Presence of third head of gastrocnemius and entrapment of the sural nerve

Anitha GURU
Naveen KUMAR *
Surekha D SHETTY
Satheesha NAYAK B

Department of Anatomy, Melaka Manipal Medical College (Manipal Campus), Manipal University, Manipal, Karnataka, INDIA.

Abstract

Presence of third head of the gastrocnemius also known as caput tertium gastrocnemius can cause severe clinical complications as it may compress the popliteal vessels and nerves of the popliteal region. An early diagnosis of such incidence is of great importance in order to avoid vascular complications and to aid in the early rehabilitation. Sural nerve is a peripheral sensory nerve often used for several therapeutic and diagnostic purposes. Hence its formation and course in the calf assumes great significance. We report here a case with concurrent variations of gastrocnemius and the sural nerve. The gastrocnemius muscle originated with 3 heads. The additional third head took origin from lateral condyle of the femur and then merged with the medial head. The sural nerve took origin from the tibial nerve, passed through the line of union between the medial and third head of the gastrocnemius muscle.


Key words [third head of gastrocnemius] [caput tertium gastrocnemius] [sural nerve entrapment]

Introduction

Gastrocnemius is the most superficial muscle of the posterior crural region. It arises by two tendinous heads from the femur. The lateral head originates from the lateral surface of the lateral condyle and the medial head originates from a rough area on the popliteal surface above the medial condyle. The lateral head frequently contains a small sesamoid bone, the fabella. The medial head is larger and longer than the lateral head.

Fleshy part of the muscle extends to about midcalf, ends on the posterior surface as a thin, common tendon. This tendon fuses with the superficial surface of the tendon of soleus to form tendo calcaneus.

Sural nerve is a branch of the tibial nerve in the popliteal fossa. It descends in the posterior compartment of the leg superficial to the gastrocnemius and pierces the deep fascia in the middle of the leg. It is then joined by sural communicating nerve and supplies the skin of the lower half of the central area of the calf and also over the lateral border of the foot up to the tip of the little toe.

Case Report

During routine dissection classes for the undergraduate medical students, we found unilateral variations of gastrocnemius muscle and sural nerve in a male cadaver, aged approximately 65 years. The gastrocnemius muscle contrary to its usual origin with two heads, originated with 3 heads. A medial head was markedly diminished in size and was observed to be originating from the medial condyle of femur. The lateral head originated as a tendon from the lateral condyle of femur. The third head also known as caput tertium gastrocnemius (CTG) also originated from the lateral condyle of femur. The CTG and the lateral head descended down to fuse to form a single entity, which further joined the medial head (Figures 1, 2).

The sural nerve (SN) after branching from the tibial nerve (TN) descended superficially for a short distance and then passed deep to the gastrocnemius muscle through the line of union between the CTG and the medial head unlike its usual course. The nerve disappeared deep to the muscle and re-emerged from within the gastrocnemius proximal to its tendon. After emerging out from the muscle, the nerve had its usual course.

Discussion

CTG or the third head of the gastrocnemius encounters occasionally. It usually arises from popliteal surface of the femur. In rare occasions, it may also arise from the linea aspera, the long head of the biceps femoris, the lateral epicondyle, the knee joint capsule, the mid fibula and the crural fascia [1].
Muscular variations are mainly due to genetic predispositions. Most of them are due to the errors in embryologic developmental timings [4]. Iwai et al. [5] reported the popliteal vessel entrapment syndrome by third head of the gastrocnemius.

Currently, incidence of additional head of the gastrocnemius and its complications has sought more significance as the increased number of cases of athletes with popliteal artery entrapment [1].

Deep course of sural nerve or its entrapment in gastrocnemius muscle has been reported by many authors. Sural nerve solely arising from common peroneal nerve (CPN) without the contribution of tibial nerve has been reported by Shankar and Veeramani, in 2008 [6]. In such cases, surgeon should be aware of these kinds of variant origin of SN before harvesting it as it may eventually lead to partial palsy of CPN.

The sural nerve is generally considered to be a purely sensory nerve, except for the sympathetic fibers supplying smooth muscle and sweat glands in the skin. However, Amoiridis et al. [7] reported it having motor fibers in 4.5% cases. Based on this, George and Nayak [8] have suggested that the muscular course of the SN could be associated with a motor innervation of the gastrocnemius muscle. In a study done by Sekiya et al., [9] in Japan, after observing the communications between the TN and SN in the lower part of the leg of some cadavers, came to conclusion that, it could be the pathway by which motor fibers enter the SN.

Regardless of controversy about the presence of motor fibers in SN, the variant origin and course of the SN is clinically important because it is often used in various nerve transplantation procedures, and also commonly used for diagnostic purposes such as nerve conduction velocity studies as well as therapeutic purposes as in nerve grafting etc. Pementel et al. [10] suggested that, compression of sural nerve either by entrapment or by injury is often associated with neuropathies of the nerve. It was evident in the people using new ski boots and suffered neuropathies in addition to hypoesthesia in lateral border of the foot. Sural nerve is the main nerve used to evaluate sensory axonal loss in distal axonal neuropathies [11].

Isolated cases of presence of caput tertium gastrocnemius or SN entrapment are common and have been reported earlier. But, a case as encountered here having both variations together in a same cadaver has not been sought in available literature. Therefore, the possible variant course of the SN should be considered in any pain that occurs in the distribution of the SN due to suspected entrapment.

References


