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The role of the titanium functionally dynamic bridging plate for the treatment of the atrophic mandible fractures

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ABSTRACT

The role of the titanium functionally dynamic bridging plate (TFDBP) in the fracture treatment of the severely atrophic mandible was assessed retrospectively. In 28 consecutive patients with fractures of a severely atrophic mandible fixation was carried out with TFDBPs. Twenty-one patients with 27 fractures were included in the study and then followed up for complications and the progress of fracture healing for 17 months postoperatively on average. There was only one case that required plate removal. All patients showed bone healing 3 months after surgery. The mental nerve sensation improved in 12 out of 23 fractures that had presented with nerve function disturbance. Every patient who had dentures prior to sustaining the fracture was able to return to denture wearing 3 weeks after surgery. No major complications occurred. A high proportion of bone healing with a low complication rate was observed with the use of TFDBPs in the treatment of severely atrophic mandible fractures. The TFDBP is an excellent alternative to conventional plating of the severely atrophic mandible.

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1. Introduction

Stabilization of the fractures affecting the atrophic mandible is still a challenge in the oral and maxillofacial surgical practice.

There are several different approaches for the management of the severely atrophic mandible fractures and rarely, in cases with minimal dislocation conservative management could be adopted (Barber, 2001).

For internal fixation different sizes and designs of plates are reported. Some authors emphasize the necessity of using larger plates to ensure the sufficient rigidity necessary for uneventful healing (Bruce and Ellis, 1993; Luhr et al., 1996; Sikes et al., 2000; Kunz et al., 2001; Wittwer et al., 2006; Müller et al., 2011).

On the other hand, bulky plates may cause difficulty with soft tissue coverage (Tiwana et al., 2009; Müller et al., 2011) and for this reason, other authors recommend miniplates (Blume et al., 2003; Mugino et al., 2005; Clayman and Rossi, 2012). However, miniplates have a lower stability and a higher risk of plate fracture and complicated fracture healing. Nevertheless, their use requires a less invasive approach, (Iatrou et al. 1998).

The titanium functionally dynamic bridging plate has often been used in reconstructive surgery after segmental mandibular resection (Krenkel and Roth, 1994; Zwetyenga et al., 2002; Lopez et al., 2004; Schuller-Götzburg et al., 2009).

This plate fulfils the prerequisite of a reduced size in the bridging area and of a high stability in the screw fixation area. Its small dimensions and high stability with the possibility of placing the screws distant to the defect are the main advantages of this plate system. There have been no reports regarding the use of this plate in the treatment of fractures of the severely atrophic mandible.

In this retrospective study the role of the TFDBP in fracture treatment of the severely atrophic mandible is assessed and clinical and radiological results are reported.

2. Material and methods

From 1995 to 2010 fracture fixation with TFDBPs was carried out in 28 consecutive patients with fractures of a severely atrophic mandible at the department of Oral and Maxillofacial Surgery at the University Hospital Salzburg, Austria. Twenty-one patients (13 female, 8 male) with 27 fracture sites met the inclusion criteria: fractures of the mandibular body in a severely atrophic mandible with a height of less than 15 mm. Pathologic bone fractures were excluded.

All patients were followed up with clinical and radiological evaluation for 17 months postoperatively on average.

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The TFDBP consists of two 4- holes plate sections and a quadrangular (3 × 3 mm) bridging bar.

The design of the plate allows screw positioning in areas with an adequate amount of bone at a safe distance from the fracture site. The geometry and size of the plate results in an intermediate degree of rigidity somewhere between the conventional reconstruction plates and the 2.0 mm miniplates. This avoids plate fracture and has the effect of functionally dynamic stimuli on the bone resulting in progressive bone healing (Fig. 1).

Surgery was performed under general anaesthesia. The fractures were explored via an intra-oral approach or submandibular extra-oral approach. Following anatomical reduction, temporary fixation was achieved with lag screws, temporary wire ligatures or miniplates. TFDBPs were selected and adapted using tin-templates and then secured with 8 screws or in rare cases, with 6 or 7 screws.

