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MAGNETIC RESONANCE IMAGING IN THE DIAGNOSIS OF PIGMENTED VILLONODULAR SYNOVITIS

Original Article

PİGMENTE VİLLONODÜLER SİNOVİT TANISINDA MANYETİK REZONANS GÖRÜNTÜLEME

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ABSTRACT

Objectives: Pigmented villonodular synovitis (PVNS) is an uncommon synovial proliferative condition with inflammatory origin of unknown aetiology typically affecting adults in the third or fourth decade of life. The aim of this study was to retrospectively asses the usefulness of MRI for characterizing pigmented villonodular synovitis and to review the literature.

Materials and Methods: The data of 14 consecutive patients (9 males, 5 females; mean age 38 years, range 22-55 years) who underwent MRI examination and subsequent biopsy with typical clinical and imaging findings suggesting PVNS were included this retrospective study between June 2007 and April 2010. Of 14 cases 8 had knee, 1 had hip and 5 had ankle involvement.

Results: Findings on MRI are mainly referring to the haemosiderin deposition in the affected tissues due to its magnetic susceptibility properties. In addition to the deposits of haemosiderin, the signal characteristics also reflect the histological composition of the tissue, particularly lipids and inflammatory fibrosis. The MR imaging appearance of PVNS consists of multiple synovial lesions with low or intermediate signal intensity on T1-weighted and low signal intensity on T2- weighted and gradient-echo images.

Conclusıon: In addition to it's highly suggestive role in the diagnosis of PVNS, the usefulness of MRI in determining the distribution and thickness of abnormal tissue is extremely important for making decision about the process and subsequent surgical planning .

Key words: *Pigmented villonodular synovitis, MRI, Haemosiderin.*

ÖZET

Amaç : Pigmente villonodüler sinovit, tipik olarak yaşamın üçüncü ya da dördüncü on yılındaki erişkinleri etkileyen, etyolojisi bilinmeyen inflamatuar kökenli nadir bir sinoviyal proliferatif durumdur. Bu çalışmanın amacı pigmente villonodüler sinovit tanısında MRG'nin yararlılığını retrospektif olarak değerlendirmek ve literatürü gözden geçirmekti.

Materyal ve Metod : Bu retrospektif çalışmaya, Haziran 2007 ve Nisan 2010 tarihleri arasında MRG çekilen ve takiben biopsi uygulanan, tipik klinik ve görüntüleme bulguları ile PVNS'yi düşündüren 14 ardışık hastanın (9 erkek, 5 kadın; ortalama yaş 38, 22-55 yaşlar arası) verileri dahil edildi. 14 hastanın 8'inde diz, 1'inde kalça ve 5'inde ayak bileği tutulumu vardı.

Bulgular: MRG bulguları temel olarak, tutulan dokulardaki hemosiderin birikimi nedeniyle oluşan manyetik duyarlılık özelliğine bağlıdır. Sinyal özellikleri, hemosiderin birikiminin yanı sıra, özellikle lipit içerik ve inflamatuar fibrozis gibi dokunun histolojik bileşimini de yansıtır. PVNS'nin MRG görünümü, T1AG'de düşük-eş sinyal intensitesinde, T2AG ve gradient-eko görüntülerde düşük sinyal intensitesinde multipl sinoviyal lezyon şeklindedir.

Sonuç: MRG'nin PVNS tanısındaki oldukça anlamlı rolüne ek olarak anormal dokunun kalınlığı ve dağılımını saptamadaki yararlığı,sürecin ve cerrahi planlamanın kararlaştırılmasında son derece önemlidir.

Anahtar Kelimeler: *Pigmente villonodüler sinovit, MRG, Hemosiderin.*

INTRODUCTION

Pigmented villonodular synovitis (PVNS) is a locally aggressive synovial proliferative disorder of unknown aetiology affecting the linings of joints, tendon sheaths and bursae. It was first described by Chassignac (1) and later on coined by Jaffe et al (2). PVNS represents a part of a disease spectrum that includes diffuse and localised forms. Localised form occurs most commonly in the knee with presenting mechanical symptoms, whereas diffused form occurs in the knee, hip and ankle with presenting chronic oedema and pain symptoms (3). The most commonly occurring sites are the knee, flexor tendon sheaths of the hand and hip joint, followed by the ankle and shoulder (3,4). There are numerous factors causing diagnostic difficulties not only at clinical and radiological levels, but also histologically in the course of PVNS.

