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Titanium miniplate osteosynthesis in maxillofacial surgery

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Introduction

Both in trauma and orthognatic surgery, miniplate osteosynthesis of the jaws and skull is considered to be the "gold standard" method of care. The use of titanium implants and osteosynthesis materials in orthopaedics, neurosurgery, and maxillofacial surgery has increased considerably, and they may be retained in patients for a long time. For fixture of the miniplates, self-tapping screws (STS) are frequently used showing good results. Titanium is a chemical element, it's main characteristics being low density, remarkable strength, ductility, corrosion, and heat resistance, properties that make it an attractive material from which to construct implants. In general, the stability of the plate fixation relies on the pressure on the bone surface established by the screws, which may endanger the bone's circulation. Pressure around the screws and under the plate may weaken the bone and endanger the stability of the osteosynthesis. A lack of stability of the osteosynthesis may cause screw loosening, plate fractures, impaired healing and a higher risk of infection. They have several drawbacks such as local irritation, growth disturbance, passive migration, infection, dysaesthesia, computed tomograms or magnetic resonance imaging distortion and metallic debris accumulating in local lymphatic nodes.

Material and methods

A retrospective study was conducted, using records from 48 adult patients, between 18-68 years of age, who underwent miniplate osteosynthesis for reconstruction of skull and mandible fractures and orthognatic surgery fixation, between November 2013- October 2016. All patients had a minimum follow up of 6 months by clinical examination and periodic CT scans. Alcohol abusers, smokers, edentulous patients and those who underwent radiotherapy were included in the study. Patients were observed daily for clinical signs of infection and day lab checks were performed (WBC counts). Contour irregularities, paresthesia, infection and bone induction were clinically or radiographically evaluated.

Results

Thirty four male and fourteen female patients (mean age 45,08 years) underwent miniplate osteosynthesis by intra- or extraoral approach for skull and mandible fractures or orthognatic fixation. Most patients reported satisfactory aesthetics and medium intensity of postoperative pain. Contour irregularities were reported by 12 patients, mostly by young women. Temporary paresthesia occurred in 20 patients especially those who suffered osteosynthesis for posttraumatic injuries or orthognatic surgery. Infection (controlled with drainage and antibiotics) occurred in 18 cases of patients with comorbidities, in all patients who underwent radiotherapy and in patients with poor oral hygiene. Instability of the fixation occurred mostly in edentulous and radiotherapy treated patients. Long term stability for the rest of the patients was considered excellent. Bone healing was satisfactory in all the patients, and there was no evidence of abnormal resorption. Time delay between injury and surgery

ranged from 3h-8 days and mean duration of surgery was 2,64 h. Only 4 patients underwent removal of the internal fixation by request.

Discussions and conclusion

The rigid internal fixation by miniplates and screws produces an optimal functional stability compared with other conventional systems. The combination of the advantages of an external fixation device and those of stable internal osteosynthesis produces a long term functional stability even in cases with extensive defects where delayed consolidation is to be expected; tilting and loosening of the screws or resorption of the compact bone underneath the plate do not occur. The results show a very low plate removal rate and support our current practice of inserting internal fixation plates and not removing them routinely. Good stability showed clearly superior functional and anatomic long-term results.

The aim of miniplate osteosynthesis is to allow the conditions for good, rapid bone healing, avoid poor consolidation of the fracture and offer good stability in time. It provides an advantage for patients by reducing healing time, allowing good quality of the newly formed bone, and decreasing the risk of postoperative complications.