



VARIATIONS IN THE BRANCHING PATTERN OF DORSALIS PEDIS ARTERY - A CADAVERIC STUDY

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ABSTRACT

The Dorsalispedis artery is an anatomical structure that shows numerous variations in the origin, course and branching pattern as witnessed from several previous studies. Awareness of variations in the vasculature of dorsum of foot is of extreme importance in clinical assessment and surgical procedures of foot. The present study focused mainly on the branching pattern of the artery which showed a great deviation from the standard anatomical description given in textbooks. The study was carried out in 40 cadaveric feet of unknown age and sex for a period of 2 years in Sree Mookambika Institute of Medical Sciences, Kulasekharam. The branching pattern of dorsalispedis artery was studied, photographed and documented in detail in all specimens. Variations in the branching pattern were observed in 12 specimens. They were Categorized into eight types of branching patterns. Absence of Arcuate artery and subsequent variations in the origin of dorsal tarsal arteries were found to be the most common variation. Other variations like origin of dorsalispedis artery from perforating branch of peroneal artery, bifurcation and trifurcation of dorsalispedis artery, high origin of arcuate artery was also noted. The deviation from standard description of branching pattern was more evident in this study. Various types of variations were observed in the branching pattern of Dorsalis pedis artery in the current study. A thorough knowledge of potential variations of vascular anatomy of foot is very important for choosing the best procedures in microvascular and reconstructive surgeries on foot.

Keywords: Dorsalispedis Artery, Arcuate Artery, Vasculature.

INTRODUCTION

The arterial supply of dorsum of foot largely depends on dorsalis pedis artery and its branches. Awareness of variations of arteries on foot is important for angiographers, vascular and reconstructive surgeons. Dorsalis pedis artery is ideal for revascularization, since it is the largest artery distal to ankle joint. Fascio-cutaneous flaps with dorsalis pedis artery have been shown to be very reliable for covering defects on the foot.

Dorsalis pedis artery is the continuation of anterior tibial artery which crosses the ankle joint, and it passes forwards along the medial aspect of dorsum to the gap between the heads of first dorsal interosseous muscle. Here it divides into first dorsal metatarsal artery and deep plantar branch which enters the sole and completes the plantar arch by joining with lateral plantar artery. Below ankle joint, dorsalis pedis artery gives off medial tarsal artery and lateral tarsal artery and at the level of metatarsophalangeal joints. It gives off the arcuate artery which in turn gives off 2nd to 4th dorsal metatarsal arteries.

Arterial variations are common in lower limb due to rich anastomosis around ankle joint and dorsum of foot. High variability in origin, course and branching pattern was observed in many previous studies. These variations have significant clinical and surgical implications. Correct knowledge of anatomy of dorsalis pedis artery, and awareness of variations is helpful for angiographers, vascular



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surgeons and plastic surgeons. The risk of pseudoaneurysm found during ankle arthroscopy can be reduced by knowing the occurrence of variations.

Myocutaneous arterialized dorsalis pedis artery flap can be used as osteocutaneous island flap for reconstructing oral mucosal defects, retromandibular defects and as free flaps for palm defects. The reliability of flap elevation depends on vascular anatomy and the variations of dorsalis pedis artery. Variations should be considered during preoperative Doppler evaluation and other non-invasive vascular study.

When dealing with non-healing wounds or amputation in connection with lifestyle diseases and peripheral vascular diseases, surgical complications can be avoided to certain extent by knowing the common variations that can occur on the dorsum of foot. The simple way of palpating pulsations of dorsalis pedis artery may lose its role to assess and evaluate peripheral vascular diseases like Thrombo Angitis Obliterans or Buerger's disease, once variations occur or there is absence of DPA.

Continuing studies on vascular anatomy and their variations on the dorsum of foot is essential and helpful to achieve better results in clinical and surgical treatments. The cadaveric study is an accurate and effective method to get a thorough understanding of potential variations of vascular anatomy.

