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Raphaël Guillin, Thomas Moser, Juan Jorge Mendoza-Ruiz, Mickael Ropars, Régis Duvaufrier, Etienne Cardinal

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SNAPPING BICEPS FEMORIS TENDON: A DYNAMIC SONOGRAPHIC EVALUATION

Cases Report

April 14th 2010

Abstract:
Snapping of the distal arms of the biceps femoris tendon may explain pain and discomfort on the lateral aspect of the knee. Dynamic sonography has been recently developed in order to assess transient pathologic phenomena. In our two cases, this modality was able to confirm the diagnosis and document which of the main arms was involved in the process. This modality represents a cheap, accessible and useful tool in the evaluation of the disease.

Keywords:
Knee, biceps femoris, snapping, dynamic, sonography

Introduction:
Numerous structures may be responsible of a lateral snapping at the level of the knee.
Among them, distal arms of the long head of the biceps femoris (LHBFT) have been reported to impinge against the lateral aspect of the fibular head in the orthopedic literature (1, 2, 3, 4, 5, 6). In addition, anatomical studies have emphasized a normal bifurcation of the distal LHBFT into two main arms, the direct one reaching the tip of the fibular head while an anterior one, also named “tibial” arm, ends up onto the anterolateral aspect of the proximal tibia through a lateromedial and slightly downward trajectory (7,
8) (Figure 1b). Here we report two cases in which dynamic ultrasonography (US) was useful to confirm the involvement of the tibial arm of the LHBFT in lateral snapping of the knee.

**Case 1**

A 44 year-old male, regular amateur cyclist, was referred to our hospital to assess the association of a right knee pain and repeated snapping on the postero-lateral aspect of the knee, especially during sport activities. Symptoms had exacerbated progressively to the point that his activities were limited. There was no history of trauma. On physical examination, knee motion and stability remained in normal ranges. An audible snap and pain could be generated in the vicinity of the fibular head by exerting 70-90° flexion and extension manoeuvres. At static US examination (7-15 MHz linear array transducer, ATL HDI 5000, Philips Medical Systems) during knee extension, axial examination showed, above the level of the fibular head, the bifurcation of the LHBFT. Echotexture of the two distal arms was normal and no bursitis was encountered. The patient was then placed in left lateral decubitus while the probe was firmly positioned in the axial plane along the fibular head (figure 1). As the patient was asked to flex the knee above 90 degrees, the anterior arm was shown to travel backward over the fibular head and distal lateral collateral ligament insertion. At subsequent extension, the tendon was demonstrated to spring over the same structure through a sudden move, thus producing postero-lateral pain and snap that were easily recognized by the patient (video and figures 1 and 2).
This manoeuvre could be repeated with good reproductibility. Presence of two distal arms of the LHBFT was confirmed by MRI.

**Case 2:**

A 25 years old male, with irregular sports activities, was referred for a recurrent lateral knee pain along the bulge of the fibular head. For the last year, symptoms had become significant while the patient was following an intensive long distance running program, and tended to completely fade during periods of inactivity. If snapping of the knee was only intermittent during such efforts, it could be reproduced when the knee was flexed around 90 degrees at physical examination. At US (12 MHz linear array transducer, iU 22, Philips Medical System), both direct and tibial arms of the LHBFT were seen, without evidence of tendinosis or bursitis. During dynamic study, the body of the tibial arm was gliding along the lateral aspects of the distal lateral collateral ligament and underlying fibular head, thus producing a sudden snap. Presence of this anterior arm that was attached to the proximal tibia was also confirmed by MRI. As the patient accepted to lower the intensity of his activities, symptoms improved and surgery was not required.

**Discussion**

Lateral snapping of the knee may be regarded as a rare condition if one considers no wide serie is available in the literature. Case reports have involved numerous structures in lateral snaps, such as foreign bodies, fabellas (9), lateral meniscus (10), the proximal
tibio-fibular joint (11), ganglion cysts (12) or other type of intraarticular tumours (13).

Other studies have emphasized the role of impingements between tendons and neighbouring bony structures, such as the popliteal tendon and the edge of the popliteal groove (14, 15), the iliotibial band and the lateral femoral condyle (16) and the distal arms of the LHBFT and fibular head (1, 2, 3, 4, 5, 6, 17).

