ORIGINAL RESEARCH

Anatomical variation of the Dorsalis pedis artery and Its Clinical Correlations- A Cadaveric Study

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Received: 15 April, 2023 Acceptance: 20 June, 2023

ABSTRACT

Background: The primary source of blood supply to the dorsum of the foot is the dorsalis pedis artery. An easily accessible artery for determining pedal pulsations is the dorsalis pedis artery. The present study was conducted to assess variation of branching pattern of dorsalis pedis artery.

Materials & Methods: The present cadaveric study was conducted on 80 lower limbs of both genders. Dorsalis pedis artery was identified and traced down, the origin, branching pattern and the course were noted.

Results: Out of 80 limbs, 45 were of males and 35 were of females. Type A was seen in 52, B in 8, C in 5, D in 4, E in 3, F in 2, G in 2, H in 1, I in 1 and J in 2 cases. The difference was significant ($P< 0.05$).

Conclusion: Authors found that there are different branching patterns in the dorsalis pedis artery. Type A was the most prevalent type found.

Key words: Dorsalis pedis artery, Foot, talocrural joint

Introduction

The primary source of blood supply to the dorsum of the foot is the dorsalis pedis artery. An easily accessible artery for determining pedal pulsations is the dorsalis pedis artery.[1] The dorsalis pedis artery can be felt against the navicular bone, which is the preferable location, but it can also be felt from the middle of the malleoli to the proximal end of the first intermetatarsal gap.[2] The primary vascular supply of the forefoot is provided by the dorsalis pedis artery, also referred to as the dorsal artery of the foot. At the talocrural joint, just distal to the inferior extensor retinaculum, it continues the anterior tibial artery. The first dorsal metatarsal artery and the deep metatarsal artery emerge from the area between the first and second metatarsals.[3] Dorsalis pedis pulse changes or is absent typically indicate vascular insufficiency. The dorsalis pedis pulse may, however, be congenitally absent in some healthy people. The anterior ti bial artery's termination pattern varies in certain situations.[4] Humanity is more susceptible to conditions like diabetes and hypertension as a result of changing lifestyles and rising stress. Diabetes-related neuropathy increases the risk of catastrophic amputations by causing foot infections and ischemia. DPA bypass is crucial in the efforts to save the ischemic limb.6 The recipient vessel that is most frequently used is the dorsalis pedis artery (DPA) and its significant branches. It is safe to employ the myocutaneous dorsalis pedis arterialized flap as a free flap, an island flap, or to cover the ankle or heel.[5] The present study was conducted to assess variation of branching pattern of dorsalis pedis artery.

Material & Methods

The present cadaveric study was conducted in the department of Anatomy. It consisted of 80 lower limbs of both genders. Ethical approval for the study was obtained before starting the study. Limbs were dissected lower down from the level of the ankle joint on the dorsal aspect till the level of the web space, the long Extensor tendons were severed, dorsalis pedis artery was identified and traced down, the origin, branching pattern and the course were noted. Results thus obtained were subjected to statistical analysis. P value less than at 0.05 wa considered significant.

Results

It is advisable to have preoperative angiography for any abnormality, to prevent risks during surgical intervention. Rajeshwari et al[12] evaluated the arterial supply on the dorsum of the foot. The study was carried out on 42 dissected limbs of unknown sex and age from the department of Anatomy. The incidence of classical text book description was found to be very less. In 16.67% of cases, the arcuate artery was completely absent, which was compensated by two large lateral tarsal arteries that provided the dorsal metatarsal arteries. In 9.52% of cases the dorsalis pedis artery was absent. The findings suggest that the lateral aspect of the dorsum of the foot has a poor nourishment.

