

Short communication

Snapping knee syndrome in an athlete caused by the semitendinosus and gracilis tendons. A case report

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Abstract

We report a case of symptomatic subluxation of the semitendinosus and gracilis over the posteromedial corner of the tibia manifesting with snapping. This is the first such case recorded in non-Asian population and in a high-demand athlete. Snapping was reproduced on active extension of the knee and at initiation of flexion and could be readily palpated over the posteromedial aspect of the tibia. Dynamic ultrasound, a key diagnostic tool in such conditions, revealed abrupt anterior subluxation of the semitendinosus and gracilis tendons during active terminal extension over the insertion of the semimembranosus as well as areas of tendinopathy corresponding with the site of subluxation.

Due to failure of conservative treatment, surgery was undertaken, involving tenotomy and resection of a 10–12 cm segment of the semitendinosus and gracilis. The patient returned to the same level of sporting activities within 4 months and remained symptom-free 18 months post-operatively.

The role of eccentric loading of the knee joint, as well as the “protective” role of the accessory tendinous bands and aponeurotic expansions of the semitendinosus and gracilis is discussed.

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1. Introduction

Snapping symptoms around the knee are a rather rare condition and have been described in association with a number of causes [1–8]. In most cases it involves the lateral aspect of the knee and it has been highly associated with the presence of discoid meniscus [1,2]. It may also result from biceps femoris or iliotibial band pathology and more rarely from intra-articular tumours or cysts [3–6]. Snapping symptoms are even more uncommon around the medial aspect of the knee [6–8]. We report a case of symptomatic snapping of the semitendinosus and gracilis tendons over the posteromedial corner of the tibia in a high-demand athlete.

2. Case report

2.1. Clinical presentation

A 32 year old Caucasian semi-professional volleyball player presented with a 4-year long history of a painful snapping sensation over the posteromedial aspect of his right knee. Relatively mild snapping coupled with discomfort was noted initially following a period of intensive training, but no clear trauma could be related to the onset of his symptoms. Treatment with medication, physiotherapy and local steroid injections only temporarily alleviated his symptoms. This painful snapping sensation progressively worsened causing pain during sporting activities and some discomfort even when he was walking at a brisk pace, eventually forcing him to abandon his sporting career and discontinue all strenuous activities.

On clinical examination there was no angular deformity of his knees, no limb length discrepancy or muscle atrophy and the patient had a normal Q-angle. Furthermore, no linear or

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Fig. 1. a. MRI (sagittal view) showing existence of fluid in the semimembranosus bursa and the sheath surrounding the semitendinosus and gracilis (arrows) (Philips Intera 1.5 T, Philips Medical Systems Holland BV, Sequence: T2 WFFE). b. MRI (transverse view) showing fluid in the semimembranosus bursa and surrounding oedematous fat (arrows) (Philips Intera 1.5 T, Philips Medical Systems Holland BV, Sequence: T2 WFFE).

rotational instability could be elicited and the patient had full knee flexion and could hyperextend both his knees to about 10° . The snapping sound could be reproduced on active extension of the knee in the arc of 0 – 15° and at initiation of flexion as the knee moved from slight hyperextension to the initial 15° of flexion. The site of snapping could be readily palpated over the posteromedial aspect of the tibia and the area was moderately tender.

2.2. Imaging

Plain radiographs were normal. Further investigation with an MRI scan did not show any intra-articular pathology. It revealed though abnormal thickening of the semitendinosus and to a lesser extent of the gracilis tendon distal to the myotendinous junction, together with surrounding oedematous fat and existence of fluid in the semimembranosus bursa and the sheath surrounding the semitendinosus and gracilis (Fig. 1a,b).

