Ultrasonic diagnosis of Osgood-Schlatter and Sinding-Larsen-Johansson diseases of the knee

Luca De Flaviis, M.D. 1, Renato Nessi, M.D. 2, Pietro Scaglione, M.D. 1, Giuseppe Balconi, M.D. 3, Walter Albisetti, M.D. 4, and Lorenzo E. Derchi, M.D. 5

1 Radiological Service, Istituti Clinici di Perfezionamento, C.T.O., Milan,
2 Institute of Radiology, University of Milan,
3 Scientific Institute H.S. Raffaele, Ultrasound Department, Milan,
4 Institute of Orthopaedics, University of Milan, and
5 Institute of Radiology, University of Genoa, Italy

Abstract. High resolution ultrasonography of the knee was performed on 82 young patients with clinically suspected Osgood-Schlatter disease and on 30 normal subjects; in 45 pathological cases (55%) comparative X-ray films were taken. The ultrasound pictures were equally or more effective than X-ray images in 45/45 cases; their value was particularly marked for soft tissue study. The typical sonographic changes of the ossification center, of the cartilage, and of the surrounding soft tissues are described and classified, both for Osgood-Schlatter and for Sinding-Larsen-Johansson diseases. These signs are based mainly upon cartilage swelling and edema, fragmentation of the ossification center, thickening of the patellar tendon, and bursitis of the infra-patellar bursa. Ultrasonography is proposed as a simple and reliable method for the diagnosis of knee joint osteochondrosis. The ultrasound picture is also suitable for periodical follow-up the course of the disease.

Key words: Sonography – Knee – Patella – Tibial tuberosity – Osgood-Schlatter disease – Sinding-Larsen-Johansson disease

Both patellar and tibial osteochondrosis occur at tendinous insertions into the patella, at the proximal and distal levels respectively [10, 11]. It has been suggested that the dynamic stress and microtrauma due to the active function of the tendon are responsible for the onset of both these disorders [7, 9, 10, 14, 18, 28]. For this reason, these osteochondroses of the knee have also been called "non-articular osteochondrosis", since they occur in ossification centers that are submitted to traction, not to compression stress [2, 16, 24].

The diagnosis of non-articular osteochondrosis of the knee, and of Osgood-Schlatter disease in particular, is mainly clinical. A complete diagnostic approach, however, also requires soft tissue radiography [8, 11, 17] or xeroradiography [23]. This baseline examination needs to be repeated serially to monitor the course of the disease. Moreover, radiography cannot give complete information about the involvement of the non-calcified cartilage and of the surrounding soft tissues: these findings, however, provide a diagnostic hallmark of the early stages of this condition [8, 9, 11, 23].

For these reasons, we considered it worthwhile to assess the value of high resolution ultrasonography for the study of osteochondrosis of the knee. This technique has already found useful applications in the diagnosis of soft tissue tumors [1] and of a number of articular disorders, including ganglia [4], rheumatoid arthritis [5] osteochondrosis of the hip joint [27] and trauma to the knee joint [3]. The sonographic evaluation of disorders of tendons in particular, is now a well-established diagnostic procedure [6, 12, 13].

Materials and methods

High-resolution ultrasonography was performed on 82 young patients with knee pain and a clinical presentation highly sug-
gestive of Osgood-Schlatter disease. The patients' ages ranged from 10 to 15 years (mean: 13 years); a marked male predominance was shown (71 cases – 87%). Many patients (69–84%) were actively performing sport, mainly basketball or football. The sonographic study was carried out with real-time units (ATL, Ansaldo, Toshiba) equipped with linear or sector probes of 5 or 7.5 MHz frequency. The probes were used in combination with a block of transonic gel (Kitecho™ path) placed between the transducer and the patient's skin. Longitudinal scans were obtained on both knees along the midline axis of each joint. Sonography was also undertaken for comparative purposes on the knees of 30 healthy subjects of the same age range.

In 45 cases (55%), radiographs were taken of the affected side. The radiographic controls were discontinued in the late phase of the study, owing to the results obtained with sonography and due to the need to avoid unnecessary X-ray exposure.

Results

The ultrasound picture of the anterior profile of the knee is quite characteristic on the longitudinal

Fig. 1. Longitudinal scan of a normal knee in a child aged 4 years. The patella is still almost completely echofree. Its ossification center is beginning to appear as a small central hyperechoic spot (arrow)

Fig. 2. Longitudinal scan of a normal knee in a 13-year-old boy (the mean age of our patients). At this time, the patella presents the same sonographic pattern as in adulthood, with a sharp hyperechoic line corresponding to its outer cortical profile determining a marked posterior acoustic shadow (asterisk)

Fig. 3. In Sinding-Larsen-Johansson disease, the ultrasound scan (A) demonstrates fragmentation of the nucleus (white arrow) as well as a hypoechoic swelling of the overlying soft tissues (black arrows), probably due to inflammatory edema. See the corresponding xeroradiography (B) for comparison

Fig. 4. Longitudinal scan of the tibial tuberosity in a boy aged 11 years. The patellar tendon is inserted on the tibial cartilage, which appears diffusely echopoor. The ossification center can be recognized as a small central hyperechoic line (arrow)

Fig. 5. Longitudinal scan of the tibial tuberosity in a boy aged 13 years. At this age, the ossification center is well developed and its proximal edge is united to the tibia. The distal pole of the center is still open with a spur-like appearance. Note also the good representation of the surrounding soft tissues, including the patellar tendon and the subcutaneous fat