Segmental defects of the mandible may occur as a result of ablative surgery for malignant or benign pathology and can be disfiguring and disabling. Microvascular surgical reconstruction has become the standard treatment for large or composite segmental resections as it allows for repair of significant hard- and soft-tissue defects with high success rates. The goals of mandibular reconstruction include restoration of the lower facial third, maintenance of oral competence, facilitation of speech and swallowing, and alignment of the dental arches to aid dental rehabilitation and mastication. However, despite improvements in the understanding of surgical anatomy and advances in surgical techniques, achieving these goals can still be challenging, particularly in large mandibular defects.

We describe what we believe to be the first reported case of bilateral unifocal distraction osteogenesis (DO) to bilateral deep circumflex iliac artery (DCIA) composite free flaps used for mandibular reconstruction after total mandibulectomy for treatment of osteosarcoma. Performed for reasons of retrognathia and facilitation of dental prosthetic rehabilitation, this is the first case of bilateral horizontal distraction osteogenesis of deep circumflex iliac artery free flaps reported in the literature. (Plast Reconstr Surg Glob Open 2016;4:e635; doi: 10.1097/GOX.0000000000000623; Published online 8 March 2016.)

CASE REPORT

A 19-year-old patient was treated via the Head and Neck Oncology multidisciplinary team for a biopsy proven osteosarcoma of the anterior mandible. The patient underwent neoadjuvant chemotherapy with a combination of methotrexate, doxorubicin, and cisplatin before total mandibulectomy with immediate reconstruction utilizing bilateral DCIA free flaps. After surgery, the patient underwent a further course of chemotherapy with methotrexate, doxorubicin, and cisplatin, with ifosfamide and etoposide added to the regimen due to inadequate tumor kill by the preoperative regime. Three years after oncological treatment, the patient remained

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well with no signs of recurrence; however, both the functional and aesthetic results of reconstruction were unsatisfactory due inadequate projection of the neomandible (Fig. 1). To address this, DO of the neomandible was planned to improve facial profile and achieve a maxillomandibular relationship conducive to dental rehabilitation.

Under general anaesthetic, previous fixation was removed and a single bicortical osteotomy was made in the DCIA flaps bilaterally in the body region of the neomandible. Oblique bone cuts were utilized to provide increased surface area of the segments to be used for distraction. Internal distraction devices (unidirectional, end-activated 40-mm CMF distractors, DePuy Synthes, West Chester, Penn.) were placed and secured to the bone segments with screw fixation before intraoperative activation of the devices to ensure interference free movement. The devices were returned to their initial position, and the overlying soft-tissue wound was closed (Fig. 2). The distraction arms exited via transcutaneous incisions in the neck. Miniplates were placed transmucosally at the anterior mandible and anterior maxilla to facilitate vector control via elastic traction. These miniplates allowed for traction of the distal segment of the neomandible to minimize divergence of the mandibular plane. After a 7-day latency period, the patient activated the devices at a rate of 1 mm per day for a total 25 days to achieve 25 mm of lengthening. After a consolidation period of 3 months, the devices were removed. Clinically, a significant improvement in thyromental definition, pogonion position, and maxillomandibular relationship was achieved (Figs. 3 and 4). Dental implants were placed 10 months after the removal of the distractors.

**DISCUSSION**

DO has been used in the correction of mandibular defects since McCarthy et al applied the technique for treatment of craniofacial microsomia in 1992. It has since become an integral surgical technique in the treatment of craniofacial hypoplasias. The first report on the application of DO to vascularized flaps in English language scientific literature was by Friedrich et al., where DO was used to augment vascularized fibular flaps to facilitate prosthesis treatment and improve cosmesis in patients.
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treated for oral squamous cell carcinoma. However, it has been suggested that similar procedures were reported in German scientific literature in 1995.6

Despite DO for augmentation of vascularized free flaps used in mandibular reconstruction being described approximately 20 years ago, only a limited number of cases on this application of DO have been reported. These reports, in both irradiated and non-irradiated patients,4,7,8 typically describe vertical distraction of a vascularized bone flap to facilitate oral rehabilitation with osseointegrated dental implants.7,9–12 Descriptions of DO being used to improve maxillomandibular relationships and facial profile are less frequently documented.4,8,13

Reports generally involve distraction of fibula flaps,5,7,9 although cases of distraction of bony scapula flaps4,11 and vascularized iliac crest flaps4,8 used for mandibular reconstruction have also been published in the literature.

The predominance of cases involving fibula flaps is likely due to the overall popularity of this flap for mandibular reconstruction combined with issues regarding inadequacy of bone height. Although fibula flaps can provide sufficient bone length for total mandibular reconstructions, the fibula has insufficient height to restore native alveolar height, particularly in a dentate mandible.2 Supplementary techniques such as double-barreling and DO have been utilized to augment vertical height in an effort to overcome this limitation.15

In the case described above, bilateral vascularized iliac crest flaps based on the DCIAs were used for total mandibular reconstruction. This provided sufficient bone height and width; however, it resulted in retrognathia of the neomandible. Successful distraction of the bone flaps bilaterally improved the maxillomandibular interarch relationship and facial cosmesis.

CONCLUSION

Mandibular defects can have significant functional and aesthetic consequences for patients, and secondary reconstructive surgery can be difficult, often and often yielding suboptimal results. DO can be used to augment the mandible in both the vertical and horizontal planes after free flap reconstruction as a means of improving function and cosmesis.

Fig. 3. Lateral cephalogram after removal of distraction devices. SNB = 83 degrees.

Fig. 4. Clinical photograph demonstrating facial profile after distraction osteogenesis.
The patient provided written consent for the use of his image.

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