MATERIALS AND METHODS

Forty formalin preserved lower limbs of unknown sex and age were collected from the Department of Anatomy, Sree Mookambika Institute of Medical Sciences, Kulasekharam. The dissection was carried out from the level of ankle joint on the dorsum of foot till the space between the toes. The tendons of extensor muscles and extensor digitorum brevis were severed. The Dorsalis pedis artery and its branches were traced carefully on the dorsum of foot from ankle joint distally. The branches were painted

for a clear picture and photographs were taken. During dissection, occurrence of any variations in the branching pattern was looked for. In few cases, the plantar arch was also dissected and traced to study the origin of dorsal metatarsal arteries from perforating branches of plantar arch. All the data's were documented.

RESULTS

In this anatomical study through dissection, multiple unusual branching patterns of Dorsalis pedis artery were observed. The branching pattern was found to be normal in 70 % of specimens, following the standard pattern. 8 types of variant patterns were identified in 12 specimens. The variants that were found in the remaining of the specimens (percentage) were classified to 8 types.

• Variant Type 1

Lateral deviation and bifurcation of DPA

This type was observed in 2 specimens. In both cases, anterior tibial artery continued as Dorsalis pedis artery. But in one case, the artery followed a different course, with a 'S' shaped curve from lateral to medial, distal to ankle joint from the level of cuboid to base of 2nd metatarsal. Then it ran forwards to the proximal end of second metatarsal space, where it bifurcated into medial and lateral branches. The medial branch dipped into first intermetatarsal space after giving off 1st dorsal metatarsal artery.

The lateral branch was bigger in size and appeared to be the continuation of dorsalis pedis artery.

This branch also dipped into 2nd inter metatarsal space after giving off 2nd dorsal metatarsal artery. Distal to ankle joint, medial and lateral tarsal arteries take origin from the dorsalis pedis artery (Fig:1).

In second specimen, origin and course of dorsalis pedis artery was normal and the bifurcation and the branching pattern were seen to be similar. In both cases, 3rd and 4th dorsal metatarsal arteries were continuation of perforating branches of plantar arch. Arcuate artery was absent in these specimens.



Fig:1 Shows Lateral deviation & bifurcation of dorsalis pedis artery

• **Variant Type-2**

Trifurcation of Lateral tarsal artery

This type was observed in one specimen. Dorsalis pedis artery showed normal origin, course and continued the dorsum of foot keeping the relations normally up to the proximal end of first intermetatarsal space. In its course, it gave off 3 lateral tarsal arteries. They were named as proximal, intermediate and distal based on their positions (Fig:2). The proximal one is larger giving branches to lateral part of dorsum and lateral malleolar network. Intermediate one was smaller running

obliquely to base of little toe, giving branches to lateral part of dorsum and communicating branches to 3rd and 4th dorsal metatarsal arteries. Distal branch also gave branches to dorsum of foot and 2nd dorsal metatarsal artery. Medial tarsal arteries were present as minute branches to medial side of dorsum. Arcuate artery was not present. 1st dorsal metatarsal artery originated from terminal end of dorsalis pedis artery before it ends as deep plantar artery. The 3rd and 4th dorsal metatarsal arteries were found to be continuations of perforating branches of plantar arch.

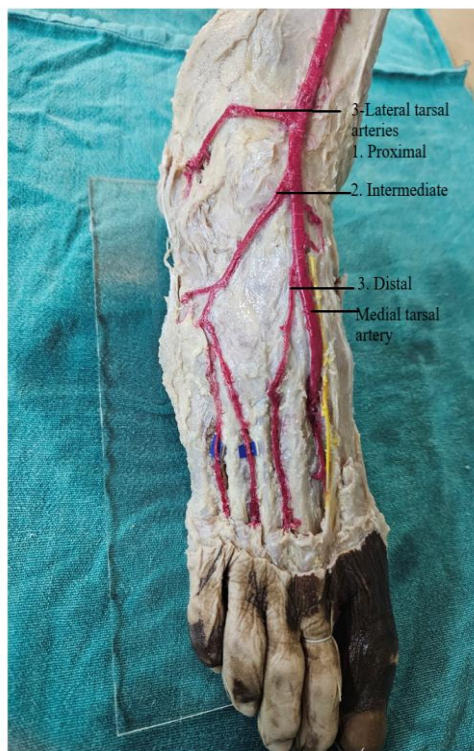


Fig: 2 Trifurcation of lateral tarsal artery

• **Variant Type 3**

Absence of Dorsalispedis artery.

