Lipoma Arborescens of Subacromial-subdeltoid Bursa: Ultrasonographic Findings

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The present study describes the ultrasound findings of lipoma arborescens arising in the subacromial-subdeltoid bursa. Ultrasound examinations were performed in seven shoulder joints of six patients with shoulder pain and functional limitations, as well as suspected rotator cuff abnormalities. Magnetic resonance imaging (MRI) was also performed in all cases. T1-weighted spin-echo and T2-weighted turbo spin-echo images, and a proton density-weighted sequence with fat spectral suppression or a short inversion time inversion recovery were obtained in a 1.5-T unit. Synovial-based hyperechoic villous proliferations and a diffuse synovial thickening associated with a sonolucent effusion in the subacromial-subdeltoid bursa were seen in all cases. Color Doppler showed no vascularization in any of the cases. The fatty nature of the synovial hyperechoic proliferations was confirmed by MRI in all cases. In conclusion, ultrasonographic findings of lipoma arborescens arising in the subacromial-subdeltoid bursa suggest villous hyperechoic synovial proliferations associated with an effusion. Confirmation of the fatty nature of the synovial proliferation should be performed with MRI, which allows an unequivocal diagnosis.

KEY WORDS — lipoma arborescens, shoulder, subacromial-subdeltoid bursa, synovial membrane, ultrasound

Introduction

Lipoma arborescens (LA) has been described as a rare synovial disorder characterized by villous lipomatous proliferation of the synovium. It is usually monoarticular in distribution and most commonly seen at the knee joint. This condition is considered very rare in other joints or bursas, and only isolated cases of bilateral involvement have been previously reported [1]. Most previous reports dealing with radiological diagnosis of LA have been based on descriptions of magnetic resonance imaging (MRI) and computed tomography (CT) findings [2,3]. Meanwhile, different morphological appearances of
synovial fatty proliferation have been described based on MRI findings [2]. However, there are only isolated descriptions of the ultrasound (US) characteristics of this synovial disease [4–6]. We report US findings in six patients with LA arising within the subacromial-subdeltoid (SA-SD) bursa. It was bilateral in one of the patients and associated with rotator cuff tear in six joints. Confirmation of the fatty nature of the synovial proliferations was carried out using MRI.

Case Report

Six patients (5 men and 1 woman; 66–71 years old, except for 1 male patient who was 20 years old) were referred to the US unit because of longstanding shoulder pain and functional limitations with suspected rotator cuff abnormalities. The symptoms were bilateral in one patient. Thus, a total of seven shoulder joints were studied. Three patients had a previous diagnosis of osteoarthritis, and the other case (the 20-year-old patient) was posteriorly diagnosed with ankylosing spondylitis.

US was performed utilizing a Logic 400 CL (General Electric Medical Systems, Milwaukee, Wisconsin, USA) unit and an ATL HDI 3500 (Bothell, Washington, USA) US machine, using high-frequency linear transducers (7.5–11 MHz and 10–14 MHz). Static images in standard planes were obtained. Dynamic images with compression and manipulation of bursa effusion as well as color Doppler evaluation were also obtained.

MRI examinations were performed with a 1.5-T unit (Gyroscan NT; Philips Medical Systems, Amsterdam, The Netherlands) using a dedicated coil in all cases. Images of the shoulder in coronal, axial and sagittal planes were obtained by combining with T1-weighted spin-echo and T2-weighted turbo spin-echo images, and a proton density-weighted sequence with fat spectral suppression or short tau inversion recovery sequences (Figs. 2B, 2C, 4B and 4C). Rotator cuff abnormalities due to a partial or complete tear detected on US were also confirmed by MRI examination. All of these patients were treated conservatively, except for the 20-year-old man with ankylosing spondylitis who received surgical intervention.

On US, all cases presented homogeneous hyper-echoic synovial proliferations located in the SA-SD bursa (subcutaneous fat echogenicity was considered as the threshold). In one case, there was also extension of the process to the subscapular recess and the synovial sheath of the long head of the biceps (Fig. 1). These synovial proliferations had a point-like appearance (Fig. 2) in two patients, an undulating appearance (Fig. 3) of medium size in three patients and a frond-like mass aspect (Fig. 4) in the remaining patients. Diffuse synovial thickening and synovial fluid were seen in all cases. A change in morphology and deformity of the hyperechoic frond-like lesions was observed on US dynamic exploration of the joint with progressive compression. The rotator cuff showed abnormalities consisting of either a partial or complete tear in all cases. Color Doppler exploration showed no signal in any of the cases.

MRI examination showed synovial proliferations that were highly hyperintense on T1-weighted spin-echo images, and hypointense on a proton density-weighted sequence with fat spectral suppression or short tau inversion recovery sequences (Figs. 2B, 2C, 4B and 4C). Rotator cuff abnormalities due to a partial or complete tear detected on US were also confirmed by MRI examination. All of these patients were treated conservatively, except for the 20-year-old man with ankylosing spondylitis who received surgical intervention.

