

Popliteal Vessels Entrapment by a Variant Accessory Belly of Medial Head of Gastrocnemius

Srinivasa Rao Sirasanagandla¹, Bhagath Kumar Potu^{2*}, Satheesha Nayak B¹ and Kumar MR Bhat³

¹Department of Anatomy, Melaka Manipal Medical College, Manipal University, Madhav Nagar, Manipal, Karnataka, India

²Department of Anatomy, Faculty of Medicine and Health Sciences, UCSI University, Kuala Lumpur, Malaysia

³Department of Anatomy, Kasturba Medical College, Manipal University, Manipal, Karnataka, India

Abstract

The present case report regards the incidental finding of right popliteal vessels entrapment by a variant accessory belly of the medial head of gastrocnemius. The accessory head of gastrocnemius took origin from the popliteal surface of the femur and joined the medial head. The popliteal vessels passed between the medial and the accessory head of the gastrocnemius. The accessory head was quite large and was supplied by a branch of tibial nerve. Popliteal vessels compression usually leads to a condition called popliteal vascular entrapment syndrome which is a rare clinical entity, predominantly in young adults. This anomaly might cause intermittent claudication, aneurysmal dilatation, thromboembolism and eventually limb-threatening ischemia. Early recognition and diagnosis is important to minimize surgical treatment and avoid vascular reconstruction. Knowledge about the rare anatomical variants of popliteal vessels is helpful for correct diagnosis and planning of treatment.

Keywords: Popliteal vessels entrapment; Popliteal vascular entrapment syndrome; Accessory belly; Claudication; Gastrocnemius

Introduction

The popliteal fossa is a narrow intermuscular space posterior to the knee joint that is bounded by biceps femoris tendon proximolaterally, semimembranosus muscle proximomedially, and medial and lateral heads of the gastrocnemius muscle distally. The popliteal artery is a continuation of the femoral artery. It begins at the opening (hiatus magnus) in the adductor magnus muscle and runs downward and laterally to terminate at the lower border of popliteus muscle by dividing into anterior and posterior tibial arteries. The popliteal vein is formed at the lower border of the popliteus muscle by the union of veins accompanying the anterior and posterior tibial arteries. It runs upwards and medially and continues as femoral vein at the hiatus magnus. The vein lies superficial to the artery in the popliteal fossa. The gastrocnemius muscle is a superficial muscle of the calf. It has two heads which take their origin from the respective condyles of the femur. The two heads join each other to form a tendon which unites with the tendon of soleus muscle to form the tendo calcaneus. The gastrocnemius is supplied by the tibial nerve and is a plantar flexor of the ankle joint. The popliteal vessels normally course between the medial and lateral heads of gastrocnemius muscle. Because of the variations that occur during embryologic development of the muscles and arteries, the popliteal artery might be entrapped by neighboring muscles and tendons [1]. Stuart described the anatomical basis of popliteal entrapment, having noted the abnormal course of popliteal artery in 64 year old man [2]. Subsequently anatomic variants of popliteal artery entrapment have been described in medical literature: aberrant path of popliteal artery related to the medial or lateral head of the gastrocnemius muscle; compression of a normally positioned artery by variant musculotendinous structures lying between the two heads of gastrocnemius; combination of a displaced artery and muscular variations [3]. Involvement of popliteal vein in the entrapment is uncommon compared to the entrapment of popliteal artery [3]. Aberrant origins and accessory slips are the reported variations of the medial head of the gastrocnemius. The aberrant origin of medial head of the gastrocnemius from the intercondylar notch rather than the medial femoral condyle has been reported. It was found to pass between the

popliteal artery and vein before joining the medial head of the muscle [1,4]. In this case report we discuss one of the rare anatomical variations of popliteal vessels entrapment by an accessory belly of the medial head of gastrocnemius.

