

Dorsalis Pedis Artery and its Variations: A Cross-sectional Cadaveric Study

Chandan Sintakala^{1,*}, Prabina Manandhar¹

ABSTRACT:

Introduction: The dorsalis pedis artery is the continuation of the anterior tibial artery from the mid-point of the two malleoli and passes medially along the dorsum to the proximal end of the first intermetatarsal space. It then turns into the sole between the first dorsal interosseous muscle to complete the plantar arch. Tarsal, arcuate, and first dorsal metatarsal arteries are branches of the dorsalis pedis artery. The study aimed to determine variations in the origin, termination, branches, length, and diameter of the dorsalis pedis artery compared with normal anatomy. **Methods:** The cross-sectional study was conducted in the dissection hall of the Anatomy Department in Lumbini Medical College. Thirty-one lower limbs from cadavers were dissected to expose the dorsalis pedis artery, and the required data were documented for the study. Arteries were colored, and variation was recorded in a photograph. **Results:** In the 31 lower limbs, the study found the mean diameter of the dorsalis pedis artery at origin to be 4.13 ± 0.88 mm, at termination it was 3.47 ± 0.84 mm, and the mean length was 66.83 ± 12.45 mm. The variation was observed in the arcuate artery and its branches, as well as in the origin and number of dorsal metatarsal arteries and the lateral tarsal artery. **Conclusions:** The dorsalis pedis artery is a major artery of the foot, so normal and variations of the artery are very important for radiologists, orthopaedics, and vascular surgeons to prevent risk during surgical intervention.

Keywords: Arcuate artery; Dorsalis pedis artery; First dorsal metatarsal artery; Tarsal artery.

INTRODUCTION:

The dorsalis pedis artery (DPA) is an anatomically and surgically important artery of the foot, which continues from the anterior tibial artery at the talocrural joint distal to the inferior extensor retinaculum. Usually, it branches into the arcuate artery, which crosses the base of four metatarsals.¹ The other branches are the lateral tarsal artery, medial tarsal arteries, and 1st dorsal metatarsal arteries.¹⁻³ The

arcuate artery gives 2nd, 3rd and 4th dorsal metatarsal arteries. The artery courses downward and forward to the proximal end of the first intermetatarsal space, where it enters the sole to complete the plantar arch.³ Dorsalis pedis artery is the major artery of the foot.¹⁻⁵ It is also an important artery in the diagnosis of peripheral arterial diseases such as Buerger's disease (thromboangitis obliterans) in the lower limbs.^{2,3} The knowledge of DPA helps to avoid injury to the artery during the surgical procedure of the midfoot.⁴⁻⁶

The study aimed to determine variations in the origin, termination, length, width, and branching pattern of the dorsalis pedis artery, which can be helpful not only in surgical procedures but also in the diagnosis of vascular diseases of the foot and lower limb.

Submitted: 12 March 2026

Accepted: 16 May 2026

Published: 24 June 2026

1- Department of Anatomy, Lumbini Medical College and Teaching Hospital, Palpa, Nepal.

***Corresponding Author:**

Chandan Sintakala

e-mail: csintakala2020@gmail.com

ORCID: <https://orcid.org/0000-0002-7440-760X>

How to cite this article:

Sintakala C, Manandhar P. Dorsalis Pedis Artery and its Variations: A Cross-sectional Cadaveric Study. J Lumbini Med Coll. 2023;11(2):3 pages. DOI: 10.22502/jlmc.v11i2.559.



Licensed under CC BY 4.0 International License which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

METHODS:

The cross-sectional descriptive study was conducted in the Anatomy Department of the Lumbini Medical College and Teaching Hospital from April 1, 2022, to November 30, 2022. Ethical approval was obtained from the Institutional Review Committee, Lumbini Medical College (IRC-LMC-02/022). The study was conducted on 31 lower-limb specimens (18 from cadavers and 13 from disarticulated lower limbs), including 15 right and 16 left lower limbs.

For the study, the dissection was performed according to Cunningham's Manual of Practical Anatomy. Scalpel, blades, scissors, arterial forceps,

blunt, sharp forceps were used for dissection, a digital vernier caliper was used to measure the length and diameter of the dorsalis pedis artery, and a pen, plain paper were used to note the recorded measurements.⁷ The length of the artery was measured from the front of the ankle between two malleoli to the first inter-metatarsal space. Damaged foot, ruptured artery, and newborn were excluded from the present study.