The management strategy depends on the type, site and aggressiveness of the PVNS lesion. The aetiopathogenesis still remains uncertain. Inflammatory synovial hyperplasia, benign neoplasia of unknown aetiology, abnormality of local lipid metabolism, repetitive trauma and haemorhage are the various hypotheses put forward to explain the possible aetiology of PVNS. The main aetiology of PVNS has been proposed to be precipitated by trauma.

In this article we aimed to describe the MRI appearance of pigmented villonodular synovitis by presenting imaging findings of histopathologically proven 14 cases with typical clinical and imaging features and reviewing the literature.

Materıal and Methods

In this retrospective study, initially the data of 14 consecutive patients (9 males, 5 females; mean age 38 years, range 22- 55 years) who underwent MRI examination with typical clinical and imaging findings suggesting PVNS were recorded and subsequent biopsy results were obtained within a period of 28 months.

MRI scanning was performed with a 1,5 T body scanner (Avanto; Siemens, Erlangen,

Germany) with a 33 mT/m maximum gradient capability using an eighteen channel phased-array body coil, consisting of spin-echo T1-weighted (T1W) , turbo spin-echo T2-weighted (T2W) , turbo spin-echo trim, gradient-echo sequences and in some cases enhanced T1W sequences in axial, coronal or/and sagittal planes including the entire joint and adjacent soft tissues. The scanning time was 30 to 45 minutes.

The MR images were retrospectively reviewed in consensus by two radiologists with experience in musculoskeletal radiology.

RESULTS

MRI features of 14 PVNS cases were localised as ; 8 occured in the knee, 1 in hip and 5 in ankle.

In the knee joint , among 8 cases 3 of them were localised 5 were diffuse forms of PVNS. Localised forms were seen as soft tissue masses ,sized between 5 and 8 cms, in the infrapetallar fat pad (Hoffa's) with T1W, PD intermediate and T2W hypointense signal characteristics **(Figure 1).**

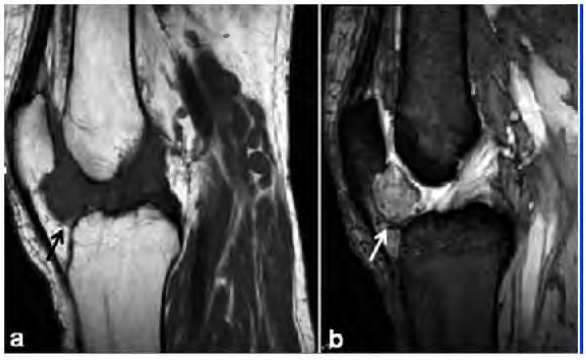

Figure. 1 *Male, 32 years old. Pelvis X-ray (a),T1-weighted (b), GRE (c) and Postgadolinum coronal (d) MRI images. X-ray showed multiple bone erosions (arrows) in the femoral neck and intertrochanteric regions and acetabulum of the left hip, with joint effusion (a). MR images of the hip showed multiple bone erosions and soft tissue masses around the joint (arrows b-d). Very low signal of hemosiderin deposits in the GRE images (arrows c).*

Diffuse forms were consisting of synovial thickening and associated joint effusion as hypointense signal on T1 and hyperintense signal on T2 with scattered low signal intensity areas within on T2W and GRE images representing haemosiderin deposition. The other diffuse PVNS form was in the left hip joint **(Figure 2).**