Case Report

During routine dissection for medical students in the Department of Anatomy, Melaka Manipal Medical College, Manipal University, Manipal, India, we found an unusual relationship of popliteal vessels to the medial head of gastrocnemius. The variation was observed unilaterally in an approximately 50-year-old formalin embalmed male cadaver of South Indian origin. The dissection of popliteal fossa was carried out according to the instructions by Cunningham's Manual of Practical Anatomy. The popliteal fossa was dissected carefully and the boundaries and contents of fossa were clearly defined. Appropriate photographs were taken.

Results

In the right popliteal fossa, the medial head of the gastrocnemius presented a variant accessory muscle belly. It originated from the lower part of the popliteal surface of the femur, then passed lateral to the popliteal vessels and finally got inserted into the medial head of the gastrocnemius (Figure 1). The accessory belly was about 4.8 cm long and was supplied by a branch of the tibial nerve. The popliteal vessels coursed normally in the upper part of the fossa but in the lower part

***Corresponding author:** Dr. Bhagath Kumar Potu, Ph.D, Associate Professor of Anatomy and Embryology, Faculty of Medicine and Health Sciences, UCSI University, Jalan Menara Gading, Cheras, Kuala Lumpur, Malaysia, E-mail: potu_kumar2000@yahoo.co.in

Received December 19, 2012; **Accepted** January 22, 2013; **Published** January 24, 2013

Citation: Srinivasa Rao S, Bhagath Kumar P, Satheesha Nayak B, Kumar MR Bhat (2013) Popliteal Vessels Entrapment by a Variant Accessory Belly of Medial Head of Gastrocnemius. *Anatom Physiol* 3: 116. doi:10.4172/2161-0940.1000116

Copyright: © 2013 Srinivasa Rao S, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

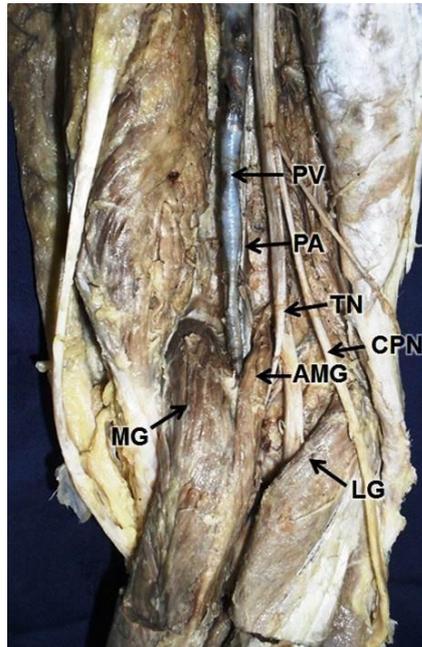


Figure 1: Photograph showing the popliteal vessels entrapment in the right popliteal fossa.

PA: Popliteal Artery; PV: Popliteal Vein; MG: Medial Head of Gastrocnemius; LG: Lateral Head of Gastrocnemius; AMG: Accessory Belly of Medial Head of Gastrocnemius; TN: Tibial Nerve; CPN: Common Peroneal Nerve

of their course they passed through the narrow gap between the accessory muscle belly and the medial head of the gastrocnemius muscle (Figure 1).

Discussion

Aberrant path of the popliteal artery or an aberrant attachment of the gastrocnemius or plantaris muscle over the normally running popliteal artery may become clinically manifest as Popliteal Artery Entrapment Syndrome (PAES) [3]. The term PAES was first described by Stuart during the dissection of an amputated leg [2]. In the general population, the prevalence of the syndrome is in a 0.16-3.5% range [5]. The anatomic variants of PAES were classified into various types by Love and Whelan based on the various relationships between the popliteal artery and the gastrocnemius muscle or, rarely, an anomalous fibrous band or the popliteus muscle [6]. Type I anomaly is characterized by aberrant medial course of the popliteal artery around a normally situated medial head of the gastrocnemius. In type II anomaly, an anomalous medial head of the gastrocnemius compresses the popliteal artery deep to it. Type III anomaly is characterized by an accessory slip of the medial head of the gastrocnemius forming a sling around the popliteal artery. The frequency of prevalence is as follows: type 1, 20%; type 2, 38%; and type 3, 26% [7]. In type IV anomaly, the normally positioned popliteal artery passes deep to the popliteus. Rich and Hughes (1967) included any of the four anatomic variants with popliteal vein to the former classification as type V anomaly [8]. Recent reports have defined functional entrapment as type VI anomaly, where popliteal artery compression is due to anatomically normal but hypertrophic muscle [9]. In the present case we report a type V anomaly, where both popliteal artery and popliteal vein are entrapped by an accessory belly of the medial head of gastrocnemius. The incidence of type V anomaly is very rare; this could be because the limb veins accompanying the arteries are the last to develop. Therefore usually limb veins, although

