

Detection of the Third Head of Gastrocnemius

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Abstract

During a routine dissection for medical students in the Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences of the Usmanu Danfodiyo University, Sokoto, the posterior aspect of the leg region of an adult male cadaver was observed to have a third head of Gastrocnemius muscle unilaterally on the right leg. The third head of the muscle originated from the distal portion of the right femur just above the lateral condyle between plantaris and the lateral head of Gastrocnemius, the third head was having a short slender belly that descends down along the medial aspect of the medial head of the Gastrocnemius before tapering as a long tendon that blends posteriorly with the calcaneal tendon. Upon tracing the muscle, it was confirmed to be a separate head with a distinct origin and insertion independent of the usual two heads. This discovery of a third head of Gastrocnemius is certainly unusual and would no doubt go a long way in drawing the attention of surgeons both in the interpretations of radiological images and the surgery itself. Additionally, this discovery would add to the existing literature for the teaching of human anatomy generally.

Keywords: Third head, Gastrocnemius, Unusual, Surgery

INTRODUCTION

Gastrocnemius muscle is a complex muscle of the posterior compartment of the leg fundamentally involved in walking and maintenance of posture (Dalmau, 2014). The Gastrocnemius muscle consists of two heads, a medial head and a lateral head, therefore referred to as the twin muscles (Dalmau, 2014). Both heads are superficial to another muscle, the Soleus (Dalmau, 2014). The three together constitute the Triceps surae and determine the plantar flexion of the foot during walking, running and jumping (Dalmau, 2014). Contrary to the general knowledge and the widely spread knowledge of the anatomy of gastrocnemius muscle, this study had discovered a third head of gastrocnemius unilaterally in an adult male, therefore the need to establish this fact not only for the purpose of teaching human anatomy to medical and health allied students but also to avail the clinicians particularly surgeons with these findings.

The medial head of Gastrocnemius takes origin from the medial epicondyle and the posterior surface of the medial condyle of the femur while the lateral head takes origin from the lateral surface of the lateral epicondyle of the femur (Dusseldrop et al., 2014). The two heads are

directed downward, delimiting the popliteal fossa, and unite at the level of the middle third on the posterior aspect of the leg to constitute a large aponeurosis which continues distally as the calcaneal tendon commonly called the Achilles tendon which inserts on the middle of the posterior surface of the calcaneus (Baliyan *et al.*, 2016).

The Gastrocnemius is being nourished by the sural arteries as collateral arteries of the popliteal artery and the sural arteries originate at the level of the popliteal fossa (Dusseldorp *et al.*, 2014). The venous blood from the Gastrocnemius is being drained by the popliteal vein which passes through the adductor opening to become the femoral vein (Fathi *et al.*, 2011; Baliyan *et al.*, 2016). The Gastrocnemius muscle is innervated by the tibial nerve which arises from the sciatic nerve (Sladjana *et al.*, 2008).

CASE REPORT

As a tradition for teaching anatomy to medical students, a practical demonstration of body structures both superficial and deep is mandatory and routine. The lower limb just like other regions of the body was being dissected in the dissecting room of Anatomy Department, Faculty of Basic Medical Sciences, Usmanu Danfodiyo University, Sokoto with a view to demonstrating the popliteal fossa to the medical students, an unusual third head of Gastrocnemius muscle in addition to the usual medial and lateral heads was discovered unilaterally on the posterior aspect of the right leg in an adult male cadaver (age, ethnicity and cause of death unknown). Both the belly and tendon of the third head were traced to an origin and insertion respectively; the muscle was confirmed to be a third head independent of the usual two heads morphologically. Certainly, anatomists would be interested in knowing the exact action of this third head in relation to the usual two heads. Therefore, this new discovery was documented using a high definition photograph images to serve as a reference point to anatomists, surgeons and for enriching the existing literature on human anatomy.

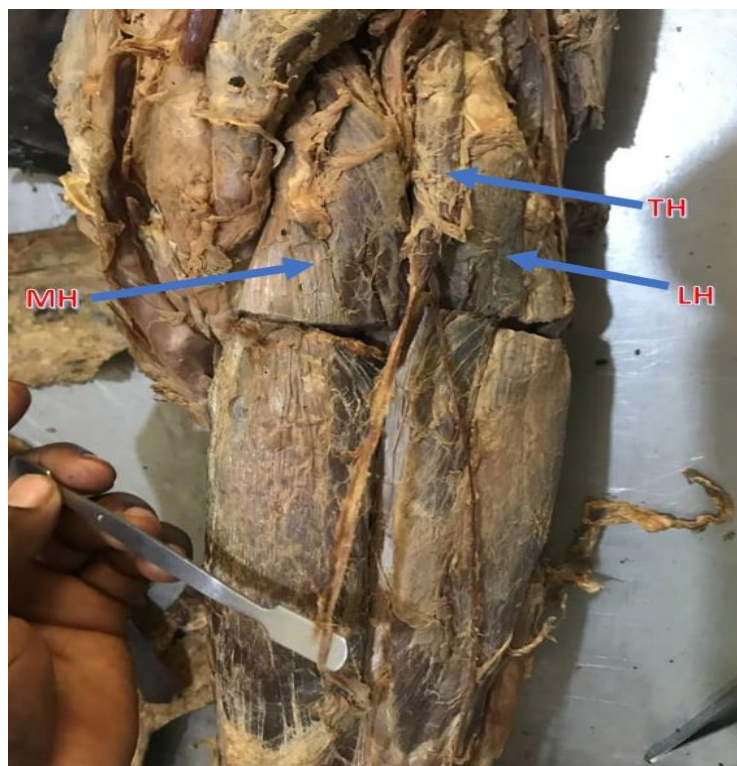


Plate 1: Posterior aspect of the right leg depicting the lateral head (LH) of gastrocnemius, medial head (MH) of gastrocnemius and the third head (TH) of gastrocnemius

