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CASE REPORT

An anomalous septocutaneous perforator to the skin paddle of the fibula osteocutaneous flap originating from the posterior tibial artery

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Summary The fibula osteocutaneous flap with a distally-sited skin paddle is the preferred design for oromandibular reconstruction because the skin has a reliable blood supply. It is supplied by the peroneal septocutaneous perforator which travels within the posterior crural septum. We report a case of variant anatomy where the septocutaneous perforator originated not from the peroneal artery but from the posterior tibial artery. The clinical implications and techniques for overcoming this anomalous situation are discussed.

The fibula osteocutaneous flap with the skin paddle centred over the distal leg at the junction of the middle and distal-thirds of the fibula, as described by Wei, has become an established, standard design for oro-mandibular reconstruction.[1] This is because the skin paddle is reliably supplied by the peroneal septocutaneous vessels passing within the posterior crural septum.[2] The skin and bone components may be transferred as a single composite flap.

While it has been widely held that the septocutaneous perforator has its origin from the peroneal artery, in rare instances it arises from another major lower limb vessel.[3] Here, we report a case in which the distal leg septocutaneous perforator originated from the posterior tibial artery.

Case report

A 30-year-old man fell from height and sustained a comminuted fracture of the mandible. The wound was debrided and a segmental loss of 7 cm of the right body of the mandible was noted. Reconstruction with a fibula osteocutaneous flap, with the skin paddle intended as a monitor for the flap, was planned. Guided by the preoperative handheld Doppler, the skin paddle was marked (Fig. 1).

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Figure 1 Skin markings of a fibula osteocutaneous flap with a distally-sited skin paddle. The location of the cutaneous perforators are located by hand-held Doppler, marked 'X', and skin paddle sited to incorporate these perforators.

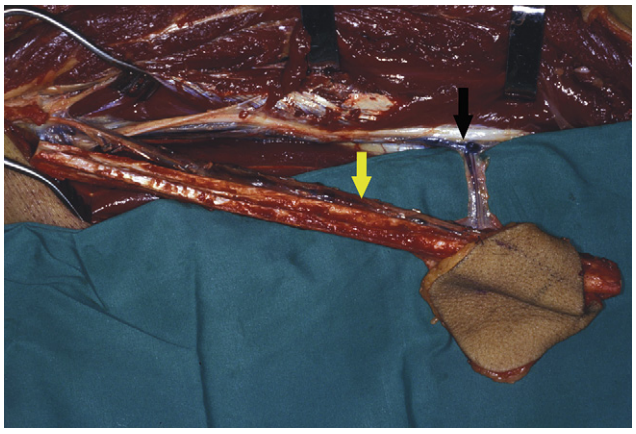

Figure 3 Upon completion of the proximal and distal osteotomies and lifting the fibula off its muscle bed, it was noted that the septal perforator had no vascular connections to the peroneal artery and that it originated from the posterior tibial artery. Yellow arrow: peroneal artery, Black arrow: Posterior tibial artery.

Intraoperatively, a large septocutaneous perforator within the posterior crural septum was identified. This perforator originated from the posterior tibial artery and seemed to be connected with the peroneal artery (Figs. 2 and 3). The skin was islanded and proximal and distal osteotomies were performed.

After delivering the fibula from its bed and before the tourniquet was released, we were faced with the question of whether or not it was safe to divide the perforator's origin at the posterior tibial artery (Fig. 3). An absence of bleeding from the skin paddle after applying a micro-clamp across its origin at the posterior tibial artery demonstrated that the skin received no supply from the peroneal. As the oral lacerations could be repaired primarily, the skin paddle was returned to the lower limb and the reconstruction achieved with bone only.

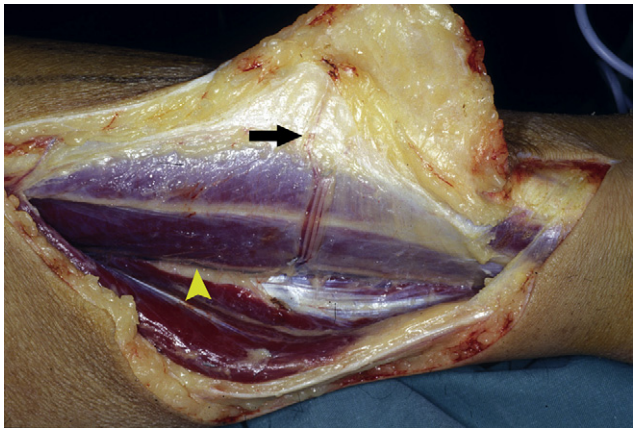

Figure 2 A large septocutaneous perforator within the posterior crural septum was noted intraoperatively (black arrow). No other septal perforators were seen in the vicinity. This perforator arose from the posterior tibial artery (yellow arrow head).

