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Case Report

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Third head of biceps femoris muscle-a case report

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ABSTRACT

Sometimes variations in biceps femoris may be noticed like an accessory head of biceps femoris. Here during routine cadaveric dissection in the department of anatomy. All India institute of medical sciences, Jodhpur we found a case with an accessory head of biceps femoris in both the lower limbs. The muscle belly is originating from the fibers of long head of biceps femoris and going downward medially to get inserted to the medial condyle of tibia on its medial superior aspect. On the right-side insertion site is like a sheath and on half a way it is merging with medial intermuscular septum of thigh. On the left side insertion is first like a thin sheath and then a thin muscle belly. The muscle belly is thin as compared to the long and short head of the main muscle bellies. On the left side thickness is around 3.7 mm in the upper end and thinner in the lower end while on right side also it is around 3.75 mm. On right side length of muscle belly is around 5 cm and on left side it is around 5.5 cm muscle belly, then becomes a sheath with length around 0.5 mm and then again becomes a muscle belly of around 3.5 cm length. Short head is arising high up on the left side while on right side it is as normal.

Keywords: Biceps, Tibia, Fibula, Muscle, Accessory, Nerve, Flexed, Knee, Hip

INTRODUCTION

Biceps femoris muscle is a muscle of lower limb found on the posterior compartment of thigh. There are two heads of biceps femoris muscle: one long head and one short head. Long head arises in common with another muscle called semitendinosus from lower medial part of ischial tuberosity of hip bone. Short head arises from upper two third of supracondylar ridge and lower lateral lip of linea aspera of femur. At the lower part of femur both long head and short head merge together to form a conjoint tendon that passes downward to get inserted into the head of fibula overlapping fibular collateral ligament. There is a bursa between the ligament and the tendon. The tendon gives a slip to the lateral condyle of the tibia also. Semitendinosus passes downward to get inserted into the medial condyle of tibia. Nerve supply-Long head is supplied by tibial component of sciatic nerve from medial side (L4, L5, S1, S2, S3) while short head is supplied by common peroneal component of sciatic nerve from lateral side (L4, L5, S1, S2) Since the biceps femoris muscle has a dual innervation, the possibility of asynchronous stimulation of the two heads exists. Actions-long head: extension of hip joint, flexion of knee joint, lateral rotation of lower leg while knee is slightly flexed. Short head: flexion of knee joint and lateral rotation of lower leg at slightly flexed knee joint. The short head of the biceps femoris acts during the swing phase of gait whereas the long head of biceps femoris stabilizes the knee when the foot is on the ground. Quadriceps femoris is antagonistic muscle of biceps femoris which is three times stronger than the hamstring muscles.[1] Activation of an agonist muscle (biceps femoris muscle) and coactivation of an antagonist muscle (quadriceps femoris) is stronger in long muscles as compared to short muscles.[2] Biceps femoris is a strong flexor compartment muscle of knee. With rupture of its tendon due to ant because there may be 75% loss of knee

flexion.[3] In clinical practice a very rare phenomenon is found that is snapping around knee joint where the patient feels severe pain on the anterolateral compartment of knee while doing activities involving flexion of the knee joint. This is often due to variations in insertion of biceps femoris tendon other than fibula like in the lateral collateral ligament, anterolateral part of capsule of the knee joint, postero-lateral part of tibia and gardy's tubercle. Determining exact site of variation and its correction may lead to successful treatment of snapping and relief from pain.[4] Long head of biceps femoris belongs to hamstring group of muscles. Other hamstring muscles are semimembranosus, semitendinosus. Semitendinosus arises along with long head of biceps femoris from inferomedial part of ischial tuberosity and semimembranosus from superolateral part of ischial tuberosity. They insert into any one of the long bones of leg i.e., either tibia or fibula. They are supplied by tibial part of sciatic nerve.[5] The hamstring muscles are biarticular structures that function in flexing the knee and extending the hip, as well as rotating the tibia and femur medially or laterally, depending on which of the hamstring muscles is isolated. During the running cycle, the hamstring muscles function in three capacities: 1) to decelerate the forward displacement of the leg during the forward swing phase, 2) to stabilize the knee and extend the hip during the support phase, and 3) to assist the gastrocnemius muscle in paradoxically extending the knee during the takeoff phase of the running cycle.[6] There is an emerging problem specially in military personnel called popliteal artery entrapment syndrome (PAES). According to Heidelberg's classification system PAES are of three types- Type 1: atypical pattern of artery, Type 2: anomalous muscle belly, Type 3: both type 1 and 2. An anomalous muscle belly in an athlete like a military person may cause compression in the artery in popliteal fossa. Consequently, the person may suffer from vascular claudication, limb pain during vigorous muscular activities etc.[7]