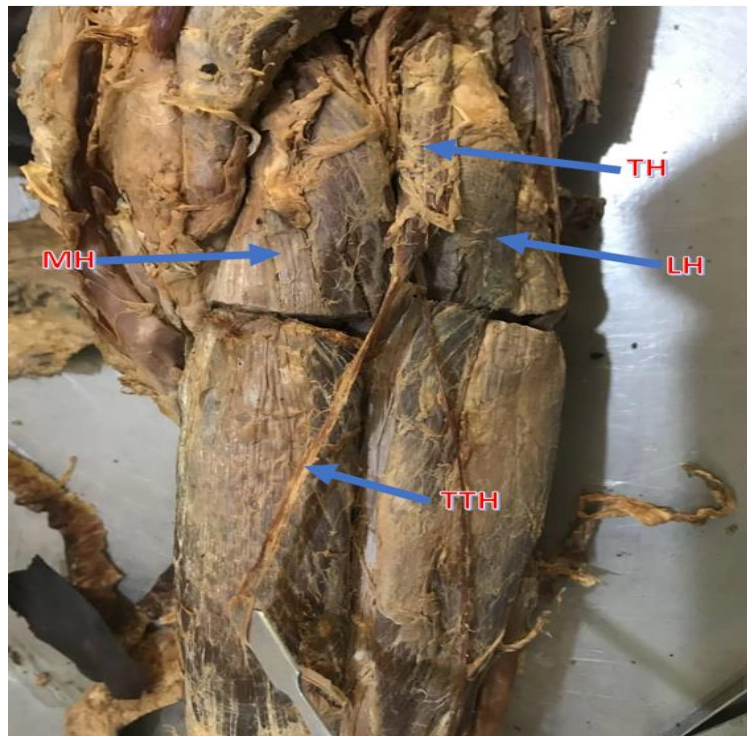


Plate 2: Posterior aspect of the right leg depicting the lateral head (LH) of gastrocnemius, medial head (MH) of gastrocnemius and the third head (TH) of gastrocnemius as well as the tendon of the third head (TTH) of the gastrocnemius

DISCUSSION

Nature and anatomy always reserve extraordinary adaptations and differences. The third head of gastrocnemius, an accessory belly of the Gastrocnemius muscle is rarely found either unilaterally or bilaterally. Worthy of note however, is the fact that this accessory muscle could cause problem in the popliteal fossa if its tendon is in contact with the popliteal artery by causing arterial entrapment (Yildrin *et al.*, 2011). Not only a third head as a rare variation could be found, quadriceps gastrocnemius is another rare but possible variation which are all yet to be classically separated from dysfunctions and pathologies (Ashaolu *et al.*, 2014). A number of anomalies such as that related to the origin of the lateral head of the gastrocnemius muscle could lead to formation of a venous and arterial thrombus that could lead to secondary pulmonary hypertension (Wang *et al.*, 2012). Therefore, reporting anomalies such as the third head of gastrocnemius does only enrich the literature of teaching anatomy but also redirects the approach of clinical diagnosis and surgical considerations, as one of the dangers associated with gastrocnemius surgery is the accidental injury of the sural nerve (Dalmau, 2014). Gastrocnemius muscle is commonly involved in reconstruction; the medial head could be used for recoveries of foot drop, Volkmann contractures and recovery of movement of the tongue (Tosun *et al.*, 2017). Additionally, the medial head of gastrocnemius muscle flap could be used to improve the cicatrization of transtibial amputation intervention (Tosun *et al.*, 2017). The tendon of the third head of gastrocnemius was observed to blend with the calcaneal tendon whose disorders are relatively common in adults due to injuries and the spectrum of its pathology ranges from insertional tendinitis, intra-substance tears and/or tendinopathy and ruptures (Wienfeld, 2014). Even though this third head of the gastrocnemius muscle was rarely observed, its asymmetrical disposition is an unambiguous scenario in human biology, as minor variations in terms of size or position of both internal and external body structure between the two sides of the mid-sagittal plane are feasible. These variations can be non-clinical or clinical (Palmer, 1993). The discovery of the third head as observed in the adult

male cadaver would serve as a cautionary point to radiologist in making diagnosis so as not to interpret the third head of gastrocnemius as an abnormal mass and also to surgeons to be well informed in carrying out surgical procedures related to the leg. Dissection of human cadaver has been a source of discovery of anomalies and variation in human structures, such as the discovery of quadruple arterial blood supply to the liver as reported by Bello and Aliu, (2023) and Costodeltoideus: A rare anomaly of the deltoid muscle reported by Abdul-Hameed and Bala, (2020).

CONCLUSION

Although medical practise is not unaware of the presence of variation as regards anatomical structures, the prevalence is very rare; this rarity should not be treated as nonexistent. On this note therefore, we conclude that a third head of gastrocnemius may exist along with the usual two heads (Medial and Lateral) either unilaterally or bilaterally with its belly grossly located between the two usual heads and a long tendons that blends with the calaneal tendon. Based on this recent finding, it is recommended that radiologists and surgeons be mindful of a third head of gastrocnemius in making diagnosis and surgical procedure of the leg in particular.

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