Dorsalispedis artery was found to be absent (Fig:3). Anterior tibial artery terminated as lateral tarsal artery. In its course, it gave off minute branches from medial side towards medial surface of dorsum of foot. A lateral malleolar artery was noted arising

from anterior tibial artery 5cm above ankle joint and descended to lateral part of dorsum of foot. The lateral tarsal branch sent communicating branches to 3rd and 4th dorsal metatarsal arteries. First to 4th dorsal metatarsal arteries were found to be continuations of perforating branches of plantar arch. Arcuate artery was absent.

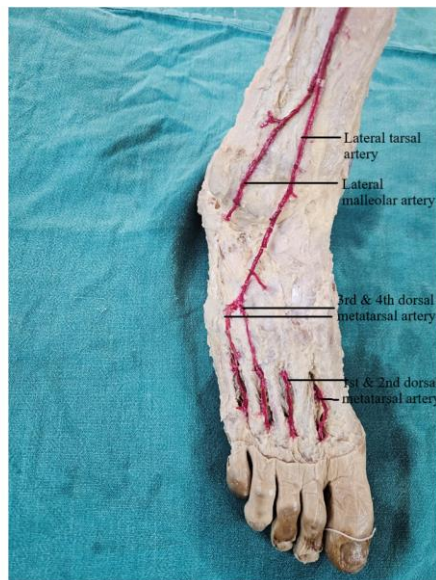


Fig:3 Absence of dorsalispedis artery

• **Variant Type 4**

Abnormal origin of Dorsalispedis artery

The perforating branch of peroneal artery pierced interosseous membrane and appeared in the anterior compartment about 5cms above the ankle joint, it anastomosed with the anterior tibial artery, and continued on the dorsum of foot as dorsalis pedis artery. It was found that the branching pattern of

DPA followed the normal pattern, giving off 2 lateral tarsal arteries, 1 medial tarsal artery, arcuate artery at the proximal end of intermetatarsal space. Terminal end of DPA, after giving off 1st dorsal metatarsal artery gave off deep plantar artery. 2nd to 4th dorsal metatarsal arteries were branches from arcuate artery. Same variations of abnormal origin of dorsalis pedis artery were noted in another case also.

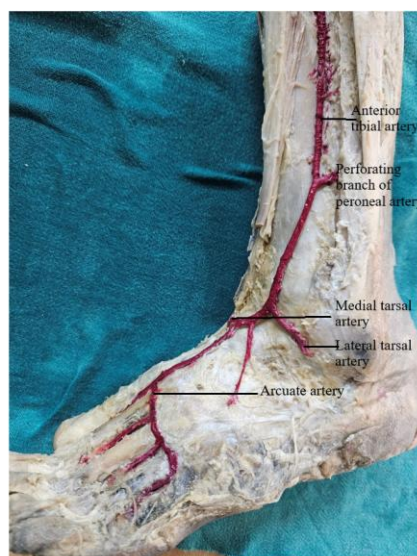


Fig 4: Shows peroneal perforating branch continues as dorsalis pedis artery

- **Variant Type -5**

Absence of arcuate artery and medial tarsal artery

Origin and course of DPA was found to be normal. Two lateral tarsal arteries took origin at the normal site. Medial tarsal artery was absent. 1st dorsal

metatarsal artery and deep plantar artery followed normal origin. Arcuate artery was absent. So 2nd to 4th dorsal metatarsal arteries were found as continuation of perforating branches of plantar arch. Absence of arcuate artery and subsequent variant origin of dorsal metatarsal arteries was seen in 3 other cases also.