Screws were placed at the dorsal border of the mandibular ramus and in the symphysis region maintaining an adequate distance from the fracture zone and the mandibular neurovascular bundle (Figs. 2 and 3) (Figs. 4–6).

Peri-operative antibiotics were given for three days. Radiological evaluation was performed after one day, 6 weeks, 3 and at least 6 months postoperatively with panoramic radiographs. that were assessed for the height of the mandible in the fracture region.

Furthermore the projection of the screws in relation to the inferior alveolar canal, bone resorption around the screws, loosening of the screws and plate fracture was evaluated. Signs of bone healing, delayed healing, infection or osteomyelitis were registered.

The shortest distance between the screws and the fracture site was measured mesially and distally as well as from the inferior alveolar canal and the mental foramen.

A clinical assessment was performed at the same time intervals and then 1 year postoperatively and beyond.

The mental nerve function, clinical stability of the fracture, masticatory function, ability to wear dentures, presence of dehiscence, infection, delayed healing, mal-union or non-union were recorded.

Fig. 1. The titanium functionally dynamic bridging plate (TFDBP) before bending and an already bent tin template, which is used for assistance during surgery.

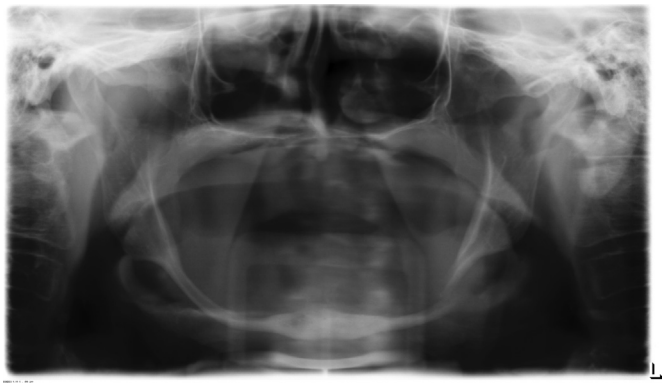

Fig. 2. Panoramic X-ray of an 83-year-old woman with a fracture on the left side of the edentulous severely atrophic mandible.

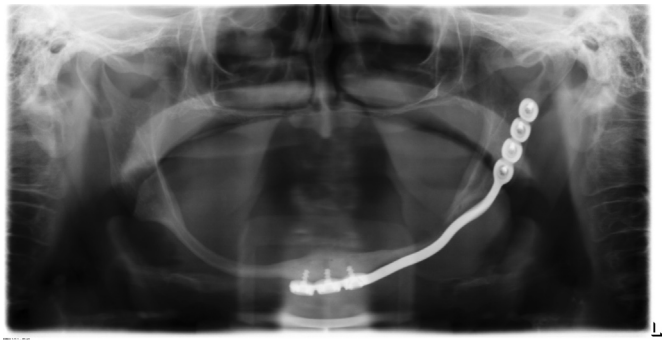

Fig. 3. Panoramic X-ray after surgery.

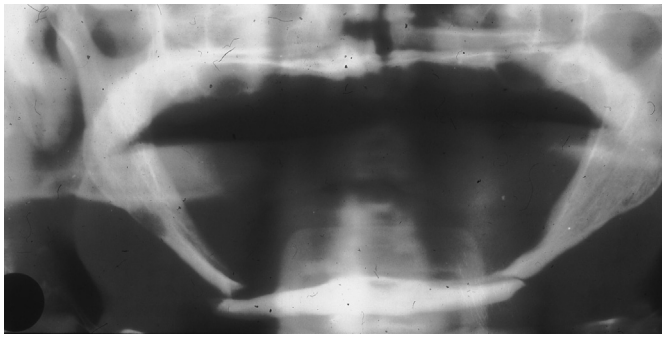

Fig. 4. Panoramic X-ray of an 85-year-old woman with a bilateral fracture of the atrophic mandible.

Fig. 5. Intraoperative situation after osteosynthesis, using an intra-oral approach. Both mental nerves are preserved.

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