In all studies in the literature, involvement of the LHBFT in a lateral snapping process of the knee was only clinically suspected but was not confirmed before the time of open surgery. Moreover, despite the fact that both direct (3, 5) and tibial arms of the LHBFT (1, 2, 4, 6, 17) may be separately responsible for the snap, the one that was brought to glide against the fibular head was never documented preoperatively.

In our cases, involvement of the tibial arm of the LHBFT and subsequent mechanism were clearly identified by US. Use of dynamic US to explain snapping phenomenons has been widely explored in the recent literature (18, 19, 20, 21, 22). At the level of the knee, this modality has only been cited in orthopedic studies in the field of the “snapping pes syndrome”, in which the semi tendinosus and gracilis tendons were involved (23, 24), or in a case of snapping fabella in a prosthetic knee (9).

In previously cited surgical works, various anatomical abnormalities were proposed to explain how distal arms of the LHBFT were brought to snap against the fibula. Such hypothesis included an excessive prominence of the fibular head (5, 4), a two distal bifurcation of the distal heads of the LHBFT (2), a tear of an aponevrotic reflected arm of
the LHBFT (17), a too anterior insertion on the fibula of the direct head of the LHBFT (3) and an exclusive attachment of the biceps femoris onto the proximal tibia (1, 6). Apart from the latter, none of those causes were properly evaluated at the time of examination for our two patients.

In conclusion, we report, for the first time, the use of sonography in the field of the snapping biceps femoris phenomenon at the knee. As shown in our two cases, US may, thanks to its dynamic capabilities, represent a unique, reliable, cheap and accessible tool to confirm the diagnosis and help in surgical planning.

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CAPTIONS FOR ILLUSTRATIONS

Figure 1a:
Axial sonographic view in the vicinity of the tip of the fibular head. Knee is in full extension. The tibial arm (TA, white arrows) of the LHBFT is encountered in front of the attachment of the lateral collateral (LCL) ligament on the fibular head (FH).

Figure 1b:
Lateral view of the knee in extended position. Lateral collateral ligament (LCL), iliotibial tract (ITT) and tibial (TA) and direct (DA) arms of the LHBFT are shown.

Figure 2a:
Axial sonographic view during flexion/extension of the knee between 70 and 90 degrees. The tibial arm (TA, white arrows) of the LHBFT is shown to travel over the fibular head, to glide in a sudden move along the distal attachment of the lateral collateral ligament (LCL) on the tip of the fibular head (FH) during extension.

Figure 2b:
During extension from flexion of the knee, the tibial arm of the LHBFT travels backward over the fibular head, thus producing an audible snap (orange star). Lateral collateral ligament (LCL), iliotibial tract (ITT) and tibial (TA) and direct (DA) arms of the LHBFT are shown.

Video:
Axial sonographic view in the vicinity of the fibular head during repeated flexion/extension of the knee. The tibial arm of the LHBFT travels over the distal attachment of the lateral collateral ligament and neighbouring fibular head. A jerky move with painful snap are encountered during knee extension, when the tendon returns into initial position (from right to left side on video).
Figure 1a

Axial sonographic view in the vicinity of the tip of the fibular head. Knee is in full extension. The tibial arm of the LHBFT (TA, white arrows) is encountered in front of the attachment of the lateral collateral ligament (LCL) on the fibular head (FH). Anterior (A) and posterior (P) sides are mentioned.

245x190mm (150 x 150 DPI)
Figure 1b
Lateral view of the knee in extended position. Lateral collateral ligament (LCL), iliotibial tract (ITT) and tibial (TA) and direct (DA) arms of the LHBFT are shown.
157x145mm (150 x 150 DPI)
Axial sonographic view during flexion/extension of the knee between 70 and 90 degrees. The tibial arm (TA, white arrows) of the LHBFT is shown to travel over the fibular head, to glide in a sudden move along the distal attachment of the lateral collateral ligament (LCL) on the tip of the fibular head (FH) during extension. Anterior (A) and posterior (P) sides are mentioned. 246x190mm (150 x 150 DPI)
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