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Case report

CAPUT TERTIUM GASTROCNEMIUS: ITS PHYLOGENETIC AND CLINICAL BASIS

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ABSTRACT: The third head of Gastrocnemius has gained significance in recent years due to the advent of sports and high stakes involved in this area. More cases of young athletes with popliteal artery entrapment are seen. Early diagnosis is of great importance in order to avoid vascular complications, and aid in athletes' early rehabilitation. Increased awareness of popliteal artery entrapment syndrome combined with improvements in investigative modalities has resulted in a more frequent diagnosis of this eminently treatable condition. Therefore, we report a case of caput tertium arising from medial head of Gastrocnemius muscle, observed during routine dissection of a 55-year old male cadaver and elaborate its embryologic and clinical aspects.

Keywords: Dissection, entrapment syndrome, embryology, gastrocnemius, variations.

INTRODUCTION

Variations in muscle arise primarily due to our genetic composition, an inheritance carried over from our ancient origins. Many or most variations are totally benign; some are errors of embryologic developmental timing or persistence of an embryologic condition. Some of these variations may seriously compromise parts of the muscular, vascular, nervous, skeletal and / or other organ systems. [1] Gastrocnemius is the most superficial muscle of the posterior leg muscle group and forms the 'belly' of the calf. It arises by two heads, connected to the condyles of the femur by strong, flat tendons. [2]

A third head (Caput tertium, CT) of Gastrocnemius has been reported due its involvement in popliteal artery entrapment syndrome, a debilitating condition, which frequently affects young active people. Also, increased awareness of popliteal artery entrapment syndrome combined with improvements in investigative modalities has resulted in a more frequent diagnosis of this eminently treatable condition. [3] It is also known to cause popliteal vein entrapment. [4] A third head of the gastrocnemius joining the lateral head is not an uncommon variant, seen in 1.9% of knee MR examinations and most are not associated with vascular symptoms. Not only the origin of third head from the medial head of gastrocnemius is a rarity its clinical implications are also more severe due to its intimate relation to the popliteal vessels. [5, 6]

Therefore, we are reporting a case of Caput tertium of medial head of Gastrocnemius and elaborating on its clinical and embryologic basis.

CASE REPORT

During routine dissection of a male cadaver of approximately 55 years age, a muscle variation was found in the right popliteal fossa region. The muscle was carefully cleaned, preserving the attachments, relative position and neurovascular connections. Careful dissection was carried out in the whole limb and all other structures were found to be normal. This muscle was studied & photographed.

The surface anatomy of the right popliteal fossa region of the cadaver being dissected was apparently normal. The skin, superficial fascia and deep fascia were removed along with the cutaneous nerves and superficial veins of the area which were normal. On exposing and clearing the boundaries of the popliteal fossa, the tibial nerve and popliteal vein were identified and retracted laterally. An abnormal muscular tissue was found in the middle of the popliteal fossa.

This muscle was cleaned and studied. A 2.75 cm long slip of muscle arose from the lateral side of the belly of medial head of Gastrocnemius. It coursed upwards and laterally traversing between the popliteal artery and popliteal vein. On lifting the popliteal vein and the tibial nerve more laterally, the muscle was observed to arch over the popliteal artery and its branch to the knee joint, middle genicular artery (Fig 1). It inserted into the popliteal surface of the femur. The popliteal artery was found to be normal in its morphology. It did not show any pathologic changes of aneurysm or thrombosis. Rest of the limb was normal and did not show any abnormal findings.

