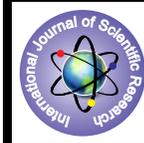


A Cadaveric Study of Fibular (Peroneal) Artery Continuing as Dorsalis Pedis Artery Associated with Hypoplastic Anterior Tibial Artery and its Developmental Basis



Medical Science

KEYWORDS : Anatomical variation, peroneal artery, dorsalis pedis artery, anterior tibial artery

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ABSTRACT

Introduction: Palpation of peripheral arterial pulse is commonly used to evaluate the patients with arterial diseases. Dorsalis pedis artery is commonly used to evaluate arteriosclerotic diseases in the lower limb.

Aim: Aim of the present study is to observe the course of fibular (peroneal) artery continuing as dorsalis pedis artery associated with hypoplastic anterior tibial artery as it is a rare anatomical variation.

Material and Methods: Fifty (50) formalin embalmed lower limb specimens were dissected and studied to observe the anatomical variation of fibular (peroneal) artery continuing as dorsalis pedis artery associated with hypoplastic anterior tibial artery.

Results: In one specimen of lower limb the fibular (peroneal) artery was larger than usual and crossed the lower end of interosseous membrane and continued as dorsalis pedis artery. Posterior tibial artery had a normal course and divided distally into medial and lateral plantar arteries, however, the anterior tibial artery was found to be hypoplastic.

Conclusions: A good knowledge about the arterial variations around the ankle is important to the vascular and orthopaedic surgeons to prevent the occurrence of any complications during arterial reconstructive studies.

Introduction

Arterial diversity has been the concern of anatomists ever since the 19th century when Quain and Dubrueil published monographs on arterial variation [1]. Foot is the only part of the body to support the weight of entire body during locomotion. Dorsalis pedis, posterior tibial and peroneal arteries are the chief source of blood supply to the foot [2, 3]. Depending on the functional dominance, some vessels regress and others diverge in the mode of origin and course from principal vessels. The dorsalis pedis artery is noted for its variations [4]. As the variation in dorsalis pedis artery is not uncommon, a detailed knowledge of vascular anatomy is essential as it forms the stem for major myocutaneous flaps used for ankle surgeries in plastic and reconstructive surgeries [5, 6]. The aim of the present study was to observe any variations in the formation of dorsalis pedis artery.

Materials and Methods

In the present study, fifty (50) formalin embalmed lower limb specimens were dissected. The skin, superficial fascia and deep fascia from anterior, posterior and lateral compartments including the dorsum of the foot were excised and studied.

Results

During the routine dissection of normal adult cadavers, we found arterial variations in a formalin embalmed male cadaver aged about 60 years. The variations were found to be in the left lower limb and were unilateral. We observed in the posterior compartment of the leg, the peroneal artery appeared to be larger than the usual and crossed the lower end of interosseous membrane and continued as dorsalis pedis artery of the left lower limb (Fig.1,2). In the same cadaver the anterior tibial artery appeared to be not of the normal caliber and measured approximately of about 2mm in diameter. This diameter kept on decreasing as we traced it to the dorsum of the foot till it ended by anastomosis with the dorsalis pedis artery, suggesting the features of

hypoplasia throughout its course (Fig.3). It was observed that the anterior tibial artery to be arising normally as one of the two terminal branches of popliteal artery at the level of lower border of popliteus muscle. Posterior tibial artery also had the normal course and ended by dividing into medial and lateral plantar arteries distally.

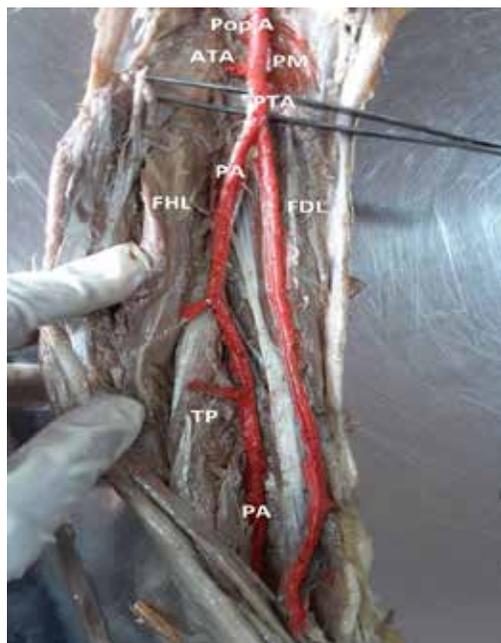


Fig.1: Origin and course of peroneal artery

Legend:

