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Anomaly of the femoral artery passage through the substance of sartorius muscle. Clinical consequences

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Abstract

The passage of the femoral artery through the substance of the sartorius muscle and its clinical consequences are presented. In the series of cadavers studied, the incidence of occurrence of this condition is probably less than 0.001% in both Caucasians and black Africans. It is suggested that this anomaly which rarely occurs is due to the angioblastic column of cells forming the femoral artery passing through the myoblastic column of cells forming the sartorius muscle.

Sommaire

L'article traite du passage de l'artère fémorale à travers le muscle sartorius et des conséquences cliniques. A travers la série de cadavres étudiés, les cas de manifestation de cette condition est probablement moins de 0.001% aussi bien chez les Caucasiens que chez les Noirs Africains. On a donc suggéré que cette anomalie qui survient rarement est due à la colonne angioblastique de cellules constituant l'artère fémorale qui passe par le colonne myoblastique des cellules du muscle sartorius.

Introduction

Anomalies of the femoral artery have been described by several authors, these included congenital absence of the artery [1,2], hypoplasia of the artery [3-8], transposition of the femoral artery and the femoral vein, [9] and duplication of the artery [10,11]. In this paper we present a particular anomaly of the femoral

artery that has not been reported before. Its passage through the substance of the sartorius muscle, the probable incidence of this anomaly in black Africans and Caucasians and its clinical consequences.

The normal femoral artery is a continuation of the external iliac artery. It takes its name after emerging from under the inguinal ligament between the femoral vein medially with whom it shares the same sheath and the femoral nerve laterally. It runs inferiorly and slightly medially in the femoral triangle and gives off most of its branches in the triangle. It then passes through the apex of the femoral triangle under the sartorius muscle into the subsartorial canal from where it passes through the adductor hiatus in the adductor magnus muscle to reach the popliteal fossa where it continues as the popliteal artery.

The sartorius muscle from its origin on the anterior superior iliac spine slopes downwards and medially forming the lateral boundary of the femoral triangle and crosses the medial border of the thigh to its insertion on the medial side of the upper part of the tibia.

Material and observation

In the above figures, the femoral artery course through the femoral triangle is similar to textbook description but in leaving the triangle, the artery could be seen (figs 1 and 2) passing superficially through the middle of the substance of the sartorius muscle into the subsartorial canal. It should be

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observed that the branches of the femoral artery to the thigh (Profunda femoris, medial and lateral circumflex arteries etc.) have already been given up before the passage of the artery through the sartorius muscle. The thigh is therefore not affected by this anomaly. In over a thousand limbs that the author has examined in medical schools in USA and Africa, the author has seen this anomaly once in a Caucasian cadaver and once in a black African cadaver. The incidence of occurrence of this anomaly is probably less than 0.001% in both races.

Discussion

The sartorius muscle and the femoral artery are so closely related at the inferior angle of the femoral triangle where the femoral artery passes under the edge of the sartorius muscle to lie directly inferior to the muscle in the subsartorial canal. It is therefore easy to perceive the possibility of the artery, passing through the substance of the muscle, occurring more

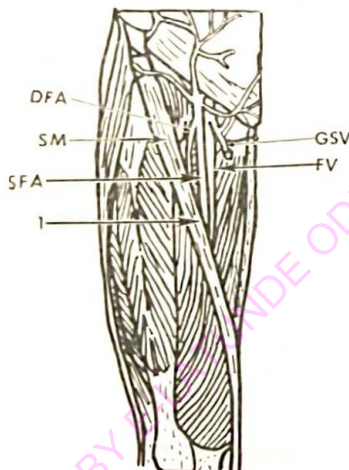


Fig. 1: Shows the anomalous femoral artery and other vessels of the femoral triangle.

- 1 — Superficial femoral artery.
- 2 — Deep femoral artery (Profunda femoris artery)
- 3 — A small branch of the femoral artery which runs below the sartorius muscle and later join the main branch passing through the substance of the muscle.
- 4 — Femoral vein.
- 5 — Great saphenous vein.
- 6 — Main femoral artery passing through the fibers of the sartorius muscle.
- 7 — The sartorius muscle.