Dynamic ultrasound examination, that allows for visualisation of the course, relations and position of the tendons over a full ROM, showed an abrupt anterior subluxation of the semitendinosus and gracilis tendons during active terminal extension over the insertion of the direct arm of the semimembranosus tendon at the posteromedial corner of the tibia. A well demarcated hypoechoic area located on the semimembranosus tendon at its insertion site, as well as on the semitendinosus and gracilis tendons, corresponding with the site of subluxation, was also noted, suggesting tendinopathy of the above tendons.

2.3. Surgical technique

The patient was placed supine with a sandbag underneath the contralateral side facilitating abduction and external rotation of the operated leg and a pneumatic tourniquet was applied. A diagnostic arthroscopy of the knee was performed first and no intra-articular pathology was revealed. Subsequently, through a slightly curved 10 cm skin incision the medial patellar retinaculum was incised at the anterior border of the sartorius allowing for the semitendinosus and gracilis tendons that lie underneath to be exposed all the way to the myotendinous junction. The sheath was evidently fibrosed and an area of tendinitis was noted at the insertion of the direct arm and the origin of the reflected (anterior) arm of the semimembranosus tendon, corresponding with the point of contact with the semitendinosus and gracilis (Fig. 2). Forced passive extension of the leg was performed intra-operatively and could only reproduce a small degree of subluxation of the semitendinosus

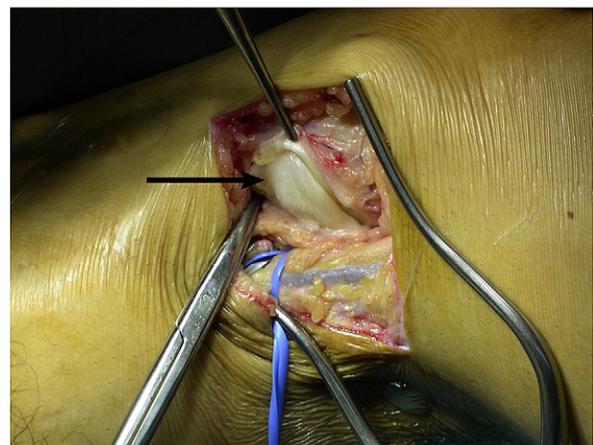


Fig. 2. Intra-operative view. Tendinitis is noted at the insertion of the semimembranosus tendon, corresponding with the point of contact with the semitendinosus and gracilis (arrow).

and gracilis tendons. Both tendons were followed proximally to the myotendinous junction and distally to the pes anserinus and it should be noted that their accessory bands to the gastrocnemius were thin, attenuated and located rather distally (about 5 cm from the pes anserinus insertion on the tibial crest). Tenotomy was performed and a 10–12 cm segment of both tendons was resected. The wound was closed in layers over a drain.

2.4. Post-operative management and evaluation

Passive range of motion within pain limits together with isometric quads exercises were commenced immediately. The patient was discharged the following day and followed a graduated rehabilitation regime including stretching and quads strengthening exercises. Light jogging, cycling and swimming were commenced at 3 weeks and the patient returned to sports specific training at 2 months. He eventually returned to the same level of competitive volleyball 4 months post-operatively. On final follow up at 18 months, he had fully resumed his sporting and everyday-life activities and reported complete resolution of his symptoms and no further episodes of snapping. His Lysholm score had improved from 64 pre-operatively to 99.

3. Discussion

The snapping knee syndrome is rather uncommon and usually symptoms are localised around the lateral aspect of the knee. Snapping symptoms around the medial aspect of the knee joint are extremely rare. Mine et al. [6] have reported two cases of symptomatic snapping caused by intra-articular tumours located at the medial region of the patellofemoral joint. Lyu and Wu [7] and Bae and Kwon [8] have respectively described two Asian patients with painful snapping caused by subluxation of the semitendinosus and gracilis tendons over the posteromedial aspect of the tibia.

