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Dorsalispedis Artery and its Anatomical Variations in A Cadaveric Study

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Abstract

Introduction: In the lower limb, Dorsalispedis artery is the main artery for blood supply to the food and nowe have come to know that there exists many anatomical variations in the dorsalispedis. Still, there is limited anatomical evidence available regarding the branches of the dorsalispedis artery, which occur at the point at which they cross the ankle joint.

Objectives: The objective of the study was to study the anatomical variations in the dorsalispedis artery of foot

Materials and Methods: We conducted our study in the department of anatomy in a tertiary medical college and dissected a total of 25 cadaveric feet to explore the course of the dorsalispedis artery while paying attention to the branching pattern at the joint line.

Results: After careful dissection, we found that Fourteen of the twenty five feet had a branch of the dorsalispedis artery that crossed the level of the ankle joint. Out of these, nine were lateral, four medial and one bilateral. Eleven of the fourteen specimens had one branch at, or just before, the level of the joint. Two specimens had two branches and one had three branches crossing the ankle, which were all in the same direction.

Conclusions: We came to the conclusion that there is a high rate of branching of the dorsalispedis artery at the level of the ankle joint.

Keywords: Dorsalispedis artery, Anatomical variations.

Introduction

In the lower limb, the dorsalispedis artery carries oxygenated blood to the dorsal surface of the foot. It's located 1/3 from medial malleolus. It arises at the anterior aspect of the ankle joint and is a continuation of anterior tibial artery. It ends at the proximal part of the first intermetatarsal space, where it bifurcates into two branches, the first dorsal metatarsal artery and the deep plantar artery. The dorsalispedis communicates with the plantar blood supply of the foot through the deep plantar artery. Through it's course, it is accompanied by a deep vein, the dorsalispedis vein.

The pulse of thedorsalispedis artery can be palpated readily lateral to the extensor halluces longustendon (or medially to the extensor digitorumlongustendon) on the dorsal surface of the foot, distal to the dorsal most prominence of the navicular bonewhich serves as a reliable landmark for palpation.[1] It is often checked bythe surgeons, when assessing whether a given patient has peripheral vascular disease. It is absent, unilaterally or bilaterally, in 2–3% of young healthy individuals.[2]

The dorsalispedis artery has been known to have a variable origin in the foot, course and branching pattern.[3,4] as also an abnormal branching pattern in 16% of 50 dissected cadaveric specimens.[3]

This abnormal branching may cause a complication called as a pseudoaneurysm which may occur in arthroscopic procedures. Fortunately, the incidence of pseudoaneurysm during ankle arthroscopy is only around 0.008%.[5] One study reported a single vascular complication from 1,305 procedures.[6] This studyaimed to identify the anatomical variation of the dorsalispedis artery at the level of the ankle joint by describing the frequency and direction of branches crossing the ankle joint.

Materials and Methods

This was an observational study carried out in the dissection hall in the department of anatomy in a new tertiary teaching hospital in central india. All dissection was carried out on formalin-preserved cadavers within an approved facility and according to guidance laid out in the Human Tissue Authority Code of Practice.[7]

We had placed marker probes at the level of the ankle joint medially and laterally before commencing dissection. We then carefully dissected the Cadaveric feet to expose the course of the dorsalispedis artery and its branches. The branching pattern of the artery at the joint line was recorded. We then photographed each ankle to show the joint line and the dorsalispedis artery. We also recorded the presence of branches from the main arterial trunk at the level of the joint and its direction and number of branches.

Results

In our observational study we studied a total of 25 cadaveric feet anddorsalispedis artery was identified in all of the specimens. The main finding of this study was the huge variation in the location of the dorsalispedis artery branches crossing the ankle joint. Of the cadavers studied, 56% (14 of 25) showed a branch that crossed the ankle joint in addition to the main arterial trunk. Of these 14 cases, 9 had a branch that was lateral, 4 had a medial branch and one case had bilateral branches (Tables 1-3).

Table 1: Showing the distribution of the branches of the dorsalispedis artery at the level of the anke joint

Branch of dorsalispedis artery	Total	Percentage (*N* = 25)
Crossing ankle joint	14	56
Not crossing the ankle joint	11	44

Table 2: Showing direction of the dorsalispedis artery that had crossed the ankle joint

Direction of the dorsalispedis artery after crossing	Number	Percentage (*N* = 14)
Lateral	9	64.3
Medial	4	28.6
Bilateral	1	7.1

Table 3: Showing number of the dorsalispedis artery that had crossed the ankle joint

Number of the dorsalispedis artery that had crossed the ankle joint	Number	Percentage (*N* = 14)
One	11	78.6
Two	2	14.2
Three	1	7.1

Discussion

In the lower limb, Dosalispedis artery is the main blood supply of foot and its anatomic variations especially in itsbranching may result in possible complications like pseudoaneurysms which may occur during orthopedic procedures. If we carefully study the applied anatomy of the dorsalispedis artery we see that in orthopedic procedures like arthroscopy, about half of all aneurysms that occur around the foot and ankle do so at the dorsalispedis artery.[5] in contrast to other studies, abnormal

branching patterns of the dorsalispedis artery at the level of the ankle joint occurred in the majority of patients in our study.

In one of the cadaveric study[8] it was demonstrated that the antero-central portal is comparatively low risk for damaging the superficial peronealnerve. However, in this study where 20 ankles were studied, 90% of instruments in the anterocentral portal touched the dorsalispedis artery and in one case there was a laceration of the deep peroneal nerve.[8] while another cadaveric study of 92 feet specimens classified the neurovascular bundle at the dorsum of the foot into four types.[3] Thus it was necessary to emphasize the importance of being aware of the anatomical variation of the trunk of the dorsalispedis artery in relation to the deep peroneal nerve for portal placement.[3]

In our study as we have demonstrated such variability in branches crossing the ankle joint, we cannot recommend a specific portal over the conventional anterolateral portal in preventing vascular damage.[8]

Also, Studies by Vijayalakshmi et al. found that the dorsalispedis artery ran a 'normal course' (definition set out by the paper itself) in only 56% of cases, with five other major variations in course.[4] Typically, it was found as a continuation of the anterior tibial artery but has been noted to arise from the peroneal artery. Only 16% showed more branches crossing the ankle joint.[3] The findings of our study are in contrast with this, as we have demonstrated abnormal branching in the majority of specimens we examined.

Our study advocatesthat the operating surgeon be aware of this anatomical variations in the dorsalispedis artery so as to avoid the possible complicatons

Conclusion

We have concluded that there are high rates of branching of the dorsalispedis artery at the level of the ankle joint and this has not been specifically investigated or described in previous literature.

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