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Clinical Paper
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Reconstruction of large mandibular and surrounding soft-tissue defects using distraction with bone transport

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Abstract. Reconstruction of large bone and soft-tissue defects of the inferior third of the face is possible using various surgical techniques. Patients who require these procedures need to be in good general health, may have sequelae linked to donor sites, and require several interventions to achieve good aesthetic and functional results. The aim of this study was to report outcomes in patients with large mandibular and soft-tissue defects treated using osteogenic distraction with bone transport. Between 2001 and 2008, 14 patients had distraction with bone transport. Most patients were men (92.1%). The mean age was 43.1 years. The average mandibular bone reconstruction was 13.6 cm. The mean duration of distraction was 2.3 months. No infections occurred, and in all cases reconstruction of soft tissues was obtained. Two patients had non-union and underwent reconstruction using an iliac bone graft. Patients with sufficient bone height (57.1%) had dental implants. 44 implants were inserted, two of which were lost. 36 implants were activated. Six patients had satisfactory oral rehabilitation with implant-supported prostheses. Osteogenic distraction with bone transport allows total or partial restoration of oral function, provides an acceptable appearance, and enables patients to resume a reasonable quality of life.

Keywords: gunshot; mandible; distraction; bone.

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The challenge of facial reconstruction following gunshot wounds is to restore an acceptable quality of life with minimal sequelae. Reconstruction of large bone and soft-tissue defects of the lower third of the face is possible using various surgical techniques, including new techniques.[1–5] Free vascularised flaps are the preferred donor tissue (cutaneous, osseous and muscular).[4,6] Patients undergoing microvascular procedures need to be in good general health and may have sequelae linked to the donor site.[7,8] Good aesthetic and functional results can be achieved, but require several surgical procedures. Osteogenic distraction allows bone and soft-tissue reconstruction and has been used successfully for mandibular distraction in gunshot wounds.[7,9] There are two types of osteogenic distraction. The first type is osteogenic distraction without distraction bone transport, and is used in orthopaedic and maxillofacial malformation surgery. This technique can be used to lengthen bone and the adjacent soft tissues. The second type is osteogenic distraction with bone transport,

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Fig. 1. Example of peroperative aspect of mandibular and adjacent soft-tissue defects linked to gunshot.

which is used in cases of osseous defect. This latter technique makes it possible to fill the defect without changing the original length of the bone.

The aim of this study was to report outcomes in patients with large mandibular and soft-tissue defects treated using osteogenic distraction with bone transport.

Materials and methods

The medical records of patients who underwent reconstruction of large mandibular and soft-tissue defects using external distraction with bone transport between 2001 and 2009 were reviewed (Fig. 1). The bone and soft-tissue defects were evaluated by preoperative computed tomography (CT) scan with three-dimensional reconstruction (Fig. 2).

From the initial trauma to the distraction protocol, all the patients were in intensive care with tracheotomy, a nasogastric tube or a gastrostomy tube. During the first 3 or 4 weeks, dressings were changed under general anaesthesia every 2 days. A mandibular reconstruction plate was inserted to avoid tissue retraction and fibrosis (Fig. 3). This phase was devoted to cleaning the necrotic tissue to allow new tissue regeneration. The surgical procedures began after this period.

The first procedure began with the placement of the distraction device under general anaesthesia. First, the skin was marked and four pins were inserted percutaneously into each mandibular ramus. The horseshoe-shaped trammel of the device was placed in the axis of the bone defect and two pins were inserted vertically into the lower border of the mandible on each side of the defect. One or two planned bicortical osteotomy(ies) that preserved the internal periosteum was (were) performed through a cutaneous incision using an alternating microsaw (Figs. 3 and 4). To anticipate possible obstacles, each mobile segment was activated over a few millimetres and then returned to the original position. The period of latency to allow the formation of a neocallus was 7–10 days. The active phase began with a rate of distraction of 1 mm per day for each osteotomised segment. The device was activated for the first time by the surgeon and then by the patient using a screwdriver and a mirror. During the active phase panoramic X-rays were taken regularly (Fig. 5). The distraction was ended when the mobile segment was in contact with the fixed segment (one osteotomy

Fig. 2. Preoperative three-dimensional CT (3D CT) scan showing a mandibular osseous defect.

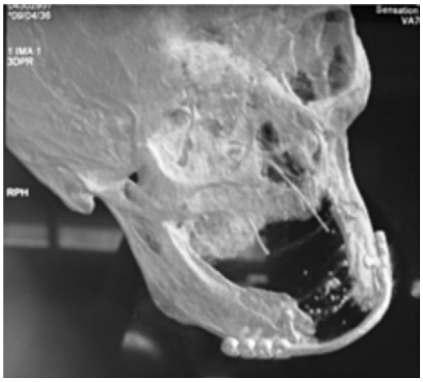

Fig. 3. 3D CT showing a mandibular reconstructive plate inserted to avoid tissue retraction and fibrosis.