



A unique case of an accessory sartorius muscle

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Abstract

The sartorius muscle (SM) is a long strap muscle originating from the anterior superior iliac spine and inserting onto the medial surface of the proximal tibia. It crosses the anterior compartment of the thigh obliquely and descends towards the medial aspect of the knee. We found an accessory sartorius muscle (ASM) from the inguinal ligament and an original SM bifurcated into medial and lateral heads. The ASM merged with the medial head of the SM and inserted on the medial aspect of the tibia as the pes anserinus. The lateral head of the SM continued inferiorly and inserted on the medial aspect of the patella. We report a unique variation in the morphology of the SM, and discuss its functional and clinical implications.

Keywords Accessory muscle · Sartorius muscle · Thigh muscle · Variation

Introduction

The sartorius muscle (SM) arises from the anterior superior iliac spine (ASIS) on the lateral edge of the pelvic bone. It descends obliquely across the thigh, and medially and inferiorly toward the medial edge of the knee. The SM is a biarticulated muscle, as it crosses both the hip and knee joint. It inserts on the medial surface of the tibia as the pes anserinus. Its functions are enabling flexion, abduction, and lateral rotation of the hip and knee. It also helps pull the foot and ankle toward the knee of the opposite leg. This particular action is used while crossing the legs so that the ankle rests on the opposite leg, while sitting cross-legged, or when looking at the sole of one's foot.

To the best of our knowledge, variations in the SM are exceptionally rare and are very rarely reported in the literature [1, 2, 4–7]. According to the literature, an accessory SM originates in the pectineal line, iliopectineal eminence, femoral sheath, a notch below the ASIS, inguinal ligament (IL), or the pubic symphysis [1, 4]. This accessory muscle mostly inserts into the fascia lata, the femur above the medial condyle, ligament of the patella, tendon of semitendinosus, or the tendon of the main belly, and arises from the

same points as the additional heads of bifid muscles [1, 2, 5]. In the present case, we report a unique morphology of an accessory sartorius muscle (ASM) and two heads of the SM.

Case report

During a routine cadaveric dissection performed by undergraduate medical students, we observed a unique case of accessory muscular slip for the SM in the left lower limb of a cadaver of an 82-year-old Korean male (Fig. 1). The skin, subcutaneous fat, and deep fascia was longitudinally opened to expose anterior compartment of leg. Each muscle was carefully examined and the findings were photographed. In the anterior compartment of leg, SM, femoral sheath, and quadratus femoris muscles were found. The SM originating from the ASIS continued for 15.8 cm and then bifurcated into medial and lateral heads. The lateral head of the SM traveled inferiorly and inserted at the medial aspect of the patella. It measured 32.2 cm in length. The medial head gave off small muscle belly to the vastus medialis and then, merged to an accessory sartorius muscle (ASM). It originated from the inguinal ligament next to the origin of the original SM. The ASM continued for 15 cm more and merged to the medial head of the SM. It finally inserted on the medial aspect of the proximal tibia as the pes anserinus. It measured approximately 36 cm in length until its insertion. This muscle was supplied by femoral artery and innervated by the femoral nerve normally. And entire SM is

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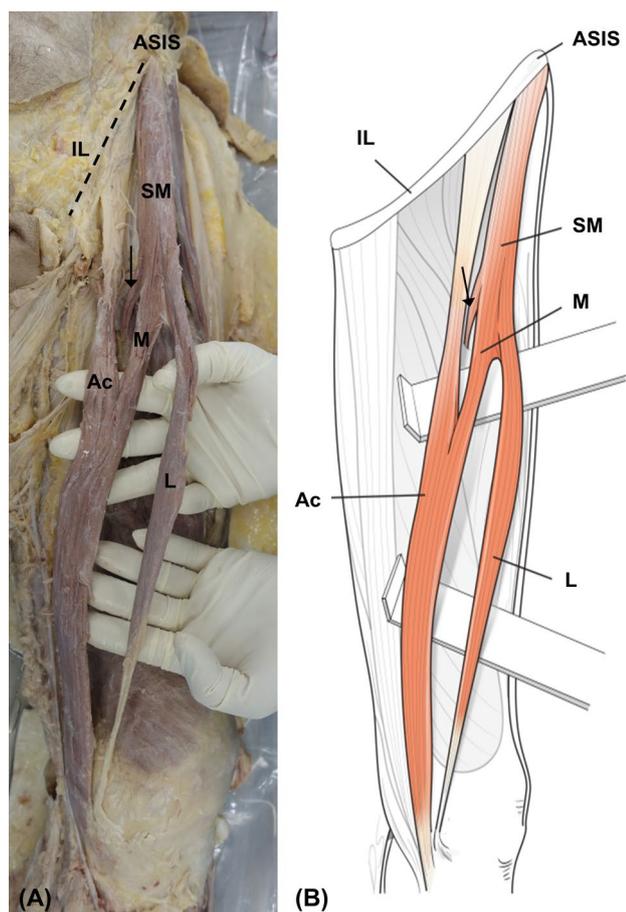


Fig. 1 Photograph (a) and schematic illustration (b) of the variation of the sartorius muscle in left leg. The original sartorius muscle (SM) was divided into two heads, lateral head (L) and the medial (M) heads. The medial head gave off muscle belly to vastus medialis (arrow) and then, it merged with the accessory sartorius muscle (Ac). ASIS anterior superior iliac spine, IL inguinal ligament

completely enclosed by deep fascia. Other variation was not found in this region and opposite side.

