

ORIGINAL RESEARCH ARTICLE

ANATOMICAL STUDY OF DORSALIS PEDIS ARTERY

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ABSTRACT

Background: The dorsalis pedis artery is the dorsal artery of the foot. The knowledge of any variation in the course and distribution of the artery is clinically important and it is used to record peripheral pulsation. The aim of this study was to study origin, course, relation and branches of the artery. The length and diameter of surgically important branch were recorded.

Methods: An observational cross-sectional study was conducted at dissection hall of anatomy department at Chitwan medical college. Thirty lower limbs from fifteen cadavers were dissected for the study. Photographs were taken at different site of dissection and on finding anomalies. Newborn specimens and Conical enlargements if present were excluded.

Results: The diameter of the artery ranged from 3.0 to 4.6mm and its length ranged between 5.6cm to 8.4cm. The length of deep plantar artery was between 5.6cm to 8.4cm. Double lateral tarsal artery was found in (24)80% of the studied specimen and (6)20% were with single lateral tarsal artery. In 90% of the specimen medial tarsal artery originated as proximal and distal branch from medial aspect of dorsalis pedis. The arcuate artery emerged directly from dorsalis pedis artery in (100%) all studied specimen. The 2nd, 3rd and 4th metatarsal artery were placed on their corresponding intermetatarsal space.

Conclusions: Awareness of anatomical variation of vasculature of foot is important for the vascular surgeons, angiographers and reconstruction surgeons. Dorsalis pedis artery is excellent for the revascularization since it is the largest artery below the ankle joint.

INTRODUCTION

The dorsalis pedis artery is the dorsal artery of the foot and is the continuation of the anterior tibial artery distal to the ankle. It passes to the proximal end of the first inter metatarsal space to complete the plantar arch, and provides the first plantar metatarsal artery. The dorsalis pedis artery gives off the tarsal, arcuate and first dorsal metatarsal arteries.¹

The dorsalis pedis artery is a constant embryonic vessel that plays an important role in the normal arterial morphogenesis of the lower limb. The tiny blood vessels derived from the blood islands in the 3rd and 4th week of development merge with each other forming a continuous network of fine vessels.²

The knowledge of any variation in the course and distribution of the dorsalis pedis artery is clinically important because the dorsalis pedis artery is used to record peripheral arterial pulsation. It is often examined, by physicians, when assessing whether a given patient has peripheral vascular disease. It is absent, unilaterally or bilaterally, in 2-3 % of young healthy individuals.³

With changing lifestyle, and increasing stress, mankind is more liable for diseases like diabetes, hypertension and peripheral vascular disease awareness of the anatomical variations in anatomy of the dorsalis pedis artery is important for angiographers, vascular surgeons and reconstructive surgeons who operate upon these regions.⁴

The study was designed to determine the origin, course, relation and branches of the dorsalis pedis artery as well as the length and diameter of the artery was measured.

METHODS

The observational cross-sectional study was conducted at Chitwan Medical College from November 2019 to December 2019. Ethical approval was obtained from CMC-IRC(CMC-IRC/076/077-049). A preformed proforma was used to collect the study variables. Thirty lower limb from fifteen cadavers were dissected for the study. A measuring scale was used to measure length and diameter of the artery. Newborn specimens and Conical enlargements if present at the point of origin and along the course of artery were excluded.

RESULT

In all studied specimen Dorsalis Pedis artery were present. It was a continuation of anterior tibial artery in front of ankle joint in all the studied specimen. The artery passed between the extensor hallucis longus medially and extensor hallucis brevis laterally. At the proximal end of the first inter metatarsal space the Dorsalis Pedis artery was divided into deep plantar artery and dorsal metatarsal artery.

The diameter of Dorsalis Pedis artery ranged from 3.0 to 4.6mm with an average of 4cm. In 28 (95%) the specimen the first dorsal metatarsal artery was seen originating directly from dorsalis pedis artery. Remaining 2 (5%) of the specimen the artery was absent. The diameter of deep plantar artery ranged from 1.7mm to 2.2mm. In 97% of the specimen the location of the artery was at 1-1.5cm lateral to medial edge of proximal head of first metatarsal bone on the middle of dorsum of foot. The length of the artery ranged from 5.6cm to 8.4cm. On remaining 3% the deep plantar artery was medial to first metatarsal.