RESULTS:

The present study was performed in 31 lower limbs (15 right and 16 left). The length of the dorsalis pedis artery (DPA) was found to be ranged from 40.35 mm to 88.66 mm (mean 66.83 ± 12.45 mm), the diameter of artery at origin (i.e. at the mid-point of two malleoli where anterior tibial artery continues as DPA) ranged from 2.91 mm to 6.90 mm with the mean of 4.13 mm and the diameter at termination (i.e. at the first dorsal metatarsal space) ranged from 1.37 mm to 5.91 mm (mean 3.47 ± 0.84 mm).

The variation of DPA was observed in six (22.6%) specimens and the remaining 25 (77.4%) specimens showed the normal branching pattern of the artery. Among the six specimens, three (9.7%) specimens showed the absence of arcuate artery and in one (3.2%) specimen, second and third dorsal metatarsal arteries directly arise from the arcuate artery making the total of four (12.9%) specimens showing the variation in arcuate artery whereas remaining two (6.5%) specimens showed the origin of lateral tarsal artery directly from the tibial artery.

DISCUSSION:

In the present study, the variation was observed in 22.6% of specimens, and the remaining 77.4% specimens were normal. The incidence of the absence of the arcuate artery was about 9.7% in the present study, and in about 3.2% of cases, the second and third dorsal metatarsal arteries originated from the arcuate artery. Most of the studies showed a variation in the DPA different from that in the present study. A study reported almost similar variation with the incidence of normal pattern in about 78.84% and abnormal pattern in 21.16%, and also reported the incidence of absence of arcuate artery in 11.53%.⁸ There were only 11 arteries normal out of 29 in the study conducted by Tonogai et. al.¹ and Hemalini et. al.² showed variation in 13 limbs out of 40, seven had no arcuate artery, second and third dorsal metatarsal arteries directly arose from DPA in one specimen, and there was variation in origin and course in five specimens.² In the study of Ntuli et al., there was a lack of DPA in 6.06% of specimens.⁴ Parikh et. al.⁵ showed variation in 11 out of 19 specimens. Kim JW et. al. studied the three types of DPA in which five variations were observed in the first dorsal metatarsal artery.⁹ A study showed that the arcuate artery was absent in 16.67% and DPA was absent in 9.52% spec-

imens,¹⁰ whereas another study reported the absence of arcuate artery in 3% of cases.¹¹ Mitra NK et. al.¹² reported the origin of the second dorsal metatarsal artery in 14.29% of cases, and B Vengadesan et. al.¹³ also reported a higher incidence of origin of the second dorsal metatarsal artery from the arcuate artery.

The recent study showed the diameter of DPA at origin ranged from 2.91 mm to 6.90 mm, and the diameter at termination ranged from 1.37 mm to 5.91 mm, with a mean diameter of 66.83 ± 12.45 mm and 4.13 ± 0.88 mm, respectively. Gautam A et. al.³ showed the diameter range from 3.0 mm to 6.4 mm and length range from 56 mm to 84 mm of DPA, which is different from the present study. Similar research was done by Kulkarni and Ramesh where the diameter of DPA ranged from 1.5 mm to five mm, with a mean diameter of three millimeters in 33 lower limbs was documented.¹⁴ These differences may be due to different specimens from different cadavers of different sexes, races, and regions, though the anatomical structures of all human beings are not the same.

In the present study, DPA was present in all specimens, and variation in DPA, including the arcuate artery and the lateral tarsal artery, was observed in 22.6%. A study by Vijayalaxmi et al. reported the variation at origin, in branching pattern, absence of DPA, and duplication in 8%, 16.1%, 2%, and 2%, respectively.¹⁵ Whereas another study showed variation of the lateral tarsal artery in 9.4% out of 32 feet, and variation was observed in two specimens where the lateral tarsal artery directly arises from the tibial artery.¹⁶

As mentioned in other studies, the present study did not find duplication of the DPA. No dorsal metatarsal arteries arose directly from the DPA, and the present study also found no evidence of DPA absence. The length of the DPA ranged from 40.35 mm to 88.66 mm, with a mean of 66.83 ± 12.45 mm in the present study, whereas Gautam A et. al.³ reported a range of 5.6 cm to 8.4 cm.

LIMITATIONS:

The limitations of the study are the limited sample size and one study setting. Thus, the findings cannot be generalized.

CONCLUSION:

DPA is the continuation of the anterior tibial artery from the mid-point of two malleoli and passes medially along the dorsum to the proximal end of the first intermetatarsal space. Then it enters into the sole to complete the plantar arch. It gives rise to tarsal, arcuate, and first dorsal metatarsal arteries. As DPA is the major source of blood supply in the dorsum of the foot, as well as contributing to forming the plantar arch, it plays a very important role in compensating for the nutrient supply of the foot. Since the DPA has variation along its course and it is an important artery for the diagnosis of the peripheral arterial diseases

like Buerger's disease (thromboangitis obliterans), the knowledge of DPA and its branching pattern is essential for radiologists, orthopaedics, and vascular surgeons to avoid injuries during surgical procedures.