Pop A- Popliteal artery; **ATA-** Anterior tibial artery; **PM-** Popliteus muscle; **PTA-** Posterior tibial artery; **PA-** Peroneal artery; **FHL-** Flexor hallucis longus; **FDL-** Flexor digitorum longus; **TP-** Tibialis posterior

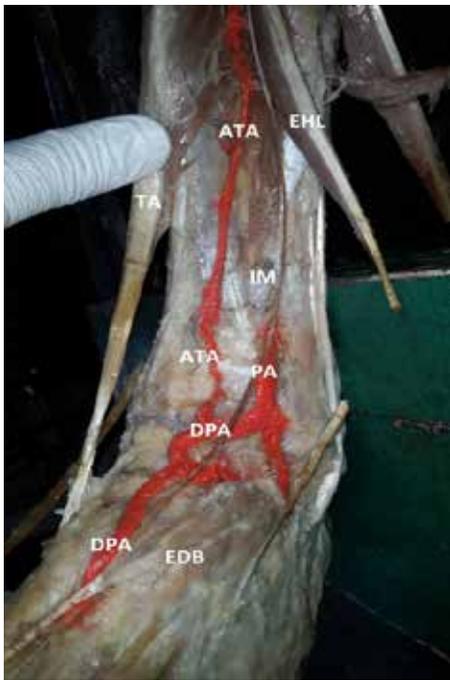


Fig.2: Peroneal artery continuing as dorsalis pedis artery after emerging from the lower end of interosseous membrane

Legend:

TA- Tibialis anterior; EHL- Extensor hallucis longus; ATA- Anterior tibial artery; IM- Interosseous membrane; PA- Peroneal artery; DPA- Dorsalis pedis artery; EDB- Extensor digitorum brevis.

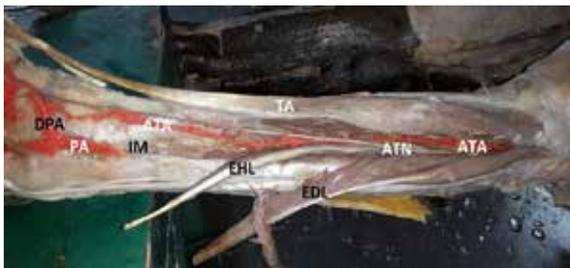


Fig.3: Course of anterior tibial artery and its termination into dorsalis pedis artery

Legend:

ATA- Anterior tibial artery; ATN- Anterior tibial nerve; TA- Tibialis anterior; EHL- Extensor hallucis longus; EDL- Extensor digitorum longus; IM- Interosseous membrane; PA- Peroneal artery; DPA- Dorsalis pedis artery.

Discussion

In human anatomy related to dorsum of foot, the dorsalis pedis artery is the chief source of blood supply to the foot. It is seen as a continuation of anterior tibial artery on the dorsum of the foot, where it dips into the sole, between the heads of origin of first dorsal interosseous muscle to complete the plantar arch [7]. Variations in the dorsalis pedis artery have been observed previously by many of the anatomists and surgeons [8-12]. In the present study, out of the 50 specimens dissected, we observed that in one specimen the peroneal artery appeared to be larger than usual and crossed the lower end of interosseous membrane and continued as dorsalis pedis artery of the left foot. Based on

the data available in the literature, in 8% of the case dorsalis pedis artery was found to be as continuation of peroneal (fibular) artery [13, 14]. In the same specimen we also observed that the anterior tibial artery was not of the same caliber throughout its course and the diameter kept on decreasing till it was reduced to a very thin artery and ended by joining into dorsalis pedis artery, suggesting hypoplastic changes. Similar anomalies were described by various other authors also [15-24].

Embryological basis:

The dorsalis pedis artery is a constant embryonic vessel that plays an important role in the normal arterial morphogenesis of the lower limb. The axis artery of the lower limb develops from 5th lumbar intersegmental artery. During 3rd-4th week of development numerous tiny blood vessels anastomose with each other to form a continuous network of fine vessels. The adult arterial pattern of the lower limb develops depending on the functional dominance. This explains the reason for the anomalies of blood vessels of limbs not only present as divergence in the origin and course but also as supernumerary vessels in the region. Hence, the anomalous course and variations of blood vessels can be attributed to their development [25, 26, 27]. Hence, the vascular variations mentioned above must be borne in mind as it will influence the success of vascular reconstructive surgeries.

Conclusion

A good knowledge about the arterial variations must be kept in mind during physical examination in relation to peripheral arterial disorders like thrombo-angitis obliterans in which pulsations are not palpable distal to the site of occlusion. Hence, a prior angiography will be helpful to avoid complications during surgical procedures.

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