Radiología. 2010;**52(4):**301-310

RADIOLOGÍA

www.elsevier.es/rx

UPDATE

The usefulness of ultrasonography in synovial disease

A. Bargiela

Departamento de Radiolo a, Comple o Hospitalario Universitario Cor a, Cor a, Spain

Received 8 September 2009; accepted 2 February 2010

KEYWORDS
Synovial membrane;
Synovial disease;
Sonography;
Ultrasound;
Synovial joint;
Musculoskeletal system

Abstract
Synovial disease is common in clinical practice and can have different causes.The development of high resolution ultrasonography (US) has led to greater use of US in the study of synovial disease. In this context, US is useful because (1) it can detect not only synovial disease, but also its consequences as tissue damage (erosions); (2) it can guide arthrocentesis when clinical attempts to obtain joint uid have been unsuccessful, especially in joints that are dif cult to access (hips), or sometimes when joint infections are clinically suspected; (3) it enables the ef cacy of treatment for synovitis to be evaluated; and (4) it makes it possible to distinguish benign cystic lesions from other tumors.
The overall evaluation of synovial disease is based on semiologic criteria that enables these alterations to be classi ed into four main groups: (a) joint effusion, (b) cystic synovial lesions, (c) intra-articular free bodies, and (d) synovial thickening.

PALABRAS CLAVE
Membrana sinovial;
Enfermedad sinovial;
Ecografía;
Ultrasonidos;
Articulación sinovial;
Sistema musculoesquelético

tilidad de la ecografía en el estudio de la enfermedad sinovial

Resumen
La enfermedad sinovial es frecuente en la práctica clínica y puede tener diferentes etiologías. La introducción de la ecografía de alta resolución se ha traducido en una mayor utilización de esta técnica para explorar esta enfermedad. La utilidad de la ecografía consiste en los siguientes aspectos: a) detectar no sólo la enfermedad sinovial, sino también sus consecuencias en forma de daño tisular (erosiones); b) obtener líquido articular guiando la artrocentesis, especialmente en articulaciones poco accesibles (caderas), cuando clínicamente sea infructuoso o en algunos casos de sospecha de infección articular; c) evaluar la e cacia del tratamiento en la sinovitis, y d) distinguir lesiones quísticas benignas de otros tumores.
Para realizar una aproximación global a esta enfermedad utilizamos un criterio semiológico que nos permite clasi car estas alteraciones en 4 grupos principales: derrame articular, lesiones quísticas sinoviales, cuerpos libres intraarticulares y engrosamiento sinovial.

E-mail: Amelia.Bargiela.Lemos@sergas.es

Introduction

The synovial membrane, which lines all surfaces of the articular space except for the articular cartilage, also forms part of the tendon sheaths and bursae. This membrane ensures a rapid and extensive reaction to any foreign agent. It also synthesizes proteins that are part of the synovial fluid, a high-viscosity plasma dialysate that lubricates the articular structures. The synovial membrane is composed of two or three layers of synoviocytes and is too thin to be assessed by ultrasound. However, ultrasound is an excellent technique for the detection and assessment of synovial disease when using high-resolution equipment with high frequency broadband (7-13 MHz) linear transducers, Doppler (and power Doppler), good lateral definition, and tissue harmonic. For exploring the musculoskeletal system, ultrasound has some advantages over other imaging techniques; these include superior spatial resolution and the possibilities of dynamic exploration, applying pressure with the transducer, a comparative study with the contralateral joint and obtaining clinical data thanks to a direct contact with the patient. However, under certain conditions, ultrasound images require correlation with other imaging techniques. Magnetic resonance imaging (MRI) is presently considered the gold standard for the assessment of the synovial membrane. Because many conditions can lead to synovial disease, it is essential to consider the findings of imaging studies as well as the clinical signs to make a correct diagnosis.

The following is a review of synovial disease that includes descriptions of its usual ultrasound findings. In this review, we use a semiotic approach that allows us to classify synovial diseases into four main groups: joint effusion, synovial cystic lesions, intraarticular loose bodies and synovial thickening.

Joint effusion

Under normal conditions, a thin layer of synovial fluid separates apposing joint surfaces. Joint effusion, which occurs when the volume of this joint fluid increases, indicates the existence of articular disease. The causes of joint effusion can be traumatic, mechanical, inflammatory or infectious and, rarely, neoplastic. Ultrasound is a technique with high sensitivity for the detection of synovial fluid, although depending on the amount of fluid and the type and size of the affected joint.There have been several studies in which the physiological volume of the synovial fluid in large articulations (hip, shoulder, knee, ankle) has been determined by MRI or ultrasound.[1] In general, when the amount of joint fluid is small, evaluation of the contralateral joint can help establish whether a significant increase in joint fluid (effusion) is present, although in some cases asymmetry can be normal.[1]

Joint effusion may appear anechoic, hyperechoic (i.e., indicative of fluids with traces of blood) or complex (detritus, presence of septa, calcifications, etc.); however, ultrasound cannot differentiate between infected and uninfected joints.

The existence of lipohemarthrosis, that is, of blood and bone marrow inside the synovial cavity can be diagnosed by an ultrasound because of its presentation in superimposed layers, the more superficial, hyperechoic, corresponding to the fat and, and the deeper layer corresponding to the sedimentation of blood cells (Fig. 1); in some cases, there may also be an intermediate layer caused by serum between the fat and red blood cells. In most cases, the existence of lipohemarthrosis can be considered a reliable indicator of intra-joint fracture. When no fat component is detected (hemarthrosis), we should consider other possibilities such as ligament injury, hemophilia or pigmented villonodular synovitis (PVNS).

Under certain conditions, it can be difficult to distinguish between fluid and synovial thickening; in such cases, we rely on the posterior acoustic enhancement that is observed in effusions, the effect of gradual compression (non-compressible in the case of synovitis) and the power Doppler, which can demonstrate an increased blood flow due to acute inflammatory processes. Ultrasound is not only a useful tool for the detection of effusion but also for guiding the arthrocentesis procedure, especially in articulations whose access, such as the hip, is demanding for the clinician, or when it was not successful when attempted by palpation. Ultrasound is also used to monitor therapeutic response in infections and inflammatory arthritis; in fact, a decrease in the amount of intra-joint fluid has been described as the first sign associated with clinical improvement.[2] Moreover, the use of ultrasound with color Doppler and, particularly, power Doppler has shown high sensitivity in the evaluation of responses to treatments for inflammatory arthritis;[3] for this reason, its use to evaluate and monitor the disease has increased.

Cystic lesions

Synovial cyst

The synovial cyst is defined as a collection of juxtaarticular fluid lined by a synovial membrane. It represents a herniation of the synovial membrane through the joint capsule. The main etiological factor is an increase in intra-joint pressure, irrespective of the underlying joint

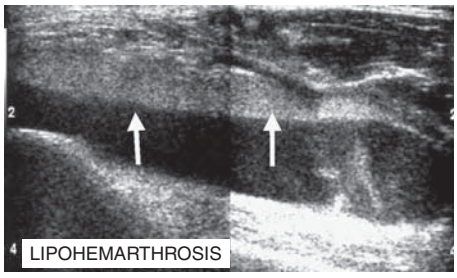

Figure 1 Suprapatellar pouch lipohemarthrosis. The ultrasound sagittal image (composite) of the suprapatellar recess shows a fat-fluid level; arrows indicate an upper hyperechoic layer of fat and a lower anechoic layer of serum in a patient with an external tibial plateau fracture.