Figure 1: Diameter of dorsalis pedis artery

The lateral tarsal artery was double in 80% of the studied specimen and in 20% the artery was found to be single. In 90% of the specimen medial tarsal artery originated as proximal and distal branch form medial aspect of dorsalis pedis. The first branch was 2 cm proximal to talus and the second was 3.6cm distal to the origination of the first branch at the level of Navicular bone. Remaining 10% had a single medial plantar artery which originated proximal to talus at ankle joint.

The arcuate artery emerged directly from dorsalis pedis artery in all studied specimen. The 2nd, 3rd and 4th metatarsal artery were placed on their corresponding intermetatarsal space.



Figure 2: Length of Dorsalis pedis artery



Figure 3: Divison of Dorsalis pedis artery

DISCUSSION

A study conducted on Fifty lower limbs at India showed dorsalis pedis artery was found to have a normal course and branching pattern in 56%, variation in origin in 8%, variation in branching pattern in 16%, absence of the artery in 2% and duplication in 2% of the specimens studied.⁵ This study documented 95% of the specimen had normal course and 80% had normal branching pattern. The finding of their study is against the finding of ours, this difference might be because of difference in sample size and because of different study population.

Study conducted in Karnataka India on 33 lower limb specimen documented diameter of dorsalis pedis artery to be 1.5mm to 5mm with mean diameter to be 3mm.⁶ Our study documented the diameter of the artery to be 3.0 to 4.6mm with an average of 4cm. The finding of their study is in accordance to ours. This similarity might be because of similar sample size.

A study conducted at brazil on 30 feet's documented dorsalis pedis artery present in 100% of specimen. 90% of specimen documented artery located between the tendons of extensor hallucis muscles and fingers. They also found medial tarsal arteries to be 56.6% and lateral tarsal arteries to be 60%. the frequency of arcuate artery was 26.7%.⁵ In all studied specimen Dorsalis Pedis artery were present. It was a continuation of anterior tibial artery in front of ankle joint in all the studied specimen. The artery passed between the extensor hallucis longus and extensor hallucis brevis laterally. The lateral tarsal artery was double in 80% of the studied specimen and in 20% the artery was found to be single.

In 90% of the specimen medial tarsal artery originated as proximal and distal branch form medial aspect of dorsalis pedis. The arcuate artery emerged directly from dorsalis pedis artery in (100%) all studied specimen. The finding of their study is similar to the finding of ours. This similarity might be because of similar study sample.

A study conducted on 30 cadaver limbs showed absence of the artery in 6.7% , the arcuate artery was absent in 33%. The dorsalis pedis artery arose from the peroneal artery in 6.7%.⁷ The finding of the study is against our finding our study demonstrated dorsalis pedis and arcuate artery were present in all

specimen and dorsalis pedis was a continuation of anterior tibial artery. This difference might be because of different study area and more study are recommended for further clarification.

CONCLUSION

Palpation of the dorsalis pedis artery is essential, particularly in suspected cases of arterial disorders. The artery is subjected to variations, ranging from abnormal course, origin, distribution to complete absence. This must be kept in mind during physical examination in cases of peripheral vascular diseases, thrombosis, embolism. Knowledge of this variation will be useful in deciding the cause. Prior confirmation by angiography

for any abnormalities will avoid unnecessary surgical risks. The artery is recognized to play an important role in micro vascular surgery.

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REFERENCES:

1. Bannister LH, Berry M, Collins P, Dyson M et al. Grays Anatomy: The anatomical basis of medicine and surgery. 38th edition 1115-18.
2. Kulkarni J, Paranjpe V, Vatsalaswamy. Anterior Tibial Artery Terminating as Tarsal arteries. Jour Dent Med Sci. 2012; 1(2):21-22.
3. Sharad Kumar et al. Bilateral variant double dorsalis pedis artery on the dorsum of the foot. Int J Res Rev Phar App sci. 2012; 2(6): 1114-19.
4. Tuncel M, Maral T, Çelik H, Taşçıoğlu B. A case of bilateral anomalous origin for dorsalis pedis arteries. Surgi Radio Anatomy. 1994; 16(3):19-23.
5. Vijayalakshmi S et al. Study of dorsalis pedis artery and its clinical relevance. Jour Clinical Diag Res. 2011; 5(2):287-90.
6. Kulkarni V, Ramesh BR. A Morphological Study of Dorsalis Pedis Artery and Its Clinical Correlation. Jour Phar Bio Sci. 2012; 2(3):14-19.
7. Yamada T, Gloviczki P, Bower TC, Naessens JM, Carmichael SW. Variations of the arterial anatomy of the foot. The ana rec. 1984 ;168(2): 130-35.