



Anatomical variation of the semitendinosus muscle origin

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Abstract

During a routine dissection of an 87-year-old female cadaver, an aberrant muscle attachment (AMA) of the right semitendinosus (ST) muscle origin was discovered medial to the primary muscle origin. This attachment originated from the medial portion of the ischial tuberosity and inferior to the sacrotuberous ligament attachment site. It then traveled distally in the long axis of the femur to join the ST muscle, which showed no other variations in structure. Variation in hamstring muscle origins has been shown to predispose patients to hamstring strains and posterior thigh pain. This study describes a previously undocumented variation of the ST origin that could predispose a patient to the aforementioned thigh pain, as well as pelvic floor pain. Patients presenting with recurrent pain or dysfunction in these areas should prompt an investigation into possible variations of hamstring muscle origins.

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Introduction

The hamstring muscles are frequently implicated in posterior thigh pain due to strains. The hamstring muscles are the three most superficial muscles that span the posterior thigh, and consist of the biceps femoris, semitendinosus, and semimembranosus. The long head of biceps femoris originates from the inferomedial aspect of the ischial tuberosity and inserts into the head of the fibula. The short head of biceps femoris originates from the linea aspera in the middle third of the femur, and combines with the long head to insert into the head of the fibula. The semimembranosus originates from the superolateral aspect of the ischial tuberosity and inserts into medial tibial condyle, popliteus fascia, and oblique popliteal ligament. The semitendinosus (ST) shares a common origin with the long head of biceps femoris from the inferomedial aspect of the ischial tuberosity and inserts medial to the tibial tuberosity as part of the pes anserinus, together with gracilis and sartorius tendons [1].

Case Report

A distinct muscular attachment was found adjacent to the origin of the ST muscle that had a ribbon-like appearance. At its origin on the ischial tuberosity, the aberrant muscular attachment (AMA) was separated by a distance of 7.86 mm from the medial border of the ST muscle origin (Figures 1,

2). The AMA then joined the ST muscle as it traveled distally. Once the AMA joined the ST muscle, it was no longer a separate entity and traveled as a whole with the ST muscle into its insertion medial to the tibial tuberosity as part of pes anserinus (Figures 1, 2). The origin of the AMA had a tendinous appearance that was covered with adipose tissue and fascia with no visible differences from the surrounding musculature. There were no other variations found in the lower extremity and there were no relevant medical history findings for the cadaver. No apparent signs of surgical incisions or interventions were found in the lower extremity from external appearance or dissection.

Discussion

The origin of the hamstring muscles plays an important role in the occurrence of hamstring strain and injury. The most common hamstring muscle strain is to the long head of the biceps femoris (BFL) [2]. Strains and separation injuries are most likely to occur at the musculotendinous junction of the muscle [3]. Previous studies, which evaluated the ST origin more closely, revealed a bifid attachment; one tendinous and the other muscular [4]. The majority of the ST was found to originate from the medial aspect of the tendinous portion of the BFL as a muscular origin. The smaller tendinous portion originated directly from the ischial tuberosity [4]. The findings of Sato et al. show a greater portion of the ST origin to be at



Figure 1. Right posterior thigh depicting the *semitendinosus* muscle (*asterisk*) and variant origin (*arrow*) in situ. (*L*: lateral; *I*: inferior; *M*: medial; *S*: superior)

risk for mechanical failure when interpreted by the principles outlined by Garrett et al. with respect to musculoskeletal architecture and function [3]. The main predisposing factor for injury is the unusual union of the ST and BFL [3]. Our variant demonstrates an independent ST origin or AMA directly to the ischial tuberosity (Figures 1, 2). We believe that this variant possesses a higher risk of injury consequent to the amount of separation from the majority of the ST origin and the sparse tendinous tissue present. Our group also postulates that as a result of the close proximity of the unusual ST origin to the pudendal nerve, increased incidence of pelvic floor pain and dysfunction may occur. Variations in the common origins of hamstring muscles should be considered when assessing proximal strains or when dealing with pelvic floor pain that is refractory to normal treatment regimens.

Embryological development at the third week of development includes the migration of myogenic precursors to the limb buds to become myoblasts. These myoblasts eventually form

the ventral and dorsal muscle masses. The ventral muscle mass eventually forms the posterior muscle compartment of the thigh. Several sequences of apoptosis and growth occur to determine the configuration of the muscles [5]. In a previous case of supernumerary semitendinosus muscle variation, the authors hypothesized that an anomaly occurred during the medial rotation of the lower limb bud between the sixth and eighth week of gestation causing the supernumerary semitendinosus variation [6]. We postulate that the variation we have presented is the result of a less severe limb bud rotation defect.

Conclusion

We demonstrate a previously undocumented variation in the origin of the semitendinosus muscle. The variant consists of a two-part origin with the variant portion being a discrete entity of fibromuscular tissue that originates along the medial border of the ischial tuberosity, superficial to the tendinous origin of the adductor magnus and inferior to the



Figure 2. The semitendinosus muscle variant (**arrow**) is found medially and is marked above by the zero reading on the caliper. The normal semitendinosus muscle (**asterisk**) is lateral to the variant origin by 7.86 mm as marked on the caliper. (**L**: lateral; **I**: inferior; **M**: medial; **S**: superior)

sacrospinous ligament. The two origins were separated by 7.86 mm of adipose and fascial tissues and appeared to represent two autonomous muscles until they converged at the belly of the normal portion of semitendinosus muscle. Several studies have reported variation among the hamstring muscles of the thigh, but none have described the AMA of the semitendinosus muscle origin revealed in our study [1, 4, 6, 7]. In addition, such variations potentially predispose patients to hamstring injury, chronic pain and pelvic floor discomfort. Future studies aimed at discovering such variants in living subjects would allow for analysis of other relevant factors such as gait analysis, pain and activity profiles.

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