Discussion

The SM is a long strap muscle in the anterior compartment of the thigh, originating from the ASIS, descending obliquely towards the medial femoral condyle, and inserting onto the medial surface of the proximal tibia. It crosses the anterior

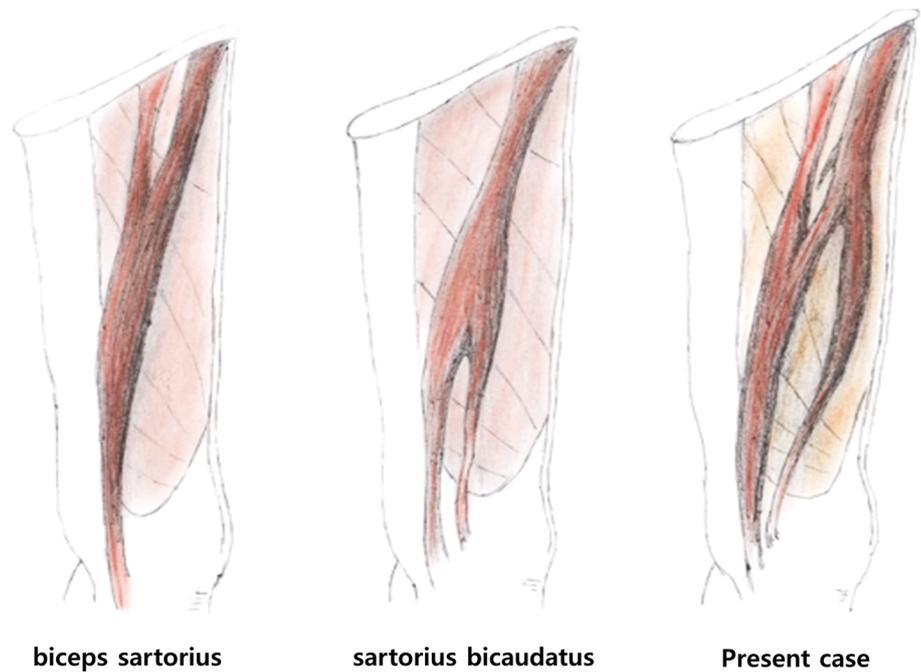
thigh obliquely, its medial edge forming the lateral border of the femoral triangle. It helps draw the lower limb into a tailor's sitting position through flexion, lateral rotation, and abduction of the hip as well as flexion of the knee. Its variations are extremely rare and have not been reported frequently. However, previous studies demonstrated its morphological variations such as a double SM with separate insertions, distal splitting of the muscle (sartorius bicaudatus), or sartorius with two heads (biceps sartorius) [2, 5, 6]. In a previous case, Garbelotti et al. [4] reported a variation of the SMA with a double origin; the main head originating from the usual site, the ASIS, and the accessory head originating from the iliopectineal eminence. Anomalous insertion patterns have also been reported: the fascial lata, the central tendon, and the medial side of the knee joint capsule [1, 4, 5].

Our case showed an ASM merging with the medial head of the original SM. The original and accessory SMs had originated from the ASIS and inguinal ligament, respectively. Their origins were similar to those stated in the abovementioned cases. However, in our case, the entire anatomy of the SM and ASM was novel and did not match with any reported patterns. It was likely a combined variation of an original SM divided as the sartorius bicaudatus and an ASM joined with medial head of the SM as biceps sartorius (Fig. 2). Simultaneous occurrence of these rare variations may have led to the formation of this extremely remarkable variation of SM.

During embryonic thigh muscle formation, incomplete cleavage of muscle mass may contribute to the development of this variation. Garbelotti et al. [4] suggested that this variation is an atrophied remnant of a pelvic bundle usually found in lower mammals. Therefore, this rare variation may include the evolutionary implication of the lower limb muscles in adapting to human development. Further studies are required to confirm the embryological mechanism and effects of this variation.

Variations in the SM have not been recognized, although these variations can be of clinical significance [3]. The presence of these additional muscles and connections between the same may result in restricted movement of the hip and knee joints [7]. The insertion of lateral head of the SM was patella; therefore, it may contribute to the power to extend the knee joint. Because the SM is an important component of the triangle, variations in its structure may give rise to iatrogenic injury during procedures such as femoral artery puncture. Therefore, knowledge of this possible variation of the SM may help clinicians during surgical and diagnostic procedures.

Fig. 2 Schematic drawing of the variations in sartorius muscle. The development of present case may be a combination of biceps sartorius and sartorius bicaudatus



Author contributions KJ performed cadaver dissection and case finding. JHL made a critical review of the manuscript. Both authors have read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest The authors have no conflict of interest to declare.

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