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Technical Note
Reconstructive Surgery

Combination of microvascular medial femoral condyle and iliac crest flap for hemi-midface reconstruction

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Abstract. In midface defects including the orbit (Brown class III and IV), no single flap can provide adequate reconstruction. In this technical note, the combination of vascularized iliac crest flap and vascularized medial femoral condyle flap (MFC) is described. The vascularized iliac crest flap is reported to be the gold standard for maxilla reconstruction. There is, however, no consensus on the best method for orbital and nasal wall reconstruction. The MFC flap can be harvested as a thin corticoperiosteal flap or as an osteomyocutaneous flap. Due to the periosteal blood supply, this flap can be customized for an individual defect of the upper hemi-midface. It is therefore of great benefit in orbital and nasal wall reconstruction. By combining the deep circumflex iliac artery (DCIA) bone flap and the MFC flap, the best standard reconstruction technique of the hemi-maxilla can be combined with a new anatomical precise microvascular reconstruction technique of the orbit. A nearly symmetric midface appearance can be achieved.

Key words: reconstruction of midface defects; combination of microvascular flaps; vascularized iliac crest flap; vascularized medial femoral condyle flap; DCIA flap; MFC flap.

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Disfiguring defects of the midface following ablative surgery impair form and function and have a great impact on self-perception. Therefore a symmetric reconstruction of the midface after hemi-midface resection is most important in patients after this type of ablative tumour surgery.

For Brown class III and IV defects, in which the orbital walls, the maxilla, and parts of the nose are involved, no single flap can provide adequate reconstruction.[1] Reconstruction must address the following: support of the orbit and facial skin; provision of sufficient bone to ensure union from the alveolar remnant to the zygomatic buttress; provision of sufficient bone for dental rehabilitation and to close the oral and nasal defects.[1,2]

The deep circumflex iliac artery (DCIA) with internal oblique muscle to obturate dead space is the gold standard for maxillary reconstruction.[1] In contrast to maxilla reconstruction, there is no consensus on the best method for orbital and nasal wall reconstruction. Some authors report the replacement of these bony components with alloplastic materials or bone grafts.[3] In the case of postoperative radiotherapy, exposure of these grafts or implant materials is a frequently seen complication.

Consequently the re-vascularized medial femoral condyle flap (MFC) can be useful in the reconstruction of the orbital

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walls and midface skeleton. If a hemifacial defect has to be reconstructed, a combination of the DCIA and MFC flaps appears to be a reliable and useful reconstruction technique. This technique is described below.

Surgical method

After ablation of the hemi-midface, reconstruction of the hemi-maxilla is first performed (Fig. 1). Here the DCIA flap from the contralateral or ipsilateral donor site, depending on the main extent of the soft tissue defect, is used to reconstruct the maxilla up to the lower border of the orbit.[4] The crestal part is used for alveolar ridge reconstruction. The adjacent muscles and fascia are used to cover the palatal defect. The ascending branch of the DCIA pedicle is prepared up to a length of 4 cm and preserved for later anastomosis to the femur flap.

After osteosynthesis of the iliac bone flap to the remnant maxilla, the anastomosis of the DCIA pedicle to adjacent facial vessels is performed. After ensuring the blood supply to the DCIA flap, the MFC flap is harvested as an osteomyocutaneous flap. The compound flap for orbit reconstruction includes the condyle periosteum and cortical bone layer, a part of the vastus medialis muscle, and the overlying skin, nourished by a perforator or the saphenous vessels. The bone part is osteotomized and contoured. One part is placed horizontally for reconstruction of the orbital floor. The other part is placed vertically for medial orbital wall reconstruction. Both parts are plated to the adjacent recipient orbital bone. The skin fat part is applied to the orbital cavity. The skin is used to form the posterior part of the conjunctiva space for later placement of an ocular prosthesis. The muscle part is used to cover the bone surface of the DCIA towards the nasal and maxillary sinus cavity. The pedicle of the MFC flap is then anastomosed to the ascending branch of the DCIA flap or to the adjacent superficial temporal vessels (Fig. 2).

If all anastomoses are working and the flaps are well perfused, wound closure is performed and the contour of the midface is assessed.