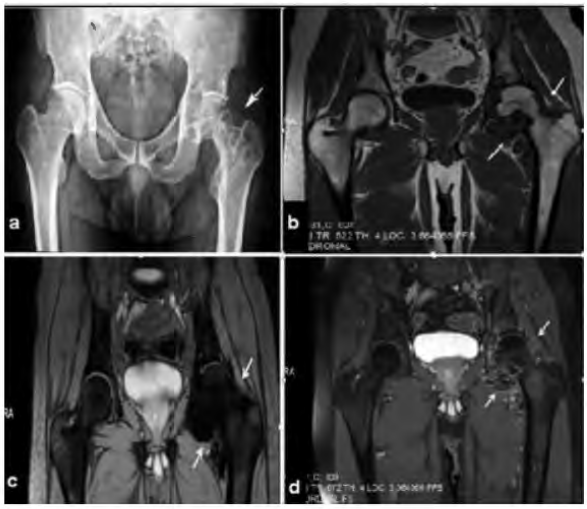

Figure. 2 *Male, 61 years old. T1-weighted (a), GRE (b) MRI sequences. Sagittal MR images of the knee showed nodular soft tissue masses in the Hoffa pad without bone erosion (arrows a) and very low signal of hemoderin deposits in the GRE images (arrow b)*

Although MR images of the hip showed multiple bone erosions and soft tissue masses around the joint , such bone involvement was not found in the knee cases. MR imaging of the ankle cases showed low signal of hemosiderin deposits on T2W and GRE sequences including bone involvement such as subchondral erosions.

Enhancement was seen in the proliferative synovial masses, however, GD-DTPA contrast-enhanced T1WI did not help the diagnosis.

DISCUSSION

Jaffe, Lichtenstein and Sutro first described the disease process they termed pigmented villonodular synovitis in 1941 (2). The knee joint is the commonest joint to be involved in PVNS, accounting for 80% of cases (4). Other sites of involvement more to rare are hip joint, ankle joint, small joints of the hands and feet, shoulder and elbow respectively (4,5). The hip joint is affected in approximately 16% of patients. Vertebrae and temporo-mandibular joints are exceptional sites of involvement (5). Mono-articular involvement is the rule; involvement of more than one joint is distinctly unusual (6,7). Bilateral symmetrical involvement is extremely rare (6).

MRI is the current imaging technique of choice . Although the MR findings in PVNS are not pathognomonic, they are highly

suggestive of the diagnosis (8). The MRI features of PVNS depend on the fat fibrous tissue and iron present. The presence of haemosiderin within tissue causes shortening of both T1 and T2 relaxation times. Haemosiderin has magnetic susceptibility properties which is manifested as low signal "blooming effect" (9,10). In our series, deposits of hemosiderin were observed in all cases, appearing as low signal areas in T1WI and T2WI images. Gradient echo sequence is best to show the deposits of hemosiderin, as reported by Lin et al. Hemosiderin deposits can also be seen in hematomas, giant cell tumors, and pseudoaneurysms as the results of hemorrhage but the combination of hemosiderin deposits, villonodular soft tissue masses and/or multiple bone erosion is highly diagnostic for PVNS.

On the other hand areas of high signals represent either lipid laden macrophages or haemorrhage on T1 sequences however on T2 sequences may be present within the abnormal synovial membrane and are believed to represent loculated areas of joint fluid trapped within the synovial membrane. The lesions of PVNS show intense enhancement after administration of gadolinium. Options for treatment include surgical synovectomy, arthroscopic synovectomy, radiation synovectomy and combined procedures. MRI plays an important role in determining the best treatment approach by providing information about the distribution and thickness of PVNS tissue. Imaging must include the entire joint and adjacent soft tissues and a specific note should be made as to the exact location of all abnormal tissue for instance, the presence of large amount of synovial tissue posterior to the cruciate ligaments may indicate the need for posterior and anterior synovectomy because the tissue cannot be removed with an anterior approach. After treatment, some inflammatory tissue may be seen within the joint, this inflammation usually subsides on follow up studies. Recurrent disease usually has the same signal characteristics as the original process.

In conclusion, MR findings are adequate to determine the differential diagnosis of synovial masses with haemosiderin deposition. With in these cases we have demonstrated that MRI is sufficient in depicting the extent of PVNS, and the combination of synovial proliferation, soft tissue masses, deposits of hemosiderin and bone erosion around the joint is highly diagnostic for PVNS. Consequently MRI should be performed whenever PVNS is suspected clinically or radiographically.

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