Fig: 5 Shows the absence of arcuate artery and medial tarsal artery

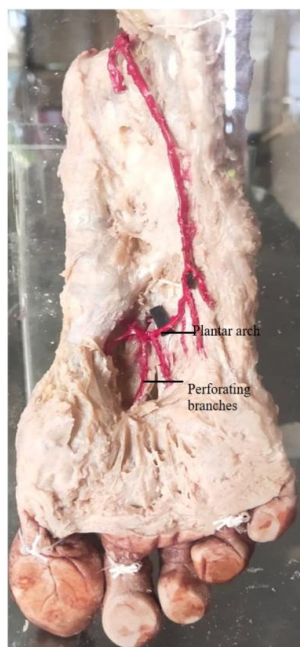


Fig 6: Plantar aspect of foot showing perforating branches arising from plantar arch

- **Variant Type -6**

Medial deviation of dorsalispedis artery with different origin of dorsal metatarsal arteries

Dorsalis pedis artery was observed to be normal in origin but showed more medial deviation of its course distally on the dorsum of foot. One medial

tarsal and 3 lateral tarsal arteries took origin from dorsalis pedis artery. At the proximal end of 1st inter-metatarsal space, dorsalis pedis artery ended as 1st dorsal metatarsal artery after giving off deep plantar artery. Also given off a communicating branch to second dorsal metatarsal artery. As arcuate artery

was absent, 2nd to 4th dorsal metatarsal arteries were found as continuations of perforating branches of plantar arch.

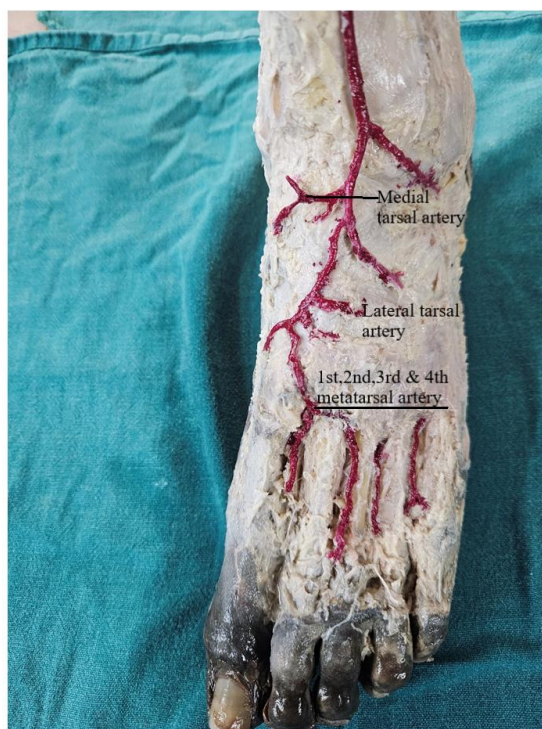


Fig 7: shows medial deviation of dorsalis pedis artery with different origin of dorsal metatarsal arteries

- **VARIANT TYPE -7**

- High origin of Arcuate artery**

The origin and course of dorsalis pedis artery was observed to be normal. Medial and lateral tarsal arteries were seen branching in front of ankle joint.

The arcuate artery took origin at a higher 2 cms proximal to metatarsophalangeal joint. It took a course parallel to dorsalis pedis artery for a short distance and then arched laterally giving off 2nd to 4th dorsal metatarsal arteries.

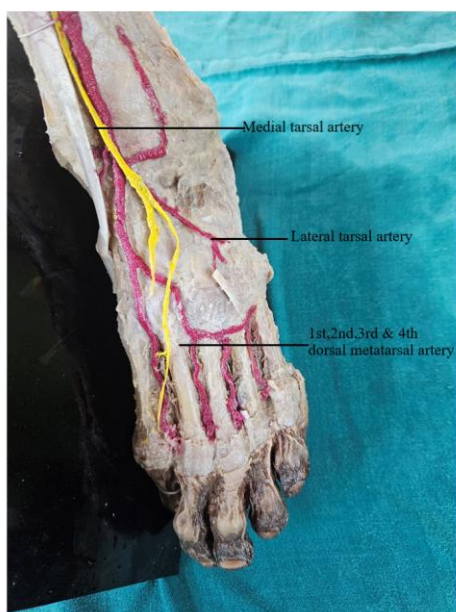


Fig 8: Shows high origin of arcuate artery

- **Variant Type- 8**

Trifurcation of dorsalis pedis artery and absence of medial tarsal artery

With normal origin and course, dorsalis pedis artery gave off lateral tarsal arteries as 3 small branches. Then it trifurcated into 3 branches, named as medial, intermediate and lateral. Medial one coursed distally and gave off 1st dorsal metatarsal and continued as

deep plantar branch. Intermediate was the largest branch passed to second intermetatarsal space and gave off 2nd dorsal metatarsal artery and dipped into the sole. Lateral branch gave communicating branches to 3^d and 4th dorsal metatarsal arteries which were continuations of perforating branches of peroneal artery. Arcuate artery was absent.