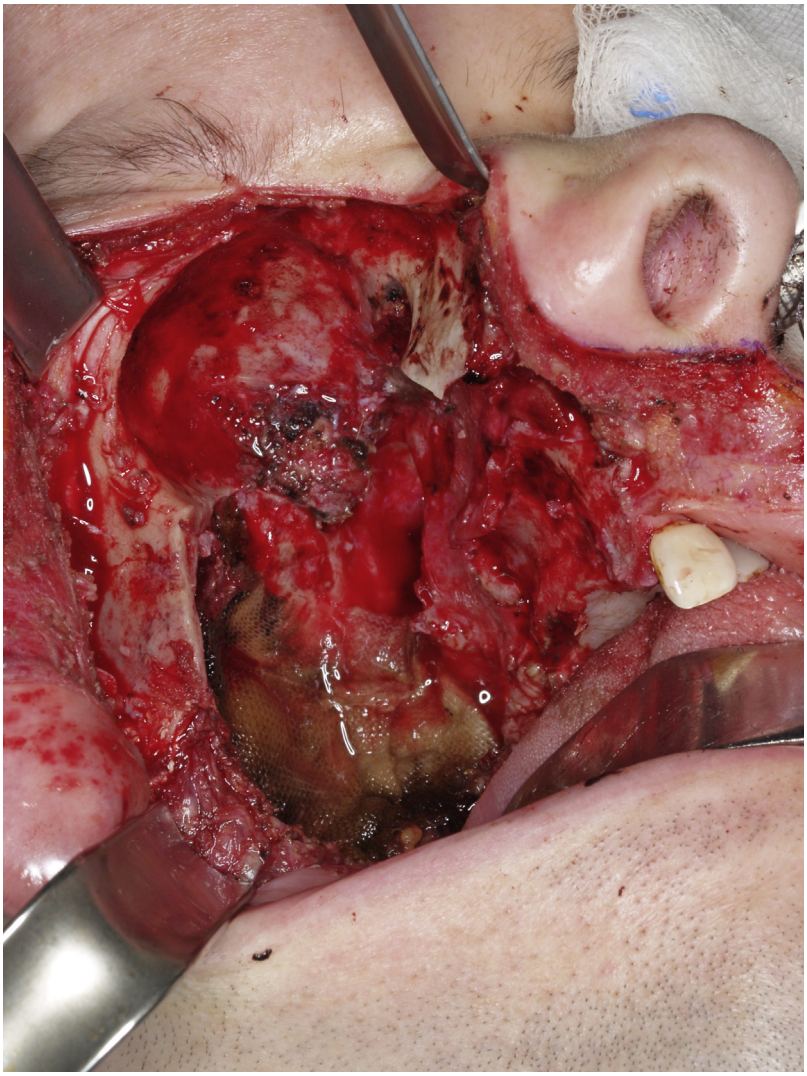

Fig. 1. Hemi-midface defect after resection of a fibrosarcoma.

Discussion

Brown and Shaw categorized maxillary and midfacial defects into six classes.[1] The reconstruction of more complex defects (Brown class III and IV), in which the maxilla, the orbit, and the skull base are involved, sometimes requires an approach different to the conventional single flap reconstruction technique. The applicability of a single osseous flap is often limited due to the bone stock and the thickness of the graft. In areas of thin bone structures of the midface contour, the re-establishment and support of soft tissue flaps to avoid sagging is essential. Therefore the main criterion for a midface reconstruction is the precise anatomical reconstruction of the skeleton. The morphology of the lateral midface is very complex and the form of the midface bone cannot be shaped exactly using a single bone flap. Thus many authors have used anatomically shaped implants to reconstruct complex bone structures.[3] These implants imply a high risk of infection and exposure after radiotherapy or even without any external influence. Other authors have described the use of more extended soft tissue flaps with the risk of later sagging.[2] To avoid these complications, two bone flaps can be combined in hemi-midface reconstruction. In this technical note, the use of such a flap combination is described for the first time.

The DCIA flap is reported to be the gold standard for maxillary reconstruction.[1,4,5] The iliac bone provides good aesthetic results for the midface and the bone volume is sufficient for placing dental implants.

The pedicle of the DCIA flap is of sufficient length for anastomosis to the surrounding facial vessels. This flap can also be used as a carrier flap for another microvascular flap using the ascending branch of the DCIA pedicle for anastomosis. A dominant ascending branch of the deep circumflex iliac vessels is present in 80% of all vascularized iliac bone flaps. As in the technique described here, these vessels can be used for anastomosis to a second flap used for orbital reconstruction. If there is no recovered