Table: I Gender wise distribution

Total- 80		
Gender	**Male**	**Female**
Number	45	35

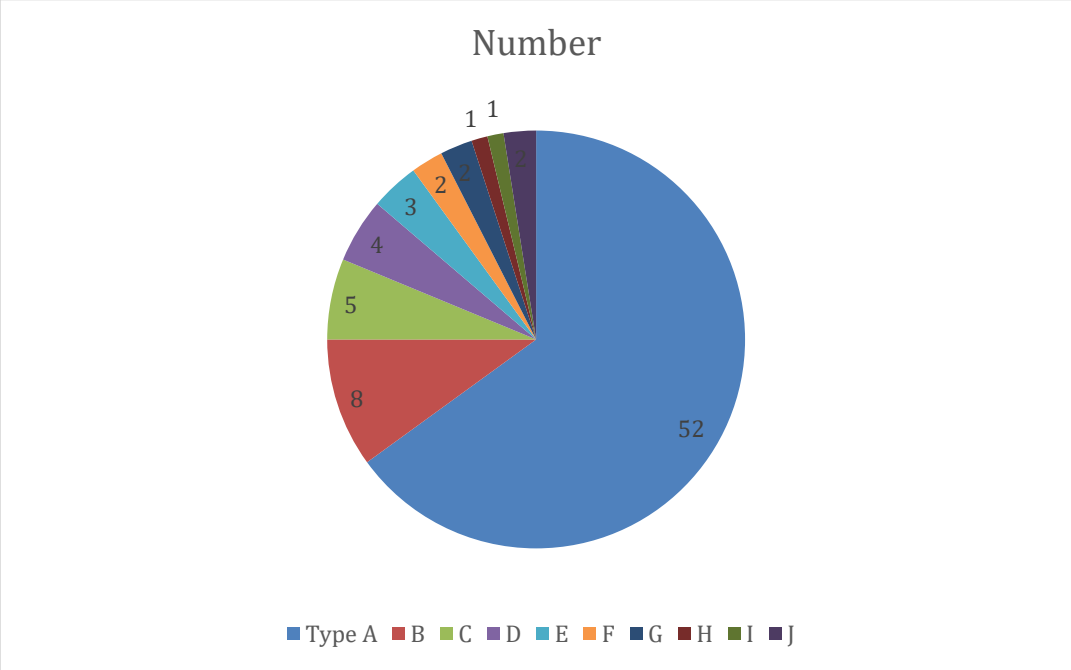
Table: I shows that out of 80 limbs, 45 were of males and 35 were of females.

Table: II Assessment of branching pattern of dorsalis pedis artery

Branching	Number	P value
Type A	52	0.01
B	8	
C	5	
D	4	
E	3	
F	2	
G	2	
H	1	
I	1	
J	2	

Table: II, graph I shows that type A was seen in 52, B in 8, C in 5, D in 4, E in 3, F in 2, G in 2, H in 1, I in 1 and J in 2 cases. The difference was significant (P< 0.05).

Graph: I Assessment of branching pattern of dorsalis pedis artery



Discussion

The development of these blood vessels can be linked to variations in the blood vessels and their abnormal course. In the third or fourth week of development, tiny blood vessels from the blood islands combine to form a continuous network from which buds branch out, canalize, and generate new vessels.[6] The new vessels in the surrounding areas connect in a closed network. Some vessels regress, while others diverge in their method of origin and trajectory from the main vessel, depending on the functional dominance.[7] The variations in the dorsalis pedis artery are well known.

