Morphometric study of the coccyx-femoral muscular fiber sheaf in relation to the maximum gluteal muscle anatomic variation: a case report

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Abstract

The maximum gluteal muscle is a wide and thick muscular band that forms the buttock prominence. The insertion-origin anatomic variations of the maximum gluteal muscle are uncommon. The gluteal musculature may receive extra fascicles originated from the lumbar aponeurosis, as well as from the ischiatic tuberosity. Some distinct muscular fascicles, known as the coccyx-femoral muscular portion, may sometimes be found close to the free lower margin of the muscle. In the present work, we reported the morphometric study of the coccyx-femoral muscular portion (band) of the maximum gluteal muscle unilaterally present in a male cadaver from the anatomy laboratory - University of Brasilia Medical School.

Keywords: maximum gluteal muscle, coccyx-femoral sheaf, gluteal musculature.

1 Introduction

According to literature (LLORCA, 1952; WARWICK and WILLIAMS, 1979; BOURGERY and JACOB, 2005; TESTUT and JACOB, 1952; ROUVÉRE, 1959), the maximum gluteal muscle is a wide and thick muscular band that forms the buttock prominence. Considered as the largest and the most superficial muscle of the gluteal region, it is originated from the posterior gluteal line and from the rugous area, including the iliac crest, the aponeurosis of the erector spinal muscle, the dorsal surface of the lower sacrum, the sacrotuberal ligament and the fascia that covers the intermediate gluteus (SOBOTTA, 2006). With a remarkable fascicular architecture, its fibers separate from the median plan obliquelaterally with tendinous laminar insertions that cross laterally to the great trochanter and attach to the iliotibial tract of the fascia lata. Its free and prominent lower muscular flap superficially coincides with the gluteal cutaneous fold, being considered the superior-posterior limit between the member root and an important element of the surface anatomy.

The insertion-origin anatomic variations of the maximum gluteal muscle are uncommon. The gluteal musculature may receive extra fascicles originated from the lumbar aponeurosis, as well as from the ischiatic tuberosity Levadoux (1907).

Some distinct muscular fascicles, known as the coccyx-femoral muscular portion, may sometimes be found close to the free lower margin of the muscle. This muscular division, quite similar to a "band", is wrapped by a flaccid conjunctive tissue and separated from the gluteal musculature portion by an areolar tissue. It is originated from the dorsal face of the coccyx and inserted in the femoral diaphyisis, being also classified as the distal head of the maximum gluteus (GRUBER, 1887; RONALD, 2001).

The objective of this work is to report the findings and the morphometric study of the coccyx-femoral muscular portion (band) of the maximum gluteal muscle unilaterally present in a male cadaver from the anatomy laboratory - University of Brasilia Medical School.

2 Case report

The coccyx-femoral portion of the maximum gluteal muscle described in the present work was collected from a male adult cadaver (50). The dissection revealed an isolated muscular sheaf located at the lower maximum gluteal muscle border measuring 17 cm in length and with different dimensions in the transversal section: 2 cm in the proximal insertion, 3 cm in the medial portion and 5 cm in its distal insertion.

The muscular fibers of the variant sheaf were grouped and distinct from the maximum gluteal muscle fibers due to an adipose and conjunctive wrapping that favored its identification, isolation and conservation.

The ribbon-shaped muscular structure presents muscular sheaves that separate oblique-laterally from the median plan, deeply crossing the posterior region of the thigh root, also crossing the sciatic nerve and tendons originated from the thigh flexor and posterior muscles.

The direction of the coccyx-femoral muscular fibers presented intense lateral inclination, and their insertions are distinct in relation to the fibers of the remaining maximum gluteal muscle.

The macroscopic analysis revealed a change in the thickness of the maximum gluteal muscle lower margin due to the reduction of the number of sacral-origin muscular fibers, and these muscular sheaves also involve the coccyx-femoral muscular sheaf in approximately 270 degrees (Figure 1a).

The arterial and venous vascularizations of the variant sheaf were originated from arteries and veins of the lower

gluteus, for example, the branches of the nerve originated from the posterior cutaneous thigh. The contra-lateral gluteal region (left) was concomitantly dissected and the presence of the coccyx-femoral muscular portion was not detected. This means that the presence of a functional variant sheaf in the right antimer was verified.

3. Discussion

The anatomic study of muscular variations, either due to the addition or due to subtraction of one of its components (tendon or venter) presents predominance of the quantitative standard in relation to the qualitative characteristics. The main difficulty is finding such anatomic variations and, most of all, preserving them makes dissection a persistent work, which is vital for the professional qualification of those who work with the human body.

The variation towards more than one tendon or muscular venter initially gives the false impression of the increase of both strength and resistance in relation to the respective musculature. Analyzing the coccyx-femoral sheaf of the gluteal region, its location suggests a higher intensity in the traction (extension) of the respective member. However, a more careful observation reveals the presence of additional muscular sheaves, which was quantitatively compensated by the reduction of sacral-origin muscular fibers of the respective gluteal muscle at the same proportion (Figure 1a). If myoelectrical studies were compared, differences in the graphic recordings between both maximum gluteal muscles in the same individual probably would not exist; however, the same cannot be inferred in relation to the muscular action.