Conflict of Interest: None

Source of Funding: None

REFERENCES

1. Tonogai I, Tsuruo Y, Sairyo K. Implications of dorsalis pedis artery anatomical variants for dorsal midfoot surgery. *Foot Ankle Int.* 2022;43(7):942-947. [PMID](#): [DOI](#):
2. Hemamalini, Manjunatha HN. Variation in the origin, course, and branching pattern of the dorsalis pedis artery with clinical significance. *Sci Rep.* 2021;11(1):1448. [PMID](#): [DOI](#):
3. Gautam A, Sintakala C. Anatomical study of dorsalis pedis artery. *Journal of Chitwan Medical College.* 2020;10(31):24-26. [DOI](#):
4. Ntuli S, Nalla S, Kiter A. Anatomical variation of the dorsalis pedis artery in a South African population: A cadaveric study. *Foot (Edinb).* 2018;35(0):16-27. [PMID](#): [DOI](#):
5. Parikh S, Dawe E, Lee C, Whitehead-Clarke T, Smith C, Bendall S. A cadaveric study showing the anatomical variations in the branches of the dorsalis pedis artery at the level of the ankle joint and its clinical implication in ankle arthroscopy. *Ann R Coll Surg Engl.* 2017;99(4):286-288. [PMID](#): [DOI](#):
6. Rimchala C, Chuckpaiwong B. Relationship of the dorsalis pedis artery to the tarsal navicular. *The Journal of Foot Ankle Surgery.* 2015;54(1):66-68. [DOI](#):
7. Romanes GJ. *Cunningham's Manual of Practical Anatomy.* 15th ed. Oxford: Oxford University Press;1986.187p. Available from: <https://www.amazon.com/Cunninghams-Manual-Practical-Anatomy-Fifteenth/dp/0199565333>
8. Chalise U, Pradhan A, Dhungel S. Variation in the branching pattern of the dorsalis pedis artery: a cadaveric study. *Nepal Medical College Journal.* 2025;27(1):29-33. [DOI](#):
9. Kim J, Choi YJ, Lee HJ, Yi KH, Kim HJ, Hu KS. Anatomic study of the dorsalis pedis artery, first metatarsal artery, and second metatarsal bone for mandibular reconstruction. *J Oral Maxillofac Surg.* 2015;73(8):1627-36. [DOI](#):
10. Rajeshwari MS, Roshankumar BN, Vijayakumar. An anatomical study of the dorsalis pedis artery. *International Journal of Anatomy and Research.* 2013;1(2):88-92. Available from: https://www.ijmhr.org/ijar_articles_vol1_02/220.pdf
11. Gupta C, Kumar R, Palimar V, Kalthur SG. Morphometric study of the dorsalis pedis artery and variation in its branching pattern: a cadaveric study. *International Medical Journal Malaysia.* 2018;17(1):19-22. [DOI](#):
12. Mitra NK, Habbal OA, El-Hag AH, Al-Hashmi NA. Bilateral absence of the arcuate artery on the dorsum of the foot. *Sultan Qaboos Univ Med J.* 2007;7(2):153-55. [PMID](#):
13. Vengadesan B, Balan VV, Hermes R. A cadaveric study on variation in branching pattern of dorsalis pedis artery and its clinical perspectives. *Indian Journal of Clinical Anatomy and Physiology.* 2020;7(3):313-15. Available from: <https://journals.ipinnovative.com/ijcap/archive/volume/7/issue/3/article/22771/pdf>
14. Kulkarni V, Ramesh BR. A morphological study of the dorsalis pedis artery and its clinical correlation. *Journal of Pharmacy and Biomedical Sciences.* 2012;2(3):14-19. [DOI](#):
15. Vijayalakshmi S, Raghunath G, Shenoy V. Anatomical study of dorsalis pedis artery and its clinical relevance. *Journal of Clinical and Diagnostic Research.* 2011;5(2):287-90. Available from: https://www.jcdr.net/articles/pdf/1251/1916_10_4_11nitr.pdf
16. Lee JH, Dauber W. Anatomic study of the dorsalis pedis—first dorsal metatarsal artery. *Ann Plast Surg.* 1997;38(1):50-5. [PMID](#): [DOI](#):