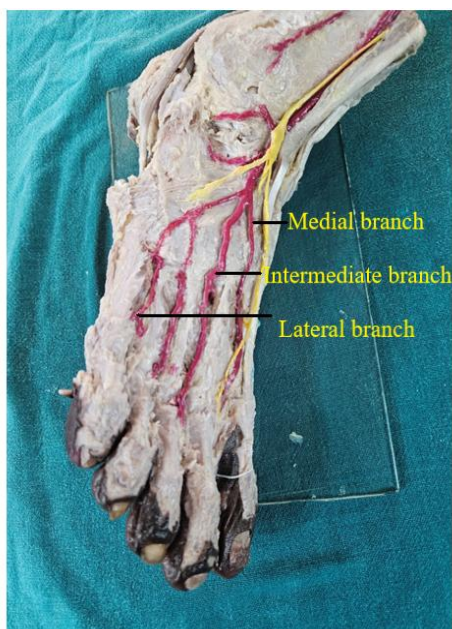


Fig 8: Trifurcation of dorsalis pedis artery and absence of medial tarsal artery

Variant types	Number
1.Bifurcation of DPA	2
2.Trifurcation of lateral tarsal artery	1
3.Absence of DPA	1
4.Abnormal origin of DPA	1
5.Absence of arcuate artery & medial tarsal artery	4
6. Medial deviation of DPA & different origin of dorsal metatarsal arteries	1
7.High origin of arcuate artery	1
8.Trifurcaton of DPA	1

Table 1: shows the dorsalispedis artery variant types

DISCUSSION

The dorsum of foot is mainly supplied by dorsalispedis artery. The branching pattern of dorsalispedis artery shows many variations which have clinical and surgical significance. These variations in the arterial pattern of leg and foot can be explained embryologically. Tiny blood vessels arise from blood islands which merge with each other and form networks and new vessels budding off from them. Regression and persistence of the arteries and their connections with the existing arteries result in variations in the arteries of leg and foot ⁽¹⁾

Dorsalispedis artery is the continuation of anterior tibial artery across the ankle joint. Along its course, it gives off medial and lateral tarsal artery and arcuate artery. It terminates at proximal end of first

intermetatarsal space after giving off first dorsal metatarsal artery and deep plantar artery which joins with lateral plantar artery to form plantar arch. ⁽²⁾

The present study on the variations of the branching pattern of dorsalispedis artery was conducted in 40 dissected feet. The normal branching pattern was observed in 28 specimens. 8 types of variations were noted in 12 specimens. Rajeswary et al ⁽³⁾ found the classic vascular pattern in 54.7%. But Kulkarni and Ramesh ⁽⁴⁾ in their studies showed that the standard pattern was an uncommon finding in their study with only 15 to 20 %. Lateral deviation and bifurcation of dorsalispedis artery 2 to 3 cms distal to the origin was reported by Bailleurol et al ⁽⁵⁾. Kesavi et al ⁽⁶⁾ in his study observed lateral deviation of dorsalispedis artery and bifurcation at a higher level. In the present study, two specimens (variant type -1)

showed bifurcation at its terminal end into medial and lateral branches. But in one specimen, the artery showed lateral deviation with a sharp curve from lateral to medial with bifurcation at its terminal end. Kesavi et al emphasized the correlation between oblique course of dorsalispedis artery and impairment in healing of fractures of bones of leg. Once the lateral deviation occurs, it may become vulnerable to injury during arthroscopy. The normal pulsations cannot be felt lateral to the tendon of Extensor hallucis brevis if there is an abnormal course.

In the present study, trifurcation was observed in one case (variant type 8) 2.5 % with medial, intermediate and lateral branches. Trifurcation was rarely reported in earlier studies. Hemamalini et al ⁽⁷⁾ reported trifurcation with three branches running parallel, where lateral branch gives off arcuate artery and medial gives off first dorsal metatarsal artery and middle one continues as dorsalispedis artery. Vijayalekshmy et al ⁽⁸⁾ reported the absence of dorsalispedis artery in 2% of cases. Absence was noted in the present study in one specimen, in variant type 3. In this specimen, anterior tibial artery continued as lateral tarsal artery.