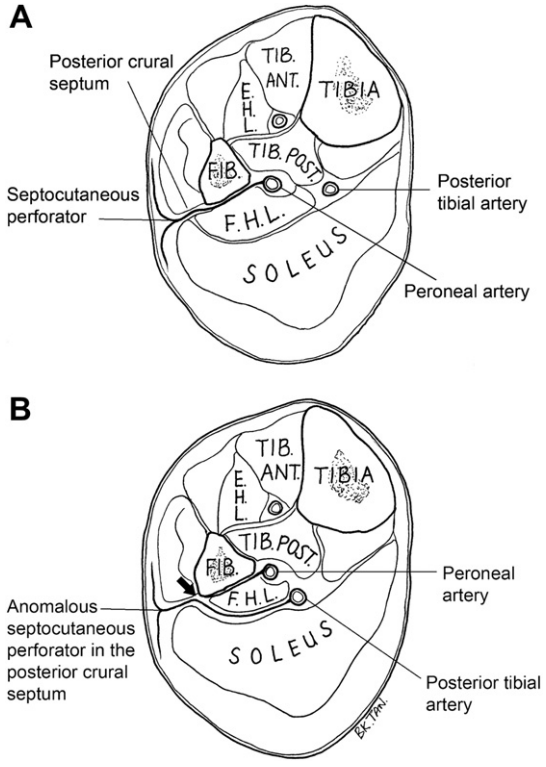

Figure 4 (A) Cross section of the distal leg showing a septocutaneous perforator originating from the peroneal artery running in the posterior crural septum. This is the usual pattern. (B) Cross section of the distal leg illustrating the anomalous perforator seen in our case. The perforator originated from a posterior tibial artery that was located more medial than usual and travelled in the posterior crural septum. Although it was intimately related to the fibula and in close proximity to the peroneal artery, it received no contribution from the latter (arrow).

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Discussion

The origin of the septocutaneous perforator of the fibula flap may in very rare instances — as is illustrated in this case — be derived from another vessel apart from the peroneal artery. Being aware of this anatomical variation is important if the flap is to be harvested safely with minimal donor site morbidity. Our initial steps of harvesting the fibula flap follow standard practice which includes confirming the presence of a septocutaneous perforator. In retrospect we could have explored the perforator and confirmed the absence of contribution from the peroneal system before islanding the skin and making the osteotomies. This confirmation would have enabled us to decide whether to continue with the harvest or to switch donor sites.

In the design of the fibula osteocutaneous flap, a distally-sited skin paddle is generally favoured over a proximally-sited one. This is because the perforators supplying the proximally-sited skin paddle do not consistently originate from the peroneal artery and may arise from the posterior tibial artery or tibial-peroneal trunk. Furthermore, they are commonly musculocutaneous perforators, making dissection more laborious. On the other hand, with a distally-sited skin paddle design, the skin flap has a consistent supply of one or two septocutaneous perforators arising from the peroneal artery.[1] This design is thus favoured as it allows the fibula osteocutaneous flap to be raised reliably as a composite flap based solely on the peroneal vessels. Our case represents a rare anatomical anomaly where the septocutaneous perforator originated from the posterior tibial artery. There were no peroneal septocutaneous perforators in the vicinity (Fig. 4A, B). Occasionally, in the distal leg, perforators originating from the posterior tibial artery are seen, but they are distinct from the peroneal perforators and do not travel in the posterior crural septum.

To the best of our knowledge, this is the first reported case in the literature whereby a septocutaneous perforator in the distal leg running in the posterior crural septum originated from the posterior tibial artery. The clinical implications of such an anomaly are that the bone and skin flaps would have to be revascularised separately and the skin paddle cannot serve as a monitor for the bone. In our case, the oral cavity could be closed primarily and the skin paddle was returned. In situations where the skin component is essential, a second free flap (such as a free radial forearm flap) would have to be raised unless suitably-sized recipient vessels could be found to perform a 'perforator-to-perforator' type transfer.[4] We do not recommend sacrifice of a second major lower limb vessel to revascularise the skin component.

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