

Anatomic Variations of Arteria Dorsalis Pedis: A Cadaveric Study on 40 Dissected Lower Limbs with Clinical Correlations

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ABSTRACT

Introduction: Few structures of the human body are as unique as the foot. The foot needs to be mobile, stable and functional in order to position the body and bear body weight. Integration and coordination between the various structural elements of the foot are required for quiet standing or locomotion. The foot is subject to trauma, surgery, arteriosclerotic and endocrine diseases. Arteria dorsalis pedis is the principal source of blood supply to the foot. As many variations in course, relations and branching patterns of this vessel have been reported it has gained attraction among researchers.

Material and Methods: Forty lower limbs from twenty embalmed cadavers were studied in the Department of Anatomy and variations in the anatomy of arteria dorsalis pedis artery were reported.

Result: Normal anatomic description was found only in 26/40 (72.5%) specimens whereas variations were reported in 11/40 (27.5%) specimens.

Conclusion: Variations in anatomy and branching patterns of arteria dorsalis pedis are clinically significant and may lead to obfuscations during foot surgeries and imaging studies.

Keywords: Arteria Dorsalis Pedis, Foot, Imaging, Surgery, Variations

INTRODUCTION

The arteria dorsalis pedis is the chief irrigating vessel of the foot. Palpation of pedal pulse is used to evaluate patients with arterial diseases. This vessel provides the basis of anatomical rationale for surgically raising a flap of skin over the dorsum of the foot which can then be used to resurface other areas of the body.¹ Normally the anterior tibial artery continues as the arteria dorsalis pedis. The anterior tibial artery enters the foot under the inferior extensor retinaculum and runs distally towards the interspace between the first and second toes.²⁻³ The arterial feeders of the foot are derived from the arteria dorsalis pedis and its branches on the dorsal aspect.⁴ There are few reports of higher bifurcation of the anterior tibial artery to form the arteria dorsalis pedis.⁵ This artery divides into two branches in the first dorsal intermetatarsal space.⁶ The larger branch is the first dorsal metatarsal artery that disappears between the two heads of the first dorsal interosseous muscle into the sole of the foot. A smaller arcuate artery runs transversely across the dorsum and provides most of the dorsal metatarsal arteries usually two to four. These arteries communicate with the plantar metatarsal arteries and end as tiny dorsal digital arteries. Branching patterns of arteria dorsalis pedis as mentioned in classical textbook description is arcuate artery, medial and lateral tarsal arteries, and first dorsal metatarsal artery.⁷⁻⁸ This artery serves as an important vascular landmark on the dorsum of the foot and is prone to exhibit variations. The aim of this study was to observe variations in the course, relations and branching patterns of

arteria dorsalis pedis.

MATERIAL AND METHODS

This study was performed on forty formalin fixed lower limbs of unknown age and sex in the Department of Anatomy, MGM Medical College, Kishanganj, Bihar. The study was performed during routine dissection classes of 1st MBBS. The leg and dorsum of foot were dissected following Cunningham's dissection manual. Anatomy and branching patterns of arteria dorsalis pedis were observed in detail. The study was approved by the Institutional Ethics Committee.

RESULTS

Conventionally described arteria dorsalis pedis was found in 29 cases (72.5%). Variations observed in 11 feet (27.5%) were as follows:

1. Variation in origin of arteria dorsalis pedis: In 3 cases the anterior tibial artery did not continue as the arteria dorsalis pedis. The peroneal artery gave off a large perforating branch which continued as arteria dorsalis pedis.
2. Variation in course of arteria dorsalis pedis: In 3 cases the arteria dorsalis pedis deviated laterally from the midline in the proximal aspect but returned to the midline in the distal aspect. The branching patterns were conventional.
3. Absence of arcuate artery: In 2 cases the origin and course of arteria dorsalis pedis was normal but absence of arcuate artery was observed as variation in branching pattern.
4. Variation in third and fourth metatarsal arteries: In 2 cases the origin and course of arteria dorsalis pedis was normal but the third and fourth dorsal metatarsal arteries were observed to be arising from the second dorsal metatarsal artery.
5. Absence of arteria dorsalis pedis: In 1 case the entire artery was absent. The anterior tibial artery ended by giving off tarsal branches beyond which the anterior tibial artery was untraceable.

DISCUSSION

On dissection of 40 embalmed cadaveric feet, we observed that the arteria dorsalis pedis was completely absent in only one case. The anterior tibial artery ended by giving off the tarsal branches.

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In three cases, the perforating branch of the peroneal artery continued as the arteria dorsalis pedis. In three cases, variations were noted in the course of the artery but the branching pattern was normal. In two cases, the arcuate artery was absent and in two cases, variation in origin of third and fourth metatarsal arteries were noted. Variations in blood vessels can be related to their development as blood vessels after formation soon merge with each other and form new vessels which canalize to form new vessels. The arteria dorsalis pedis is noted for its variations.⁹ The arcuate artery was defined as that artery branching off from the arteria dorsalis pedis at or below the level tarsometatarsal joints, running laterally across bases of metatarsals second to fourth and supplying the dorsal metatarsal arteries 2-4. Arcuate artery is not always the principal source of blood supply to the dorsal metatarsal arteries 2-4.¹⁰⁻¹¹ The calibre of the dorsal metatarsal arteries in the third and fourth spaces is very small. The lateral one-third of the dorsum of the foot has poor blood flow and this area may be prone to non-healing ulcers of diabetic foot.¹² Grafts done in these areas may not be successful.¹³⁻¹⁴ Arterial patterns of the foot should be assessed prior to podiatric surgery by arteriography and angiography for better postsurgical outcome.

CONCLUSION

Variations in anatomy of arteria dorsalis pedis are incidentally found in routine dissections of the foot. This vessel plays an important role in foot surgeries as it is the chief irrigating artery of the foot. Knowledge of its anatomic variations shall be useful in deciding whether the artery is present, absent or thrombosed. Such variations are of significance to the triad of anatomists, angiographers and vascular surgeons during interpretation of imaging studies. Comparatively the medial aspect of the foot is better nourished by this artery and its branches.

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