accompanying arteries, would be unavailable for the entrapment [10]. Many of the anatomical variations of popliteal vessels entrapment by the medial head of the gastrocnemius are due to aberrant attachment and accessory slips [1,5]. An accessory slip of the medial head of the gastrocnemius has been found to occur in 21% patients with PAES [1,5]. This is possibly due to the early development of the artery or a delay in the migration of the medial head of the gastrocnemius, so the artery is caught with the medial head [11].

The term Popliteal Vascular Entrapment Syndrome (PVES) has been proposed instead of PAES because some anatomic variants can also cause compression and thrombosis of the adjacent vein [12]. This syndrome usually affects the sports persons, athletes and soldiers. PVES may result in intermittent claudication, arterial damage and thromboembolism, eventually leading to ischemia of the affected limb. It is important to be aware of the normal anatomical features of popliteal vessels and surrounding structures in planning surgery like thrombectomy and embolectomy involving the popliteal vessels. Medical personnel and vascular surgeons should be aware of the presence of accessory slips or variant muscles to avoid complications in decompression surgery.

References

1. Elias DA, White LM, Rubenstein JD, Christakis M, Merchant N (2003) Clinical evaluation and MR imaging features of popliteal artery entrapment and cystic adventitial disease. *AJR Am J Roentgenol* 180: 627-632.
2. Stuart TPA (1879) Note on a variation in the course of the popliteal artery. *J Anat Physiol* 13: 162.
3. Radonic V, Koplic S, Giunio L, Bozic I, Maskovic J, et al. (2000) Popliteal artery entrapment syndrome: diagnosis and management, with report of three cases. *Tex Heart Inst J* 27: 3-13
4. Kim HK, Shin MJ, Kim SM, Lee SH, Hong HJ (2006) Popliteal artery entrapment syndrome: morphological classification utilizing MR imaging. *Skeletal Radiol* 35: 648-658.
5. Castiglia V (2002) Síndrome do aprisionamento da artéria poplíteia. Revisão de literatura. In: Maffei FHA, Lastória S, Yoshida WB, Rollo HA, eds. *Doenças Vasculares Periféricas*. (3rd edn), Rio de Janeiro, Medsi. Pp. 1305-1316.
6. Love JW, Whelan TJ (1965) Popliteal artery entrapment syndrome. *Am J Surg* 109: 620-624.
7. Pillai J (2008) A current interpretation of popliteal vascular entrapment. *J Vasc Surg* 48: 61S-65S.
8. Rich NM, Hughes CW (1967) Popliteal artery and vein entrapment. *Am J Surg* 113: 696-698.
9. Rignault DP, Pailler JL, Lunel F (1985) The "functional" popliteal artery entrapment syndrome. *Int Angiol* 4: 341-343.
10. Turner GR, Gosney WG, Ellingson W, Gaspar M (1969) Popliteal artery entrapment syndrome. *JAMA* 208: 692-693.
11. Gibson MH, Mills JG, Johnson GE, Downs AR (1977) Popliteal entrapment syndrome. *Ann Surg* 185: 341-348.
12. Liu PT, Moyer AC, Huettl EA, Fowl RJ, Stone WM (2005) Popliteal vascular entrapment syndrome caused by a rare anomalous slip of the lateral head of the gastrocnemius muscle. *Skeletal Radiol* 34: 359-363.