Anomalous Biceps Femoris Tendon Insertion Leading to a Snapping Knee in a Young Male

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Snapping biceps femoris tendon is an uncommon problem that can be caused by various anatomical aberrations around the knee joint. There are several case reports in the literature describing some of these anatomical variations and their treatment. We present a case of unilateral snapping biceps femoris tendon due to a previously unreported anatomical variation, our technique for successful surgical treatment, and a review of the literature.

Keywords: Knee, Biceps femoris, Anomalous insertion, Snapping

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An 18-year-old male patient presented with a painful snap over the lateral aspect of his knee whenever he flexed his knee and low grade ache over the lateral side of the knee following sitting
down/squatting. He worked as a manual labourer and was a club level basketball player. He could consistently reproduce a clearly audible snap by contracting his biceps femoris muscle with the knee in between 80° and 100° of flexion. The symptoms had started spontaneously around 12 months back without any specific trauma, and had been getting worse over the past 6 months. It was preventing him from playing a sport and doing his job that involved squatting. He was initially treated conservatively by avoidance of activities that precipitate the symptoms; however, he was not responsive to physical therapy for 6 months and then symptoms got worse. He was not able to play basketball for 6 months, and had not been working for the last 3 months. His knee examination was normal except for a palpable movement of the biceps femoris tendon over the fibular head when the knee was taken through 80°–120° of flexion. The biceps tendon could be easily palpated and passively moved anteriorly and posteriorly over the fibular head, reproducing mechanical irritation in the distal tendon. Radiography and magnetic resonance imaging scans did not demonstrate any abnormality.

1. Operative Findings and Technique

The patient was given a general anaesthetic and was positioned supine with the knee at 60° of flexion against a foot and thigh bolster. A 5 cm incision was made in line with the biceps tendon over the fibular head, ending at Gerdy’s tubercle. Superficial and deep dissection exposed the common peroneal nerve at the level of the neck of the fibula, and a neurolysis was performed from the fibula neck back under the biceps tendon and into the posterior compartment of the thigh. The terminal insertions of the biceps tendon were then carefully exposed and examined. In Terry and LaPrade(10) descriptions, the main tendon of the long head divides just proximal to the fibular head and gives an insertion to the posterolateral edge of the fibular head just posterior to the LCL insertion (the “direct arm” of the long head) before continuing on as a thinner anterior arm that ends by blending with aponeurosis of the anterior compartment of the leg as well as giving some deep fibres of its own to the lateral edge of the fibula, thus making a sling with the direct arm encompassing the LCL insertion (Fig. 1). In our case, it was the direct arm that was thin and relatively deficient, and the anterior arm was hypertrophic, cord-like, and inserted into the anterolateral fascia on the tibia that blended with the Gerdy’s tubercle over the ITB insertion (Figs. 2 and 3). It was this thickened cord that moved from superior to the fibular head to inferior to the fibula as the knee was flexed, causing a loud “snap” as it flicked over the prominence of the fibular head at that ROM. There was also a hypertrophic lateral prominence of the fibular head.

The insertion of this hypertrophic anterior arm was carefully detached (Fig. 4) from the tibia and a No. 5 Ethibond (Ethicon, Somerville, NJ, USA) suture was whip stitched on its distal 20 mm. The whipstitching involved taking five throws on either side of the detached tendon with 10 cm of two free suture ends at the distal most aspect of the tendon from where it was detached much like whipstitching hamstring tendons in an anterior cruciate ligament reconstruction. The prominent posterior-lateral border of the fibular styloid was identified and removed using a small osteotome (Fig. 5) and a rongeur was used to obtain a smooth edge. Using a guide wire and a 7 mm reamer, a socket

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**Fig. 1. Normal Biceps Femoris insertion.**

**Fig. 2. Anomalous Biceps Femoris tendon insertion.**
was drilled through the fibular head. The detached portion of the biceps tendon was then shuttled through this tunnel using the free ends of the suture whipstitched on its terminal portion and tied to a metallic button (Fig. 6) to dock it in the socket created. The knee was brought back into extension and as the biceps tendon was quite tight coming into full extension, it was lengthened slightly using a pie crusting technique. The knee could then be easily brought into normal hyperextension. The wound was closed with monocryl (Ethicon).

