Cross-arterial Repair in Digital Revascularization

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In digital revascularization, it may not be feasible to do primary end-to-end arterial anastomosis due to a segmental defect. In this situation, some opt for an immediate vein graft to bridge the defect. However, this may not be possible if there is no distal vessel on the same side as the arterial defect. Cross-arterial anastomosis (proximal radial digital artery [RDA] to distal ulnar digital artery or vice versa) is a solution in these scenarios where segmental defects do not allow for primary anastomosis.1 2 The technique minimizes operating time and can potentially avoid vein grafting. This technique also avoids the need to opt for cross-finger arterial anastomosis, which introduces unacceptable donor site morbidity to the adjacent uninjured digit.3 We describe our use of this technique in 3 cases of devascularized digit salvage.

Scenario A: Pulp replantation Tamai level 2. A 75-year-old man sustained a partial amputation to his non-dominant thumb, with only a dorsal skin bridge remaining intact. The proximal ulnar digital artery (UDA) was identified; however, the distal end UDA could not be identified secondary to segmental damage. The distal end of the RDA was identified. It was a good caliber match to the proximal UDA, which had excellent arterial flow, unlike the proximal RDA, where flow was poor. Tensionless anastomosis was performed with 9/0 nylon. We use microligation clips to ligate side branches to facilitate advancement of the proximal vessel.

Scenario B: Thumb volar-oblique revascularization. A 66-year-old man sustained a degloving injury to the entire volar thumb following a crush injury. The only proximal vessel identified was the RDA, and only distal vessel was the UDA. Primary cross-arterial anastomosis was performed with 10/0 nylon; the patient experienced congestion, but the entire pulp was salvaged with good result. In pulp replantation, the cross-arterial anastomosis is a good backup to minimize operative time and the need for vein grafting (Fig. 1).

Scenario C: Index finger revascularization with cross-arterial vein graft. A 28-year-old man sustained a partial amputation extending through the distal interphalangeal joint to the proximal interphalangeal joint following an angle grinder injury. A large segmental gap was identified, and only 1 vessel distally (RDA) and 1 proximally (UDA) were found to be intact; however, the gap was too great for direct anastomosis. Therefore, a reversed cross-arterial vein graft was performed. The patient’s recovery was uneventful (Fig. 2).

Cross-arterial anastomosis is a useful method in digital revascularization in settings where end-to-end anastomosis cannot be achieved on the same side of the digit due to segmental injury. It minimizes operative time, and all cases in this series were performed within 3 hours and with the patient awake (regional or local anesthesia). As a last resort, a vein graft can also be used in the rare setting of a cross-arterial repair with segmental loss of bilateral arteries. Cross-finger revascularization from a neighboring digit may still be necessary in the mangled hand or in ring avulsion injury where cross-arterial anastomosis is not possible.4 Hand surgeons should be aware of the option for cross-arterial anastomosis before they consider other options, particularly terminalization of a digit.
ACKNOWLEDGMENTS

Verbal informed consent was obtained from the patient(s) for their anonymized information to be published in this article. Royal Free Hospital NHS Trust does not require ethical approval for reporting individual cases or case series.

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article. No funding was received for this study.

REFERENCES

1. Barbary S, Dap F, Dautel G. Finger replantation: surgical technique and indications. Chir Main. 2013;32:363–372.
2. Urbaniak JR, Evans JP, Bright DS. Microvascular management of ring avulsion injuries. J Hand Surg Am. 1981;6:25–30.
3. Adani R, Castagnetti C, Busa R, et al. Transfer of vessels in the management of thumb and ring avulsion injuries. Ann Acad Med Singap. 1995;24(4 Suppl):51–57.
4. Chen S, Wen G, Cheng L, et al. Mangled finger salvage using cross-finger revascularization. J Orthop Surg Res. 2020;15:104.