Different pattern of dorsalis pedis artery is as follows- Type A: Normal branching pattern of dorsalis pedis artery. Type B: 2nd DMA directly arose from DPA and 3rd and 4th DMAs were given by LTA. Type C: 2nd DMA directly arose from plantar arch and 3rd and 4th DMAs were given by LTA. AA was absent. Type D: 2nd DMA directly arose from DPA and 3rd and 4th DMAs were given by plantar arch. AA was absent.[8] Type E: Arcuate artery arising higher at Cuneonavicular joint rather than its normal position at tarsometatarsal joint. Type F: DPA took a lateral course and terminated into the 2nd and 3rd DMAs. FDMA and 4th DMA arose from plantar arch. AA was absent. Type G: AA was absent and 2nd, 3rd and 4th DMA were given by plantar arch. Type H: AA were absent; 2nd, 3rd and 4th DMA were given by plantar arch. Type I: AA were absent; 2nd, 3rd and 4th DMA were given by plantar arch. Type J: DPA was hypoplastic, it terminated just below ankle into two terminal branches; MTA and LTA. AA was absent and all DMA's were given by plantar arch.[9] The present study was conducted to assess variation of branching pattern of dorsalis pedis artery. We found that out of 80 limbs, 45 were of males and 35 were of females. Mamatha et al[10] found that in one specimen the dorsalispedis artery was found to have a short straight course and divided into medial and lateral branches. The medial branch continued as the first dorsal metatarsal artery and joined the plantar arch. The lateral branch coursed obliquely towards the head of the other metatarsal bones and gave off the second, third and fourth metatarsal arteries which coursed in the inter-metatarsal spaces. We observed that type A was seen in 52, B in 8, C in 5, D in 4, E in 3, F in 2, G in 2, H in 1, I in 1 and J in 2 cases. Vijayalakshmi et al[11] found that 50 free lower limbs were dissected and the origin, course and branching pattern of dorsalis pedis artery were studied. 50 free lower limbs were collected from the anatomy dissection hall. The dorsalis pedis artery was dissected and its origin, course and branching pattern were studied. 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. As variation in dorsalis pedis artery is not uncommon, it is essential to have a sound knowledge about the artery. It is advisable to have preoperative angiography for any abnormality, to prevent risks during surgical intervention. Rajeshwari et al[12] evaluated the arterial supply on the dorsum of the foot. The study was carried out on 42 dissected limbs of unknown sex and age from the department of Anatomy. The incidence of classical text book description was found to be very less. In 16.67% of cases, the arcuate artery was completely absent, which was compensated by two large lateral tarsal arteries that provided the dorsal metatarsal arteries. In 9.52% of cases the dorsalis pedis artery was absent. The findings suggest that the lateral aspect of the dorsum of the foot has apoor nourishment.

Conclusion

Authors found that there are different branching patterns in the dorsalis pedis artery. Type A was the most prevalent type found.

References

1. Chepte AP, Ambiye MV. Study of Branching Pattern of Dorsalis Pedis Artery and its Clinical Significance. Anat Physiol 2018;8: 301.
2. Kaur J, Chhabra U, Kaushal S, Patnaik VV. High origin of arcuate artery- A Case report. Indian J Surg 2013; 75: 23-24.
3. Ntuli S, Nalla S, Kiter A. Anatomical variations of the dorsalis pedis artery in a South African population- A cadaveric study. Foot (Edinb) 2018;35: 16-27.
4. Luckrajh JS, Lazarus L, Naidoo N, Rennie C, Satyapal KS. Anatomy of the dorsalis pedis artery. Int J Morphol 2018; 36: 730-736.
5. Gu YD, Zhang GM, Cheng DS, Yan JG, Chen XM. Free toe transfer for thumb and finger reconstruction in 300 cases. Plast Reconstr Surg 1993;91: 693-702.
6. Yamada T, Gloviczk P, Bower TC, Naesseus JM, Carmichand SW. Variations of the arterial anatomy of foot. Am J Surg 1993; 166: 130-135.
7. 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: 153-155.
8. Awari PS, Vatsalaswamy P. Anatomical variations in dorsal metatarsal arteries with surgical sLJnLficDnce- A cadaveric study. Indian J Vasc Endovasc Surg 2017;4: 176-179.
9. El-Saeed EM, El-monisif AA, El-Sayed MA, Aly NM, Gezlan NA. Anatomical study of dorsalis pedis artery and its surgical importance in Reconstr surg. Alexandria J Med 2008; 44: 557-571.
10. Mama tha Y, Sunitha R, Om Prakash KV. Variation in branching pattern of dorsalis pedis artery. Int. J. Sci. Res. 2014;5(9).
11. Vijayalakshmi S, Raghunath G, Shenoy V. Anatomical study of dorsalis pedis artery and its clinical correlations. J Clin Diagn Res. 2011 Apr;5(2):287-90.
12. Rajes hwari MS, Roshan kumar BN, Vijaya kumar. An anatomical study on Dorsalis pedis artery. In t J Anat Res 2013;1: 88-92.