Postoperatively, the knee was put in a ROM brace blocking terminal 30° of extension and was mobilised non-weight bearing using crutches for 2 weeks. He was then rehabilitated to get full extension by prescribing active and active assisted exercises using a rolled towel under the heel with the knee in extension and asking the patient to extend the knee further. He was prevented from doing active hamstring contractions for 6 weeks: this was done by locking the knee in extension for 2 weeks while walking and releasing it at rest for passive flexion. At the 6 week mark, the ROM was normal, including slight hyperextension, and the patient was allowed to commence active hamstring contractions and gentle running. He returned to full sporting activities by 3 months after surgery and had a ROM of 0°–130°. At the one-year follow-up, the patient had a visual analog scale score of 0 and no recurrence of symptoms, and he was fully functional in day to day activities as well as playing club level basketball.
| Case report                | Age (yr) | Sex | Position of knee during snapping | Bilateral condition | Injury | Operative findings                                                                 | Treatment                                                        |
|---------------------------|----------|-----|----------------------------------|--------------------|--------|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
| Kristensen et al.\(^1\)   | 20       | M   | Flexion >90°                      | Present            | None   | Insertion on the anterolateral tibia with no fibular attachment                   | Partial lateral excision of fibula                               |
| Lokiec et al.\(^2\)       | 23       | M   | Extension from full flexion of the knee | Present            | None   | Insertion on the anterolateral tibia with no fibular attachment                   | Re-sutured anterior part of tendon posteriorly                    |
| Hernandez et al.\(^3\)    | 16       | M   | Knee movement between 120° and 100° with tibial internal rotation | Present            | Present | Insertion on the anterolateral tibia with no fibular attachment                     | Tendon rerouted through a tunnel in the fibular head              |
| Kissenberth and Wilckens\(^4\) | 20      | M   |                                  | Present            | None   | Very distal bifurcation of long head of biceps tendon                              | Tendon rerouted through a tunnel in the fibular head              |
| Bach and Minihane\(^5\)   | 24       | M   |                                  | Present            | None   | Normal tendon insertion with prominent fibula head                                | Bilateral partial fibular head excision                         |
| Bagchi and Grelsamer\(^6\) | 22       | M   | 80° to 100° of knee flexion       | Present            | None   | Bilateral insertion on the anterolateral tibia with no fibula attachment          | Bilateral partial resection of fibular head, one side required a repeat surgery |
| Bansal et al.\(^7\)       | 19       | M   | Extending the knee from 90° to 75° | Absent             | Present | Injury to the reflected arm of biceps femoris tendon                              | Tendon rerouted through a tunnel in the fibular head              |
| Bernhardson and LaPrade\(^8\) | 28, 43, 41 | F, M | On deep squatting                 | Absent             | Absent | Long and short heads torn from fibular attachments in all                        | Arms repaired to posterolateral aspect of fibula with suture anchors |
| Date et al.\(^9\)         | 15       | M   | 100° knee flexion                 | Absent             | Present | Insertion on the anterolateral tibia thickened with normal insertion on the lateral edge/posterolateral fibula | Arms repaired to posterolateral aspect of fibular head with 0 Surgilon sutures |
| This case                 | 18       | M   | Flexion between 80° and 100°      | Absent             | Absent | Hypertrophic anterior component of medial and lateral slips inserting into the anterolateral tibia and an atrophic posterior component of both slips inserting into the fibula | Tendon rerouted through a tunnel in the fibular head              |
Discussion

This case describes an anomaly in the insertion of the biceps femoris tendon that has never been described in the literature. In the patient, there was a hypertrophic insertion on the tibia and an atrophic insertion on the fibula, which was successfully managed surgically.

Snapping biceps tendon is an infrequently reported condition. There have been previous case reports published\(^1\)\(^-\)\(^9\), describing different anatomical variants associated with the snapping, and different approaches to its treatment. A systematic review of previously reported cases and their findings are shown in Table 1.

Date et al.\(^9\) reported a case of snapping biceps tendon with an anomalous insertion of the anterior and reflected arms of the tendon. They were both detached from their anomalous locations and were tenodised to the periosteum on the posterolateral portion of the fibula. In a case of bilateral snapping reported by Bagchi and Grelsamer\(^6\), due to an anomalous insertion into the fascia on the anterolateral tibia rather than the posterolateral fibula, partial resection of the fibular head was performed bilaterally for treatment without reinserting the tendon to its anatomical location. An anomalous tibial attachment of the biceps tendon was also reported by Kristensen et al.\(^1\), which was treated by partial resection of the lateral part of the fibula. Hernandez et al.\(^3\) reported a case where the phenomenon occurred due to the presence of only a tibial attachment of the biceps femoris tendon without any fibular insertion. They treated it by anatomical repositioning and tenodesis to the posterolateral fibula through a 10 mm drill hole and sutured to the periosteum.

These cases highlight that several different anatomical variations can result in the same symptom of “snapping bicep”. Successful treatment hinges on identification of the particular individual anatomical variant and its correction in such a way that allows for normal biceps function without undue mechanical irritation of the whole complex as the knee flexes and extends. This case is unique as it describes for the first time a case of hypertrophic anterior component attaching on the anterolateral fibula and an atrophic posterior component that was attached to the fibula, which was not responsive to conservative treatment and was successfully treated surgically. Also, the anatomy of the abnormality has been reported with reference to the normal anatomy using intraoperative photographs and illustrations.

This condition is most frequently reported in younger, active males mostly in their second and third decades. The most common causative factor is an anatomical variation either in the insertion of the biceps tendon or of a prominent fibular head. A possible reason for it to manifest around the end of the second decade of life could be the activity levels of this age group combined with specific changes that occur during fusion of the epiphyses in that area at that time. Repeated microtrauma to an existing abnormal tendon insertion may lead to hypertrophy of one or more bands of insertion or the fibular head itself. The insertion of the biceps femoris tendon in these discrete locations makes it susceptible to minor changes in the anatomy resulting in aberrations in the way the tendon glides over these surfaces during flexion and extension. Pain also accompanies the condition when inflammation occurs around the tendon due to repeated snapping.

Successful treatment was achieved in this case by recreating the attachment of the tendon that does not involve excessive friction with the adjacent bone via an osteoplasty of the fibular head and a re-routing procedure of the biceps femoris tendon.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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