

Case Report

Continuation of perforating branch of fibular artery as dorsalis pedis artery

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ABSTRACT

For the effective management of vascular surgeries such as arterial cannulation, bypass surgery, percutaneous trans arterial catheterization etc. needs a sound knowledge of the vessels of the lower extremity, their branching pattern, course followed by them and their diameter. The knowledge of arterial variation is a must before a surgeon deals with the concerned area. We are reporting a case in which the perforating branch of fibular artery passes through the gap in the interosseous membrane and continues as the dorsalis pedis artery. Normally anterior tibial artery, a branch of popliteal artery is the main artery of the extensor compartment of the lower limb which continues on the dorsum of foot as dorsalis pedis artery but in this case, it became hypoplastic and disappeared below, proximal to the ankle joint.

Keywords: Anterior tibial artery and fibular artery, Dorsalis pedis artery

INTRODUCTION

During embryonic life the fifth lumbar intersegmental artery forms the axial artery of the lower limb. The fifth lumbar intersegmental artery establishes connection with the umbilical artery. The part of the intersegmental artery distal to this connection is the external iliac and the connecting part forms the internal iliac which continues as ischiadic/ischiatic (sciatic) artery.

This ischiadic artery continues as the axial artery of the lower limb bud. The external iliac continues to grow as femoral artery. A connection is established between femoral and sciatic artery known as ramus communicans superior. A branch from ischiadic artery distal to this communication passes between tibia and fibula to enter the extensor compartment and continues to grow as anterior tibial artery. The axis artery has three remnants-small ischiatic (sciatic) artery, popliteal artery and peroneal artery. This peroneal artery lower down establishes connection with the anterior tibial artery.

Regression and persistence of embryonic vessels leads to the abnormal arterial pattern.

In adult life the main arterial supply to the lower limb comes from the femoral artery which continues as the popliteal artery in the popliteal fossa. It divides into anterior tibial and posterior tibial artery at the lower border of the muscle, popliteus. Anterior tibial artery enters the extensor compartment through a gap in the upper part of interosseous membrane and supplies the structures in the extensor compartment. It then courses towards the ankle and midway between medial and lateral malleoli continues into the dorsum of foot as dorsalis pedis artery. The posterior tibial artery remains in the posterior compartment and gives of various branches. One of its branch is fibular artery which gives of the following branches: muscular branches, nutrient artery, perforating branches, communicating branches and calcaneal branches. The perforating branch may replace the dorsalis pedis artery on the dorsum of foot when enlarged.¹

Many a times the arterial variations in the lower limb are symptomless and are incidental findings during dissection or during angiograms. Surgical corrections are needed when these variations produce symptoms hence having knowledge of arterial variations is a must for every surgeon.

This study was done to highlight the variation in the arterial supply of the lower limb as the variation in the arterial supply of foot and leg are clinically significant for plastic and vascular surgeries in reconstructing lower limb arteries or preparing viable muscle flaps.^{2,3}

CASE REPORT

During a routine dissection of the right lower limb of a 50 years male cadaver in the Department of Anatomy, RIMS, Ranchi; we observed that in the extensor compartment the anterior tibial artery which is a branch of popliteal artery gained entry through a gap in the upper part of the interosseous membrane. At first it lies between the extensor muscles tibialis anterior and extensor digitorum longus (Figure 1).



Figure 1: Showing hypoplastic anterior tibial artery. A-anterior tibial artery, B-tibialis anterior, C-extensor digitorum longus.

Here the artery's size is very thin but it gave off muscular branches and became hypoplastic as it coursed down but could reach the ankle. It disappeared before it could reach the ankle joint. Though the artery was hypoplastic there was no structural abnormality seen in the extensor compartment. The main arterial supply on the dorsum of foot comes from the continuation of anterior tibial as dorsalis pedis artery but instead an enlarged perforating branch of the fibular artery was seen to be passing through the gap in the lower part of the interosseous membrane above the ankle joint having size much larger than the anterior tibial artery continuing as dorsalis pedis artery (Figure 2). Accompanied on its lateral side is the deep peroneal nerve which is continuing from the leg to the dorsum of foot maintaining its relation with the

dorsalis pedis artery. On the left lower limb the course of anterior limb was of normal pattern.



Figure 2: Showing perforating branch of fibular artery continuing on the dorsum of right foot as dorsalis pedis artery. A-perforating branch of fibular artery, B-deep peroneal nerve, C-tendon of extensor hallucis longus, D-tendon of extensor digitorum longus.

DISCUSSION

Arterial variation occurs due to their abnormal development process. The axial artery of the lower extremity persists as sciatic, popliteal and fibular artery and the variation in the arterial pattern of popliteal artery occurs when there is arrest in the normal development of the vessels.⁴

In the text books it has been mentioned that the anterior tibial artery can be small but absent rarely and lower down on the dorsum its function either can be taken up by the perforating branch of the posterior tibial artery or by the perforating branch of the fibular artery which is a branch of the posterior tibial. Though segmental hypoplasia of anterior tibial artery is very rare segmental hypoplasia of anterior tibial artery coexisting with hypertrophied perforating fibular artery has been reported.^{5,6} It has also been seen that though anterior tibial became hypoplastic it is being replaced by a large branch of posterior tibial artery which crossed the lower part of the interosseous membrane.⁷

In the present case the anterior tibial artery did not continue as dorsalis pedis on the dorsum as it disappeared before it could reach the ankle. It was the perforating branch of fibular artery which continued as dorsalis pedis artery. There was no structural malformation associated in the present case but bony defects of lower limb such as clubfoot, tibial aplasia absence of metatarsal etc. had been reported.⁸ There are other clinical conditions such as campomelic syndrome in which absence of anterior tibial artery coexisting with absence of dorsalis pedis artery had been observed.⁹

While performing anterior femorotibial graft the diameter of the anterior tibial artery plays an important role.¹⁰ In the present case it has been observed that diameter of anterior tibial artery is Prior to surgery anatomical knowledge of arterial pattern is not only needed for vascular surgery but also for reconstructive surgeries of the lower limbs as planning of surgeries had been seen to be altered in 20-25% cases due to arterial variations.¹¹ MR angiographic study of vessels of lower extremity done preoperatively will lead to the revelation of any abnormal arterial pattern helping to plan surgical interventions below the knee reducing iatrogenic complications.

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