A Prospective Study of Preoperative Computed Tomographic Angiography of Fibula Osteocutaneous Flaps for Head and Neck Reconstruction

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Abstract

Background: During fibula flap harvest, inadequate or absent perforators may necessitate modification of the flap design, exploration of the contralateral leg, or additional flap harvest. (1-4) We performed this pilot study to determine the predictive power of computed tomographic angiography (CTA) in fibula flap planning and execution.

Methods: We studied a prospective series of 25 consecutive patients who underwent preoperative CTA mapping of the peroneal artery and subsequent free fibula flap reconstruction of complex mandibular or maxillary defects. (Figure 1) We compared perforator location and size, peroneal artery origin, and fibula length relative to bony landmarks between CTA and intraoperative findings.
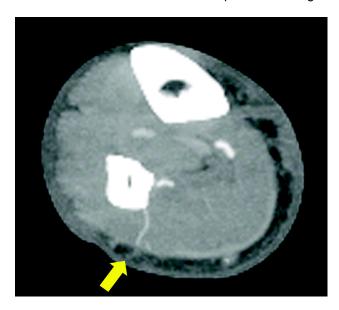
Figure 1. CTA image of a peroneal artery perforator

Results: Among the 25 fibula flaps, 59 of 61 peroneal artery perforators identified intraoperatively were visualized on CTA, resulting in an overall sensitivity of 96.7% (95%CI=0.888-0.991). Intraoperatively, perforators averaged 1.8 mm from their CTA-predicted locations. The peroneal artery origin from the tibioperoneal trunk averaged 5.9 mm from its CTA-predicted location. Average length of the fibula differed from the CTA-predicted length by 8.3 mm. CTA accurately predicted perforator size only 69.5% (95%CI=0.569-0.797) of the time. Surgeons modified the operative plan in 24% of cases based on CTA findings, including relocating skin islands and osteotomies in relationship to perforators and peroneal artery origins. All fibula flaps were successfully elevated and survived.

Conclusions: CTA accurately predicted the location of the peroneal artery origin and perforators, which was particularly useful when creating the superior fibular osteotomy and cutaneous skin island. Perforator size was less accurately estimated by CTA, likely due to variations in contrast delivery. Although preoperative CTA of the lower extremity is similar to standard angiography in confirming lower leg vessel patency in patients for whom imaging is clinically indicated, CTA is superior to standard angiography in its ability to also accurately map perforators.

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