In the present study, lateral and medial tarsal arteries, were present in all cases but varied in number and size. Arun P. Chapte et al ⁽⁹⁾ in his study noted the absence of lateral tarsal artery.

Lateral tarsal artery presented as 3 branches in 3 specimens (7.5%) as two branches in 5%. In one specimen, the artery coursed on the dorsum of foot as the continuation of anterior tibial artery (variant No.3). This variation was not yet reported in previous studies. Trifurcation of lateral tarsal artery was found in one specimen. S Ntvli et al ⁽¹⁰⁾ demonstrated variations in the number of lateral tarsal artery in 12.1%. The variations of lateral tarsal arteries are important to look for because LT flap has good contour, elasticity and durability so useful for treating traumatic forefoot skin and soft tissue defects. For operations around distal foot construction especially of wounds over the toes has always been a challenging problem in plastic surgery once variations occur. In 48 %, the medial tarsal artery was found as a single branch. In 5%, (in variant No.2), medial tarsal artery was represented as minute branches. Absence of medial tarsal artery was noted in two variant types. In the current study. The arterial supply of medial part of dorsum was found to be comparatively less

Arcuate artery is the main branch of dorsalispedis artery, originating at or distal to the level of tarso-metatarsal joints running laterally across the bases of metatarsals. Usually, it gives off 2nd to 4th dorsal metatarsal arteries. In the present study, absence of arcuate artery was noted as the most common variation. Out of 12 variants, absence of arcuate artery was noted in 9 cases ie; 22.5%. In all these

cases, dorsal metatarsal arteries showed variable origin. Vijayalekshmy et al observed the absence in 6 % out of 50 in her study. High percentage of the absence indicates that arcuate artery is not the primary supply to 2nd to 4th digits. This observation is supported by the same report seen in the study of Dilandro et al ⁽¹¹⁾.

Yamada et al ⁽¹²⁾ reported absence of arcuate artery in 33% of dissected specimens which supports the observation in the current study. High origin of arcuate artery was reported by Jeswander et al ⁽¹³⁾. The same variation was noted in one specimen (figure no.8) in which the origin was 2 cms proximal to the level of tarso-metatarsal joint.

Very few authors have mentioned about the incidence of variant origin of dorsal metatarsal arteries. Carla Gabrelli et al ⁽¹⁴⁾ observed in his study on 50 cadaveric feet, the origin of 1st dorsal metatarsal artery from dorsalispedis artery in 86%, from plantar network in 10 %, origin of 2nd dorsal metatarsal artery from perforating branch of plantar arch in 90%, 3^d in 92% and 4th in 86%.

Only in 2.5%, variation was noted in the origin of 1st dorsal metatarsal arteries in the present study, in all other cases it followed standard anatomic description in origin and course. The different origins were from perforating branch of plantar arch (variant no.3), from medial most branch of bifurcated and trifurcated branches of dorsalispedis artery (variant no. 1 & 8). Kulkarni & Ramesh viewed absence of 1st dorsal metatarsal artery in 33.3%

In 12 variant types observed, 2nd dorsal metatarsal arteries also showed multiple origin like, from lateral branch of bifurcated dorsalispedis artery 5% and Intermediate branch of trifurcated dorsalispedis artery 2.5%, from lateral tarsal artery 2.5%, perforating branch of plantar arch 10.5% from arcuate artery, 5%. The origin of 2nd dorsal metatarsal arteries from dorsalispedis artery has not been reported yet in previous studies. The 3rd & 4th dorsal metatarsal arteries were found as continuation of perforating branches of plantar arch in 25%. Preeti Shivasankar et al ⁽¹⁵⁾ reported variant origin of 3^d and 4th metatarsal arteries from deep plantar arch in 16% and 24% respectively. Also, origin from lateral tarsal artery was noted in her study.

The knowledge of anatomy and anatomical variants in the origin of dorsal metatarsal arteries is very helpful for endovascular surgeons while they deal with revascularization in diabetic foot to avoid amputation First dorsal metatarsal is commonly used as an arterial pedicle in toe to hand transplants.

