conclusion; osseous lesions originating from iliac wing and pelvic

junction can be recognised by evaluating radiological findings with the guidance of clinical history and laboratory investigations, performing density measurements on CT and obtaining particular MRI sequences that discriminate different tissues and employing the clues provided here and typical radiologic patterns. Unlike the cases presented to date in a case report format, we think that our study will serve as a reference providing clues and detailed as well as clear information about differential diagnosis of osseous masses originating from iliac wings.

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