Biomechanics of biceps femoris

The short head of the biceps femoris acts during the swing phase of gait whereas the long head of biceps femoris stabilizes the knee when the foot is on the ground. Anatomical variation of the biceps femoris muscle has been cited by Burkett as a possible predisposing factor to the incidence of hamstring strains in certain individuals. As was previously mentioned, the biceps femoris muscle is considered to be a consolidation of two muscles. The short head of biceps femoris arises from attachments on the femoral diaphysis and is innervated by the peroneal branch of the sciatic nerve, whereas the long head of biceps femoris arises from the ischial tuberosity and is innervated by the tibial portion of the sciatic nerve. Since the biceps femoris muscle has a dual innervation, the possibility of asynchronous stimulation of the two heads exists. Under certain conditions, stimulation of the biceps femoris muscle could become dissociated, altering both the action of the hamstring muscle group and the coordinated performance of the hamstring-quadriceps mechanism. Alteration of the hamstring-quadriceps function has been alluded to as the principal mechanism promoting hamstring strain. T the biceps femoris muscle was the hamstring muscle most frequently strained, with the short head of the biceps femoris muscle being the common site of injury.[8]

CASE REPORT

Sometimes variations in biceps femoris may be noticed like an accessory head of biceps femoris. Here during routine cadaveric dissection in the department of anatomy, All India institute of medical sciences, Jodhpur we found a case with an accessory head of biceps femoris in both the lower limbs. The muscle belly is originating from the fibers of long head of biceps femoris and going downward medially to get inserted to the medial condyle of tibia on its medial superior aspect. On the right-side insertion site is like a sheath and on half a way it is merging with medial intermuscular septum of thigh. On the left side insertion is first like a thin sheath and then a thin muscle belly. The muscle belly is thin as compared to the long and short head of the main muscle bellies. On the left side thickness is around 3.7 mm in the upper end and thinner in the lower end while on right side also it is around 3.75 mm. On right side length of muscle belly is around 5 cm and on left side it is around 5.5 cm muscle belly, then becomes a sheath with length around 0.5 mm and then again becomes a muscle belly of around 3.5 cm length. Short head is arising high up on the left side while on right side it is as normal. It has separate nerve supply from tibial part of sciatic nerve on its inner aspect in the upper end. Nearer to its insertion this accessory muscle belly is superficial to semitendinosus and semimembranosus muscle. On insertion site it is more medial as compared to semitendinosus muscle on tibia. Sciatic nerve is dividing at the level of superior angle of popliteal fossa into tibial and common peroneal nerve medially and laterally respectively.

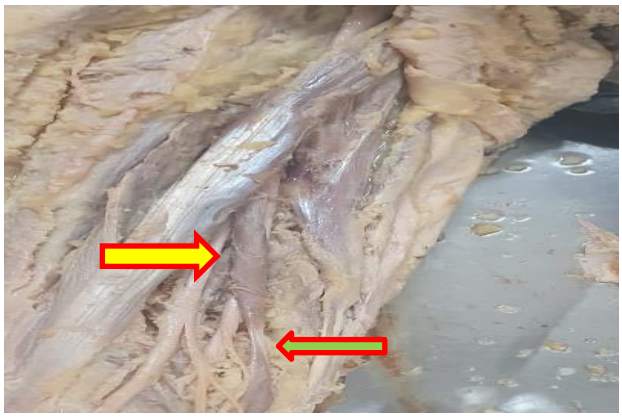

Figure 1: Left lower limb of third head of biceps femoris. Yellow arrow shows third head of biceps femoris and green arrow shows insertion of third head of biceps femoris: half muscle then half tendon slips and again half muscle blending with fascia cruris.

