

Usefulness of Multidetector-Row Computed Tomography in the Planning and Postoperative Assessment of Perforator Flaps

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Introduction

The use of vascularized free flaps has become the method of first choice for reconstructing extensive defects of bone and soft tissue. In the planning of reconstruction using perforator flaps, precise information about the course, position, and caliber of perforators is extremely important. Doppler ultrasonography is the method most commonly used for preoperative identification of perforators, but the examination is sometimes too sensitive. On the other hand, technical developments of multidetector-row computed tomography (MDCT) have dramatically changed the use of CT angiography in the assessment of vascular abnormalities (**Fig. 1**). In this paper, we report on the usefulness of MDCT for identification of perforators preoperatively.

Cases

Case 1

A 43-year-old man presented with a leg ulcer, measuring 35 × 20 mm. A posterior tibial artery perforator pedicled propeller flap was planned for reconstruction. Before the flap was designed, the course of the posterior tibial artery perforator was examined with both Doppler ultrasonography and MDCT. Two perforators were detected in the upper and lower regions of the leg with Doppler ultrasonography. However, MDCT showed that the upper perforator was not a cutaneous perforator (**Fig. 2**). Thus, we selected the lower perforator as the pedicle of the flap. The operation time was 90 minutes, and the flap survived completely. The postoperative course was uneventful. One month after the operation, we confirmed with follow-up MDCT that the flap was vascularized by the posterior tibial artery perforator (**Fig. 3**).

Case 2

The patient was a 27-year-old man. His left hand had been pulled into a printing machine and sustained a palmar degloving injury. The skin had been stripped from the shallow subcutaneous tissue layer from the wrist to the proximal crease of the palm. The avulsed skin flap had poor circulation, its distal portion was pale, and it did not bleed from its edges. Inspection of the avulsed tissue revealed the presence of a superficial vein in the skin flap, and 1 anastomosisable superficial vein was selected for the palmar vein. One superficial vein of the avulsed skin flap on the palm was anastomosed end-to-end with the branch of the first digital artery penetrating the thenar muscle. After anastomosis was completed, the color of the avulsed skin flap improved. The skin flap



Fig. 1 MDCT (64-detector)

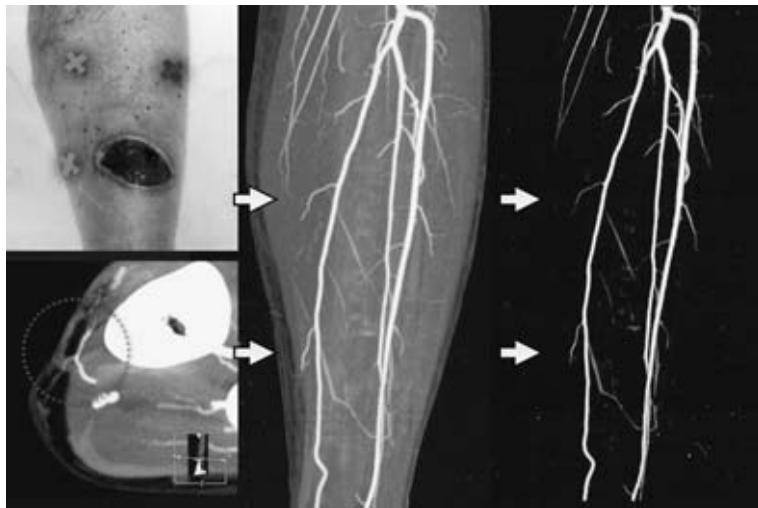


Fig. 2 Preoperative MDCT: The precise location of the emerging posterior tibial artery perforators from the fascia is marked with arrows.



Fig. 3 Postoperative MDCT: The flap was vascularized by the posterior tibial artery perforator by follow-up MDCT.

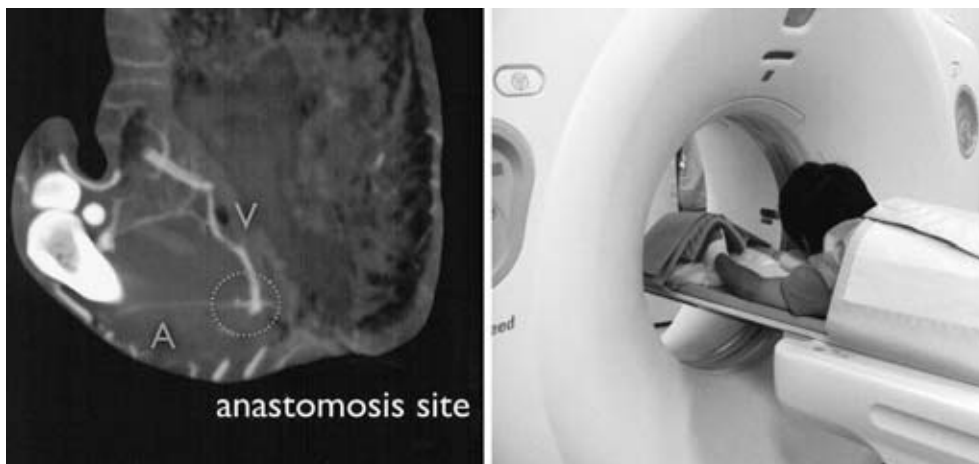


Fig. 4 Two weeks postoperative MDCT: Arteriovenous anastomosis was identified with MDCT.

healed without necrosis, and the sensation and motor function of the hand were good. In this case, 2 weeks after the operation, arteriovenous anastomosis was identified with MDCT (**Fig. 4**).

Discussion and Conclusion

Our cases showed that accurate preoperative and postoperative evaluations of the perforator are essential. Conventional Doppler ultrasonography is useful for identifying perforators but is sometimes too sensitive because even small vessels that are not sufficient to maintain the vascularity of the flap can be identified. On the other hand, MDCT allows the details of vascular anatomy to be visualized in three dimensions less invasively. This imaging method helps us to safely design the size and shape of the flap and to reduce the amount of stress for surgeons preoperatively. Moreover, postoperative MDCT is also useful to confirm the vascularity of flaps and the blood flow of anastomosed vessels. In the near future, this new imaging method may lead to new perforator flaps being developed. In conclusion, the MDCT is a highly effective method for the preoperative and postoperative assessment of perforator flaps.