CONCLUSION

The foot is very essential for man's daily activities and the integrity of its structure depends on its irrigation. Revascularization is very important therapy for restoring blood supply of wounds, and to

avoid amputation in a diabetic foot. A detailed anatomical knowledge about the region of interest is highly essential for any advancement method of surgical treatment. This created interest among anatomists to seek minute anatomical details and look for occurrence of variations

In the present study, although dorsalispedis artery was present in 97.5%, it followed the standard anatomical description only in 70%. The variations in the branching pattern of the artery in 30 % specimens was further classified into variant types 1 to 8. The main variations observed were mostly correlated with previous works. But the incidence of absence of arcuate artery and variant origin of 2nd to 4th dorsal metatarsal arteries from perforating branches of plantar arch was high in the current study. Other variations noted were bifurcation and trifurcation of dorsalispedis artery, lateral deviation of dorsalispedis artery, continuation of perforating branch of peroneal artery as dorsalispedis artery, anterior tibial continuing as lateral tarsal were also noted in accordance with previous studies. The variation in the origin of 2nd dorsal metatarsal artery from sDorsalis pedis artery was thought to be distinct from those previously described in literature.

The present study also emphasizes the great variability that can occur in the branching pattern of dorsalispedis artery. The knowledge of such variations becomes helpful for microvascular and reconstructive surgeons.

REFERENCES

1. Henry Gray Development of arteries of Lower Limb. Gray's text book of Anatomy. The Anatomical basis of Medicine and Surgery. Churchill Livingstone, London, 1995, 38th edition, pp320
2. Keith.L. Moore 1992 in Clinically Oriented anatomy, 3^d edition, Lippincott Williams and Wilkins; 462-47
3. M.S. Rajeswari, B.N. Roshankumar, Vijayakumar An anatomical study on Dorsalispedis Artery
M.S. Rajeswari, B.N. Roshankumar, Vijayakumar. International Journal of Anatomy and Research 2013; Vol 1(2); 88-92
4. Kulkarni V. Ramesh BR, A morphological study of dorsalispedis artery and its clinical correlation JOSR-JPBS 2012; 2(3):14-19
5. Bailleul JP, Olive PR, Mestdagh H, Viliette B (1984). Descriptive anatomy of the dorsalispedis artery of the foot. Bull association of anatomy 68:15-25
6. Kesavi D Keertisingh, Melani Rajendran (2002); Anomalous cause of dorsalispedis artery, Anatomical Adjuncts; 29-31
7. Hemamalini, H.N. Manjunatha Variations in the origin, course, and branching pattern of dorsalispedis artery with clinical significance. Scientific reports Jan 14; 11(5):1448-1038/5
8. Vijayalekshmy S, Reghunath G, Shenoy V. Anatomical study of dorsalispedis artery and its clinical correlations JCDR 2011; 5(2); 287-290
9. Arun P. Chepte, Ambiya M.V. Study of branching pattern of dorsalispedis artery and its clinical significance. Anat. Physiol. 2018; 3-8
10. S. Ntuli, S. Nalla A.K. The Foot 35 (2018) June 35, 16-17
11. Dilandro AC, Lilja E.C, Lepore FL, (2001); The prevalence of arcuate artery-a cadaveric study of 72 feet Journal of American Podiatric Medical Association 91(6); 300-305
12. Yamada T, Glorlezki P, Bower T C, Naessens J.M, Camchal S.W. Variations of the arterial anatomy of the foot. American Journal of Surgery 1993 August 166(2):130-135
13. Jeswinder Kaur, Ushachhabra, Subash Kaushal V, V.G. Patnaik. High origin of Arcuate Artery. A case Report. Indian Journal of Surgery 2013, June 75(supplim) 23-24
14. Gabrielli C, Olave E, Origin of the dorsal metatarsal arteries in human. Scand J. Plastic Reconstruction. Surgery. Hand Surgery 2002; 36(4):221-225
15. Preeti Sivashankar Awari, P. Vatsalaswam Anatomical variation in Dorsal Metatarsal arteries with surgical significance-A cadaveric study Indian J of vascular and endovascular Surgery 2017; 4:178-9

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