Figure 2: Right lower limb. Green arrow shows third head of biceps femoris inserting into the deep fascia of thigh.

Figure 3: Left lower limb of total length of third head of biceps femoris (9.5 cm).

Figure 4: Right lower limb of total length of third head of biceps femoris (5 cm).

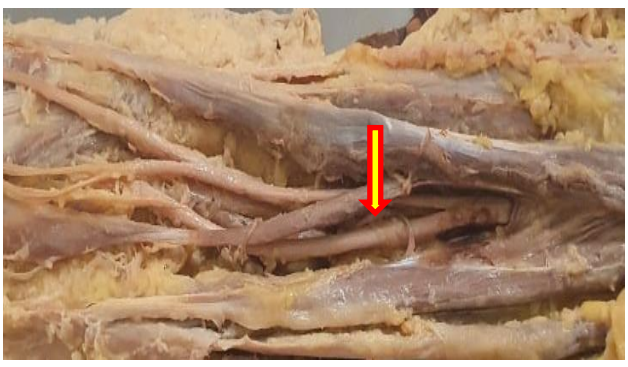

Figure 5: Yellow arrow shows divisions of sciatic nerve into tibial, common peroneal and an unusual nerve trunk.

DISCUSSION

Berihu et al noted in cadaveric studies of lower limb trifurcation of sciatic nerve dividing into three major divisions tibial nerve, common peroneal nerve and an unusual trunk in the middle of the popliteal fossa on the right side of the male lower limbs. The unusual trunks divided into the lateral cutaneous nerve of the calf and peroneal communicating nerve. Again, in one female lower limb showed trifurcation of sciatic nerve into tibial, superficial and deep peroneal nerves on the left side at the superior angle of the popliteal fossa.[9]

Cetkin et al noticed during routine dissection, two accessory muscle bundles arising from long head of biceps femoris muscle were encountered in a Turkish female cadaver. One is coming from long head of biceps femoris and passing deep to fascia of popliteal fossa to be inserted into the crural fascia. Otherone is arising from upper part of this head to be inserted into the semitendinosus muscle.[10]

Chakravarthi in 2013 found an anomalous muscle taking origin from long head of biceps femoris and merged with semitendinosus muscle. The total length of the muscle belly is 6.5 cm and average width is around 3.5 cm.[11]

Rajendiran et al in 2016 noted an anomalous muscle belly originating as a narrow tendinous slip from the medial side of the long head of biceps above the popliteal fossa. The origin is tendinous after which formed a rounded muscle belly which passed medially, superficial to the neurovascular structures present in the popliteal fossa. Inferiorly, the muscle belly formed a tendon which expanded as aponeurosis and blended with the deep fascia over the gastrocnemius muscle. The muscle belly received its innervation from the tibial nerve on its deeper aspect. The full length of the muscle along with its tendon was 19.3cm and the width was 1.4 cm. This anomalous muscle was present unilaterally and no further variations were detected in the popliteal fossa.[12]

Brett et al in 2017 found on a deep dissection of posterolateral compartment of knee after general anesthesia a thin, relatively deficient tendon of longhead of biceps femoris was found that ends as a thin aponeurosis and blends with fascia lata of iliotibial tract.[13]

Sowmya et al found in their article an anomalous muscle bundle arising from long head of biceps femoris bilaterally which were assymetrical.[14]

Bang et al in their case report found an aberrant muscular slip between the biceps femoris and semitendinosus muscles in left thigh. This muscular slip originated from a common origin with the long head of the biceps femoris, which was approximately 12.8 cm lower down the ischial tuberosity and was united with the semitendinosus 11 cm above its insertion. The total length was 13.9 cm. A

branch from the tibial part of sciatic nerve was innervating the aberrant muscle.[15]

CONCLUSION

Presence of accessory head may alter the biomechanical properties of biceps femoris leading to altered gait cycle and sometimes knapping knee during knee flexion in young athletes. During various surgical procedures also, surgeons should be aware of such variations.

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