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CASE REPORT

Importance of Computed Tomography Angiography for Planning Free Tissue Reconstruction in the Presence of Aberrant Vessel Anatomy

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Computer tomography angiography (CTA) is a crucial pre-operative investigation for planning complex lower limb reconstructions. It allows visualization of the vessel anatomy in order to detect any vascular injuries or anomalies, avoiding surprises during the procedure itself. This report presents the case of a patient admitted with an acute open ankle fracture. Her CTA showed an aberrant artery, which then was used by the surgical team as a recipient for the free soft tissue transfer required to reconstruct the area. The authors believe that CTA should be routinely undertaken for every patient with a complex lower limb injury.

Keywords: microsurgery; lower limb; free flap; Computer tomography angiography; case report

Computer tomography angiography (CTA) is a crucial pre-operative investigation to delineate the arterial supply and identify possible vascular injuries following complex lower limb trauma [1]. It has also been shown to be particularly useful for distinguishing anatomical variants and in demonstrating any significant pathology [2, 3]. The former is less common than the latter but both are of equal importance when planning safe free-tissue transfer. Unusual anatomical patterns in the axial vessels of the lower limbs although uncommon is not rare. With this in mind a pre-operative, reliable assessment is compulsory. Distal lower limb defects are challenging as free flaps are almost mandatory [4]. This, coupled with any abnormal vessel aberrations requires extreme care in planning both flap dissection and revascularization. We illustrate how to safely undertake this procedure by way of a clinical case as per the SCARE guidelines [4]. To our knowledge is the first report of a free flap anastomosed to a vascular anomaly for this clinical scenario.

A 68-year-old Caucasian lady without mild cardiac failure and chronic kidney disease (stage 2), presented to our Major Trauma Centre after sustaining a right ankle open fracture. Her case was managed in our combined orthoplastics service as per the British Orthopedic Association and British Association of Plastic and Reconstructive Surgery Standards [6].

Preoperative CTA investigations revealed a unilateral anatomical variant of the posterior tibial artery (PTA) of the affected limb (**Figures 1** and **2**). While the PTA was present only in the proximal third, an aberrant branch, originating from the peroneal artery, continued its course distally from the level of the medial malleolus. Between these two arteries only the concomitant veins and tibial nerve were present (**Figure 3**).

The distal vessel was explored during the first stage (debridement, washout and temporary fixation) by the post-certification senior microsurgical fellow, as we favor staging such difficult cases. Due to its adequate caliber, we decided to perform an end to side anastomosis to this aberrant branch of the peroneal artery during the second

Figure 1: CTA 3D reconstruction: absent PTA, ↘ aberrant vessel from the peroneal artery going behind the medial malleolus.

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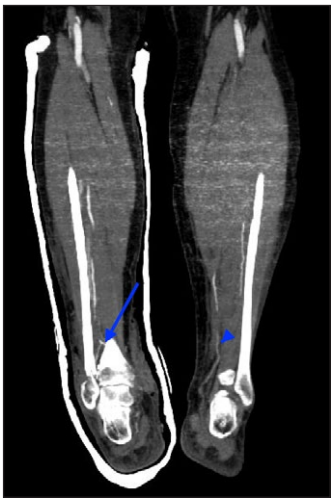

Figure 2: CTA sagittal view: ↘ aberrant vessel from the peroneal artery; ▸ normal PTA (contralateral leg).

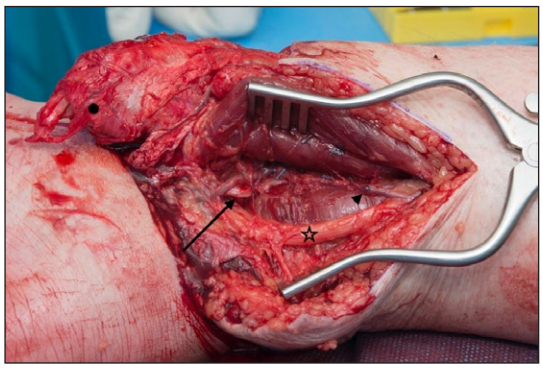

Figure 3: Intraoperative view: ↘ aberrant vessel; ▸ posterior tibial veins; ☆ tibial nerve; • medial malleolus, open fracture/dislocation.

stage using a medial sural artery perforator (MSAP) flap obtained from the contralateral side. This operation was performed by the same microsurgical fellow supervised by a senior consultant.

Her post-operative course was uneventful being discharged seven days after her last surgery. In one year of follow-up in our lower limb orthoplastic clinic, she has not presented any other issues. From the patient perspective, she has been able to recover full function of her affected lower limb.

The vessel can be seen to be true to the pre-operative CTA. Added dissection of this aberrant recipient is necessary to anticipate safe end-to side anastomosis. Choosing the site for the arteriotomy is both crucial and exacting. We would suggest that this is undertaken to account for local musculo-tendinous units and in a position on the surface of the recipient that allows for pedicle positioning and a comfortable anastomosis.

This case illustrates that free tissue transfer is still possible despite anatomical variations (**Figure 4**), by reporting the first case of a free flap anastomosed to an aberrant vessel in the context of lower limb trauma. In our Centre, CTA has become an indispensable tool to plan and anticipate this circumstances in the context of complex lower limb reconstructions.

Figure 4: Postoperative result 6 weeks after the reconstruction.

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Competing Interests
The authors have no competing interests to declare.

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