Bae and Kwon [8] suggested that long term wearing of inordinately high-heeled shoes by their patient might have led to weight-loading on the anterior portion of the knees resulting in gradual hyperextension of the knee and chronic strain of the pes anserinus. In an effort to clarify the mechanism of snapping Lyu and Wu [7] performed cadaveric dissection and stressed the importance of the “fanned-out” fibres of the semitendinosus that become tense in extension and protect the semitendinosus from slipping out of its shallow groove. After these fibres were severed the tendon would slip anteriorly out of its groove when the knee was extended. The patient they described was walking with a scissoring gate, which requires internal rotation of the tibia. This coupled with attenuation of the “fanned-out” fibres of the semitendinosus was thought to have caused increased force of displacement of the tendon resulting into its gradual slippage over the posteromedial corner of the tibia.

Recent studies have attempted to clarify the anatomy of the region [9–13]. It is now clear that the semitendinosus and gracilis tendons apart from their joint insertion through pes anserinus on the tibial crest have both aponeurotic expansions and accessory tendinous bands directed posteroinferiorly to the fascia cruris and the gastrocnemius. The above structures form

what Mochizuki describes as the tensor fascia cruris muscle, which produces considerable tension on the medial side of the knee and appears to have a role as a medial stabiliser in the upright position [11]. Evidently the tension balance is greatly changed when the knee is either flexed or hyperextended [11].

What Lyu and Wu [7] described as the “fanned-out” fibres has now more accurately been described as a combination of aponeurotic expansions and, more importantly, accessory tendinous bands [9,11]. The latter, especially as regards the semitendinosus, are present in 77–100% of cases [9,12]. A recent anatomic study has provided a detailed description of the accessory bands arising from the semitendinosus and gracilis tendons, recording the number, size, consistency as well as the site of origin and insertion of those bands [9]. The semitendinosus was shown to have two to three accessory bands (usually three) and the gracilis one to four (most commonly two). The most consistent and sizeable accessory band originated from the semitendinosus, 5–9 cm proximal to the pes anserinus and was inserted to the gastrocnemius, while a similar band was present at the gracilis, arising 4–9 cm proximal to its insertion on the tibial crest [9].

The accessory tendinous expansions of the semitendinosus are directed posteroinferiorly and appear to play a significant role in preventing the semitendinosus from slipping forward as it loops around the medial tibial condyle in its shallow groove. The more distally positioned they are the longer the lever arm to the posteromedial corner of the tibia and therefore the less the protection they offer to the semitendinosus and the gracilis from being displaced anteriorly over the insertion of the semimembranosus. This may become even more profound as the tension balance changes when the knee hyperextends.

Isolated injuries of the distal semitendinosus and the gracilis tendons are considered rather uncommon, but may have significant implications for a high-demand athlete [14,15]. To our knowledge this is the first case of symptomatic subluxation of the semitendinosus and gracilis over the posteromedial corner of the tibia manifesting with snapping that is recorded in a high-demand athlete. Dynamic ultrasound examination is a very important diagnostic modality in such conditions, as it allows for detailed and accurate visualisation of the course, relations and position of the involved tendons over a full range of motion [15].

In our patient the possible aetiology and pathogenesis of his condition could be summarised as follows. Repetitive static vertical jumping in order to block a shot in volleyball and subsequent landing can cause relative overloading of the anterior portion of one's knees, especially when combined with a degree of knee hyperextension, as was the case with our patient, even though this was within normal limits. Overloading of the anterior aspect of the knee pushes it in further hyperextension thus increasing the force of displacement on the semitendinosus and gracilis. This coupled with a “defective” protective mechanism, either because the accessory tendinous bands are distally positioned, or because they are attenuated, may lead to subsequent gradual forward subluxation of the two tendons out of their shallow groove. As they slip forward peritendinitis with pain develops causing increased muscle spasm

and resulting in a vicious circle that leads to aggravation of symptoms. Tenotomy and resection of a segment of both tendons, a safe practice used routinely during ACL reconstruction surgery, fully resolved the patient's symptoms and allowed him to return to his initial semi-professional sporting level.

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