Fig. 1. Axial ultrasound of the long head of the biceps tendon in the intertubercular sulcus shows a sonolucent effusion (asterisk) and synovial hyperechoic proliferations (arrows).
LA is a benign lesion of the synovium characterized by villous proliferation of mature fat cells beneath a swollen synovium, and is in some cases associated with a chronically inflamed synovium. While its etiology is unknown, this condition is thought to be a non-specific synovial reaction to trauma and inflammation. Although usually associated with degenerative joint disease, chronic rheumatoid arthritis, psoriasis, seronegative spondyloarthropathies (inflammatory process) and joint injuries, it can arise independent of underlying arthritis [2].

LA can be painless, but is often symptomatic with intermittent pain or joint effusion as common presenting complaints. It usually involves the knee joint, especially the suprapatellar recess, but involvement of other joints such as the hip, elbow, hand, ankle and shoulder, have also been reported in isolated cases. LA arising in the synovia of a bursa can occur even without involvement of the neighbor joint, and only isolated cases of LA in the bicipital bursa of the elbow [4] and in the SA-SD bursa have been recorded [5,7]. The subsynovial deposition of fat in a joint or in a bursa can be diffuse, fronded, villous or multilobulated, and is usually associated with joint effusion as previously shown on MRI series [2,8,9]. Although MRI and CT [3] imaging findings of LA have been well-defined, only a few reports have investigated ultrasonographic characteristics [4–6].

US findings of LA have been described as proliferation of the synovial membrane and hyperechoic frond-like masses with effusion [6]. In our short series, the most frequent pattern was a mixed pattern with multiple hyperechoic villous synovial proliferation and isolated hyperechoic frond-like mass with effusion.

**Fig. 2.** Point-like villous synovial proliferation. (A) Longitudinal ultrasound of the right shoulder shows an effusion in the subacromial-subdeltoid bursa containing hyperechoic synovial proliferation with a more pointed appearance (arrowheads). (B) Coronal T1-weighted and (C) proton-density-weighted fat-suppressed spin echo images show point-like synovial proliferations with the same signal intensity as subcutaneous fat (arrows).

**Fig. 3.** Undulated villous synovial proliferation. Longitudinal ultrasound of the left subacromial-subdeltoid bursa demonstrates an undulating appearance of the villous synovial projections (arrows).
The differential diagnosis of US findings of LA include diseases with villous synovial masses, mostly pigmented villonodular synovitis, inflammatory disorders with pannus formation such as rheumatoid or psoriatic arthritis, and infectious granulomatous diseases such as tuberculous or coccidioidomycosis arthritis [10]. These disorders have been described as hypoechoic synovial proliferations [6,11–13], whereas LA is hyperechoic. However, some infectious forms of synovitis may also occasionally show as a hyperechoic villonodular proliferation of the synovium. In these cases, the clinical presentation and associated inflammatory findings could help to establish a differential diagnosis.

Other causes of synovial joint masses or proliferative processes such as osteochondromatosis, synovial hemangioma, synovial sarcoma and synovial chondrosarcoma [14,15] could easily be excluded from diagnosis because none of them have the villonodular appearance of synovial proliferations, which are typical of LA [6].

In addition to the morphology and echogenicity of villous synovial proliferation, the behavior of the masses with dynamic compression and analysis of the vascularity based on color Doppler US are useful for US analysis of synovial diseases. The presence of this pliability as well as the diffuse hyperechogenicity of villous proliferations could be highly suggestive for LA.

Doppler US analysis of the vascularization of synovial abnormalities was performed in all of our cases. Vascularization was not detected in any of them. LA showed no signal on color Doppler US, as might be expected by the small amount of vascularity, which is found in mature lipomatous processes.

Surgery is performed in most cases of LA with SA-SD bursa. Most of the reported cases were associated with rupture of the supraspinatus tendon, and repair of this structure was, in some cases, the indication for surgery.

The limitations of this study are the low number of cases and the fact that we had no control group. In addition, synovial proliferation commonly occurs in patients with long-standing joint diseases; they are thought to be the result of irritation of the synovium in areas where fat is normally present [6]. This issue may cause diagnostic problems when the villonodular proliferations are very small. To our knowledge, there are no previous radiological criteria to distinguish between these two entities.

In summary, hyperechogenic villous, frond-like, proliferations in a bursa or joint with no flow on color Doppler US are findings consistent with LA. These ultrasonographic characteristics suggest the diagnosis of LA, but MRI should be performed to confirm the lipomatous nature of the synovial proliferation.

**Fig. 4.** Frond-like villous synovial proliferation. (A) Longitudinal ultrasound of the right shoulder demonstrates a subacromial-subdeltoid effusion with typical frond-like mass villous proliferations. (B) Coronal T1-weighted and (C) proton-density-weighted fat-suppressed spin echo images show a distended subdeltoid bursa containing fluid (asterisk) and frond-like villous proliferation with similar signal intensity to subcutaneous fat (arrows).
References