Another important aspect of the muscular anatomic variations concerns the way such findings are presented. Any morphometric variation of a superficial musculature is generally easily perceived when one is experienced in anatomy. In some circumstances and taking the coccyx-femoral muscular sheaf as example, the recognition of these anatomic variations becomes a complex task at the clinical examination. The supposed modification on the volume and profile of the gluteal region expected with the addition of a higher number of muscular fibers is often not clearly observed, making the finding of these variants in individuals with osteomuscular complaints difficult (Figure 2). The existence of this variant did not determine relative alteration on the volume of the lower gluteal region. This may be corroborated due to the reduction in the thickness of maximum gluteal fibers (caudal cranium), compensating the presence of the sheaf in its lower border.

Bipedalism is a particular postural characteristic among human primates and depended on a long adaptation process of the postural musculature in which the gluteal region stands out. The superficial projection of this muscular group was object of study of Leonardo da Vinci between 1505 and 1510 when the Renaissance artist studied anatomy for the theoretical support of his works (CIANCHI, 2000). Andréas Vesalius (2002) portrayed, in picture 77 of his Epitome, the femoral biceps muscle, suggesting that the lower sheaf was thicker. It is interesting to observe in Figure 1b of this study that after returning the fascia, the region reflected part of this image portrayed by Vesalius (2002).

In the second half of the 18th century, Bourgery and Jacob (2005) illustrated the maximum gluteal muscle in their treaty as with one sheaf of upper fibers with oblique-lateral insertion towards the femur large trochander and another one supported on the tensor muscle aponeurosis of the fascia lata.

In the 20th century, Testut and Jacob (1952) described this muscle in their Topographic Anatomy Treaty as a single set of oblique-lateral parallel fascicles which physiological activity (along with other gluteus) of great energy turns the lower muscle medially.

Once again in relation to the variant and according to authors mentioned above, one may infer that the muscular action of antimers of this individual could present functional variations.

Rouviere (1959) treated muscular sheaves from the large gluteus and admitted a dissociation of these muscles at the proximities of its femoral termination, i.e., a twisting movement of fibers that makes part of the upper sheaves to reach the lower part of the distal tendon and the lower sheaves to reach the upper part of this tendon. Figures 1a,b demonstrate a moderate twisting process in the variant sheaf.

In both texts and illustrations, recent literature considers the muscle as a single and fascicular venter with some fibers inserted in the gluteal tuberosity (WARWICK and

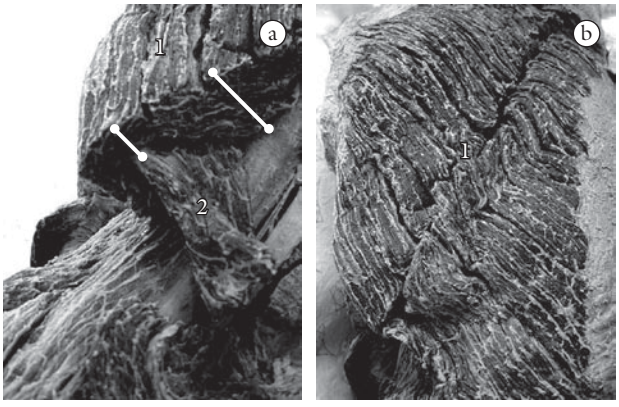

Figure 1. a, b) Maximum gluteal muscle (1), coccyx-femoral portion (band) (2) View of the different gluteal musculature thickness.

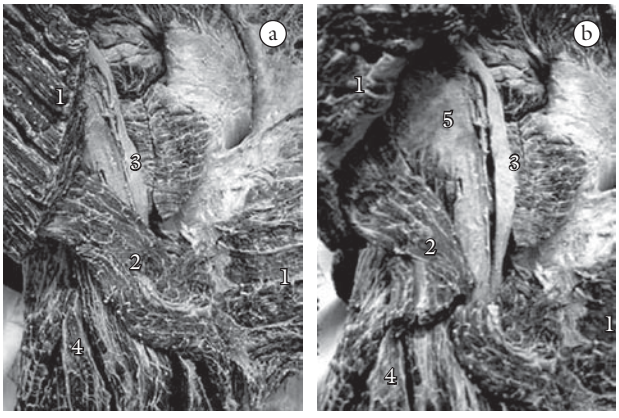

Figure 2. a, b) Gluteal region. Maximum gluteal muscle (1), coccyx-femoral portion (band) (2), sciatic nerve (3), thigh posterior musculature (4), ischium bone (5).

WILLIAMS, 1979; TESTUT and JACOB, 1952; MOORE and DALLEY, 2007).

Irrigation, drainage and innervation found in the variant are coincident with classic (GRUBER, 1887; TESTUT and JACOB, 1952; ROUVÉRE, 1959) and current descriptions (MOORE and DALLEY, 2007).

The osteomuscular problems are frequent and withdraw contemporary professionals from their jobs. These individual differences that do not occur in the current literature may make diagnoses and treatments difficult. There are differences between individuals and in this case, between antimers from the body of the same individual.

This, among other aspects, makes us think that anatomy is learned in laboratories and with anatomic pieces and how future health professionals will be formed in a time where image diagnoses require a deep knowledge on the human body and more and more extinguish the practical study.

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