

## **Anatomy of the Perforating Branch of the Peroneal Artery**

by Mathew Wedel, January 2013

The perforating branch of the peroneal artery (PBPA) branches from the peroneal artery in the deep posterior compartment of the leg, passes anteriorly between the tibia and fibula through a hiatus in the interosseus membrane, usually about 5 cm proximal to the lateral malleolus, and joins the network of arteries that supply the dorsal and lateral foot. The arterial network of the dorsal foot is complex and highly variable, and the relationships of the PBPA are likewise complex and variable. The most thorough survey and anatomical description of dorsal foot arteries is that of Huber (1941), which forms the basis of most textbook accounts (e.g., Kelikian and Sarrafian 2011). In Huber's "general pattern", the PBPA is commonly (50% of specimens) joined by one or more anastomotic branches of the anterior tibial artery, and joins with another lateral branch of the anterior tibial artery at about the level of the tibial plafond to give rise to the lateral malleolar artery.

Beveridge et al. (1988) described the following branches of the PBPA, which are variably present: a cutaneous branch to the lower leg, which is often reciprocal in size with the cutaneous branch of the lateral malleolar artery; anterior and posterior lateral malleolar branches; a small medial branch to the artery of the tarsal sinus; and terminal branches which may anastomose with the posterior peroneal artery, lateral plantar arch, and lateral tarsal artery. Mulfinger and Trueta (1970) reported that the PBPA contributed to the plexus in the tarsal sinus in most cases, but usually not as a significant source of blood, except for four cases (out of 30; 13%) in which the artery of the tarsal sinus was a direct branch of the PBPA. Huber (1941) reported a single case (out of 200; 0.5%) in which the lateral tarsal artery formed as a continuation of the PBPA.

In rare cases the PBPA may be completely absent, in which case it is replaced by the lateral branch of the anterior tibial artery that more typically anastomoses with it (Edwards 1960). Mulfinger and Trueta (1970) found that the PBPA was absent in three out of 30 specimens (10%), but no other authors have reported such a high incidence of absence so this may be a peculiarity of the donor population or an artifact of small sample size. Huber (1941) did not report any absences of the PBPA in the 200 feet examined in his study, but he was unusually meticulous, writing (p. 389), "in almost every individual foot it was possible to find a vessel, though sometimes very fine, representing each part of the pattern of the arterial network". In a survey of 20 specimens, Beveridge et al. (1988: page 198) found that "the PBPA was never completely absent but it sometimes arborized to form a descending plexus".

The PBPA is particularly clinically important when the dorsalis pedis artery is derived from it, instead of the more common situation in which the dorsalis pedis artery forms as a continuation of the anterior tibial artery. Senior (1919: page 141) referred to "numerous unillustrated instances...scattered throughout the literature" and wrote that "the anomaly is of common occurrence". Huber (1941) found six such cases (3%), although the anomaly was only present bilaterally in a single individual. Keen (1961) reported 14 cases out of 280 (5%), but again only a single bilateral instance. Interestingly, there appears to be some variation among populations in the frequency of this variant. Huber (1941: pages 377-379) wrote, "Adachi (28) states that in his studies (and those of Liu) eighty-eight out of 1239 (7.1%) showed the dorsalis pedis artery to be a continuation of the perforating peroneal, and he contrasts this finding of 7.1% in Japanese with

3.3% in Europeans as reported by several authors." In a study conducted in Minnesota, Yamada et al. (1993) found this variant in 6.7% of specimens, but as their sample size was 30 this only amounts to two cases, so the high incidence could be an effect of sampling.

The PBPA is occasionally subject to traumatic aneurysm; case reports include Maguire et al. (1972) and Pai (1999). According to Maguire et al. (1972: page 411), "because of the secure attachment of the artery as it passes through the interosseous membrane and because of its close proximity to the head of the talus, the perforating peroneal artery is susceptible to marked stress with plantar flexion and inversion of the foot. Such stress of the artery may produce intimal disruption or frank arterial rupture with the subsequent development of a false aneurysm." Pai (1999) reported a traumatic aneurysm of PBPA that might have been caused by surgical drilling for screw placement following an ankle fracture. It is the possibility of damage to the PBPA in such procedures that led us to undertake the current study, following the work of Fanter et al. (2010).

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