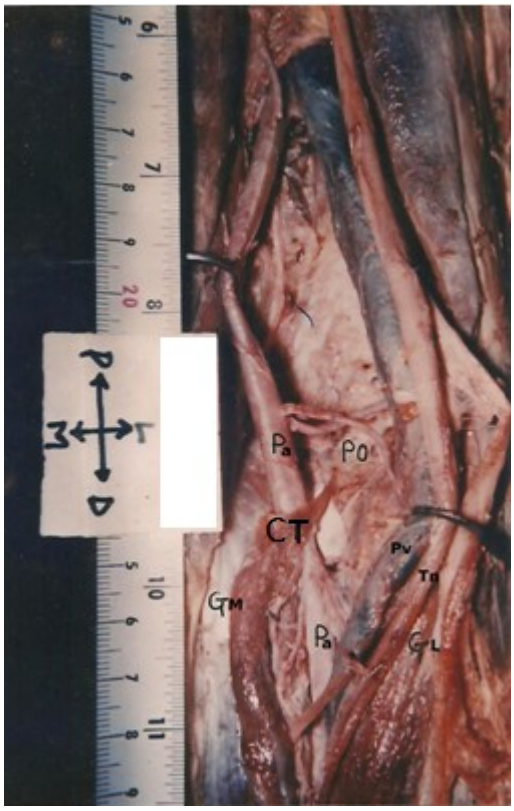

Fig. 1 Dissection demonstrating third head of Gastrocnemius, Caput tertium

GM –medial head of Gastrocnemius,
GL–lateral head of Gastrocnemius
CT –Caput tertium,
Pa –Popliteal artery,
Pv –Popliteal vein,
Tn- Tibial nerve,
PO- Popliteal surface of femur

DISCUSSION

Third head of Gastrocnemius was first described by Kelch in 1813. [5] Though illustrated in 1919 that the third head may be a potential problem for structures in the popliteal fossa, it is remarkable that the first clinical report was not published until 1959 (Hamming) [7] [8]

From phylogenetic/embryologic point of view, the gastrocnemius muscle has been considered a muscle of the fibular side of the leg (9). The gastrocnemius muscle comes from the calcaneum blastomere and follows an ascending migration towards the inferior femoral epiphysis. The medial head inserts higher than the lateral one, and comes into contact with the popliteal artery (10). The definition of the third head is a congenital growth of excess muscle.

The third head may arise from the linea aspera, the long head of the biceps femoris muscle, the lateral epicondyle, the knee joint capsule, the midfibula, or the crural fascia. It commonly joins to the medial head than to the lateral one. It may split and arise from more than one location or divide near its termination to join both heads of the gastrocnemius. The absence of the lateral head of the gastrocnemius muscle and/or its reduction to a fibrous cord has been reported (9). In some cases, the two heads of the gastrocnemius muscle may be unjoined until their insertion onto the calcaneus and with separation from soleus. The third head may be a potential problem for structures in the popliteal fossa as illustrated by Frey (11) as well as Tochihara and Onozawa (12). The third head may or may not cross the popliteal neurovascular structures. The third head joining the medial head of the gastrocnemius muscle is most commonly cited as causing clinical problems (entrapment syndromes).
We deduce that emergency physicians who encounter young patients with progressive lower limb arterial insufficiency should be aware of the possibility of popliteal artery entrapment. Early diagnosis using physical examination, history taking, and imaging is necessary. The treatment of choice is surgical correction to achieve normal anatomy within the popliteal fossa. [13]
Since its first description in 1879, popliteal artery entrapment syndrome remains a debilitating condition, which frequently affects young active people. Increased awareness of popliteal artery entrapment syndrome combined with improvements in investigative modalities has resulted in a more frequent diagnosis of this eminently treatable condition. [3].

Ultrasonography, computerized tomography (CT) and, more recently, nuclear magnetic resonance (NMR) provide detailed information ofthe abnormality: separation of the artery from the vein by a muscular bridge is the hallmark of true popliteal entrapment. True popliteal artery entrapment can be cured by surgery with subsequent resumption of sporting activities. Therefore, we thought of reporting this case which has strong clinical implications and if early treatment employed, good remedial measures possible. [14].

CONCLUSION

This variant muscle which separates the artery from the vein as a muscular bridge is the hallmark of true popliteal entrapment which can be cured by surgery. Awareness of popliteal artery entrapment syndrome, its frequent diagnosis and early treatment if employed, very good remedial measures of this condition are possible.

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