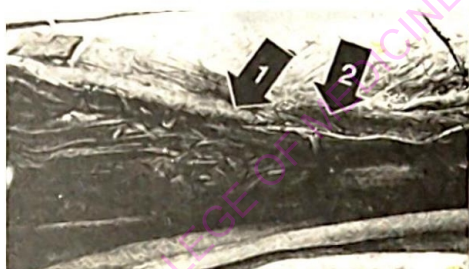


Fig. 2: An enlarged portion of figure 1 to show the point of passage of femoral artery through the substance of sartorius muscle.

- 1 — Superficial femoral artery.
- 2 — Sartorius muscle.

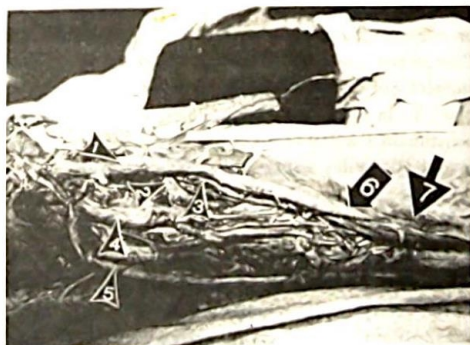


Fig. 3: Shows the passage of a normal femoral artery through the femoral triangle and under the sartorius muscle at position 1 into the subsartorial space.

- SFA — Superficial femoral artery.
- DFA — Deep femoral artery.
- SM — Sartorius muscle.
- GSV — Great saphenous vein.
- FV — Femoral vein

frequently. But this rarely happens, indicating that during angiogenesis in the developing embryo, at the inferior angle of the femoral triangle, the column of angioblasts which are first laid down to form the endothelial lining of the femoral artery, before connective tissue were added to form the wall, are precisely laid down perfectly just inferior to the column of myoblasts forming the sartorius muscle.

This precise organisation is due to positional information repository in the connective tissue of the limbs which guides migratory cells forming the various structures to their predestined position[12]. This anomaly has serious clinical consequences. The blood supply to the leg is mainly through the femoral artery. Constriction of the femoral artery would therefore reduce the volume of blood going to the affected leg in a unit time. This may not be noticeable at rest but during mere walking the individual may complain of pain, i.e. claudication in the affected leg. This condition if present in an athlete is of extreme importance. During running there is alternate flexion and extension of the lower limb at the hip and knee joints. The sartorius muscle being one the flexors of the thigh and the leg, is in contraction during flexion and a femoral artery passing through its substance is constricted and may even be totally occluded. Blood flow to the affected leg is therefore intermittent, in phase with the rhythmic contraction and relaxation of the sartorius muscle. The intermittent nature of the flow of blood would reduce the supply of nutrients and oxygen and also increase the accumulation of the products of metabolism of the muscles of the leg, particularly lactic acid. Accumulation of lactic acid causes pain and fatigue in muscles. This condition would be a serious impediment in long distance runners, cyclists, boxers, footballers, soccer players and soldiers who have to hike long distances. It should be remembered that in these people due to exercise, the limb muscles including the sartorius are usually hypertrophied and therefore the constriction of a femoral artery passing through the sartorius muscle would be severe, limiting the performance of the individual.

The condition can be diagnosed by asking the suspect to sit on the floor with flexion, abduction and lateral rotation at the hip joint and flexion at the knee joint (Yoga position). In this position the sartorius is maximally contracted and would be strangulating a femoral artery passing through its fibers. If there is such an artery, the artery would bulge at the point where it enters the muscle and its pulsation would

easily be felt at this point. Also in this position the blood supply to the leg with this anomaly is severely curtailed and the person after a short while would complain of pain in the affected leg. The incidence of occurrence of this anomaly is low but it should be borne in mind. While the position of vessels particularly the arteries are constant, occasional anomalies do occur and these are the ones that present with problems and they should be looked for. During the physical examination of athletes and recruits for the armed forces, this condition should be examined for and if present it should be corrected by surgery.

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