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Original Article

Surgical treatment of isolated zygomatic fracture: Outcome comparison between titanium plate and bioabsorbable plate

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KEYWORDS
Bioabsorbable plate;
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Summary *Background:* Zygoma fracture is of clinical importance because malar prominence plays an essential role in facial appearance. Traditionally, most maxillofacial surgeons perform osteosynthesis with titanium plates and screws for rigid fixation. However, this procedure has certain disadvantages that include the possibility of implant exposure, palpability or loosening of the screws, painful irritation, temperature sensitization, and radiographic artifacts. In this study, we compared the function and satisfaction outcome between Bonamates® bioabsorbable implant and Leibinger titanium implant.
Method: Consecutively 53 patients with isolated unilateral zygomatic fracture that were treated with the Bonamates® bioabsorbable plate system, n = 53 were compared to patients with the titanium plate system, n = 55 in the period between 2009 and 2013. All patients were followed-up at least 6 months. Preoperative and postoperative facial computed tomography (CT) scans were performed and scored from 0 to 2 in the 5 areas of zygoma. A score of 2 indicated the most severely displaced fracture in one of the areas. A visual analogue scale ranging from 0 to 10 was used to assess the postoperative aesthetic and functional satisfactions.
Result: The mean ages of the patients in the bioabsorbable and titanium plate groups were 33 years and 30 years, respectively. The male to female ratios were 1.2:1 (bioabsorbable plate group) and 1.1:1 (titanium plate group). The average preoperative CT scan scores of the bioabsorbable and titanium plate groups were 5.7 and 5.1, respectively. The postoperative CT scan scores of the bioabsorbable and titanium plate groups were 1.3 and 1.1, respectively.

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The implant cost of the bioabsorbable group was approximately 6-fold higher than that of the titanium plate group. The complication rate was similar in both groups and included complications such as palpable implant, skin irritation, and hypersensitive cheek. The patients in both groups attained similar mouth-opening function and a satisfactory score at 6 months after operation.

Conclusion: This study revealed that the bioabsorbable plate outcome was similar to the titanium plate outcome for patients with isolated unilateral zygomatic fracture. The bioabsorbable implant system provides another option for internal fixation devices in the treatment of zygomatic fractures and avoids implant removal surgery; however, the implant cost of bioabsorbable plates is higher than that of titanium plates in Taiwan.

1. Introduction

Zygoma fracture is of clinical importance regarding facial appearance and function. Displaced malar prominence plays an essential role in the overall facial appearance and results in deformity of the facial contour. Open reduction and internal fixation are required to avoid ophthalmic complications and masticatory dysfunctions in displaced fractures.[1] The most essential criteria for the successful treatment of zygomatic fractures are accurate reduction and the 3-dimensional stability of the displaced fracture to achieve favorable aesthetic and functional results.[2,3]

Titanium plates and screws are used regularly for the rigid fixation of zygomatic fractures. However, certain disadvantages including the possibility of implant exposure, palpable implant, screws loosening, pain sensation, cold intolerance, and radiographic artifacts still exit.[4,5] Some patients require secondary operation to remove plates, and the removal rate is 10—22.7%.[6—8]

To overcome the complications inherent in the titanium implant system, bioabsorbable osteosynthesis has been developed. The use of bioabsorbable plates and screws is an attractive alternative compared with that of the traditional metal plate system.[9] Because bioabsorbable implants are completely resorbed, secondary surgery for removing implants and long-term interference with nerves and the growing skeleton can be prevented. In addition, the risk of implant-associated stress shielding, peri-implant osteoporosis, and infections is reduced. Furthermore, bioabsorbable implants do not interfere with clinical imaging and do not cause sensitivity to cold weather.[10]

The strength of the bioabsorbable plate system is a major concern in its implementation. Hanemann et al reported that combination of titanium plating and resorbable plating systems exhibits adequate strength with negligible complications for the treatment of isolated zygomatic fractures in adults.[11] Furthermore, using only the bioabsorbable plate system showed stable fixation in displaced zygomaticomaxillary complex fractures.[12]

There are 2 types of bioabsorbable plate: homopolymer (Poly-L-lactic acid (PLLA), and polyglycolic acid (PGA)) and copolymer (Lactosorb, BioSorb, and DeltaSystem). A commercially available bioabsorbable system composed of 1.2-mm-thick plates and 2.5-mm-diameter screws (BonaPlates, PD series, Bonamates®, BioTech One, Taipei, Taiwan) has recently been developed in Taiwan. To test the efficiency of the new bioabsorbable plate, we conducted a study to compare the outcomes of the Bonamates® bioabsorbable implants and titanium implants on a group of patients with isolated zygomatic complex fractures.

2. Materials and methods

This is a retrospective case—control study. Consecutively 53 patients with isolated unilateral zygomatic complex fracture were treated with the bioabsorbable plate system (Bonamates®) between 2009 and 2013. Patients with simple zygomatic arch fracture, comminuted fracture at each junction of zygoma and other facial bone, and multiple midfacial fractures were excluded in this study. To compare the outcome between the bioabsorbable and titanium plate systems, control group are patients of similar isolated zygomatic complex fractures (n = 55) was treated with the titanium plate system between the 2009 and 2013.

The fracture site is explored through the gingivobuccal incision (Fig. 1). After achieved adequate reduction, fixation is performed with a bioabsorbable or titanium plate at the lateral buttress, and this is the first fixation point. If fixation was not rigid or reduction was not adequate during operation, it is necessary to explore other fracture sites for the second or third fixation points. We created an infracilliary incision to approach the infraorbital rim and zygomaticofrontal (Z-F) junction. The infraorbital rim is the typical second fixation point and followed by the Z-F junction if necessary. All the surgical procedures were performed by a single surgeon to avoid surgical bias.

For evaluation the fracture displacement and adequacy of fracture reduction, we developed a CT scan scoring system. Five anatomic points with the total score range from 0 to 10 (0—2 for each point). A score of 2 represented the most comminuted preoperative displacement and inadequate reduction of more than 2 mm after operation. A score of 1 indicated fracture displacement of less than 2 mm or nonunion (absence of calcified bone crossing the fracture site). A score of 0 represented a minimal to nondisplaced fracture line preoperatively and accurate alignment with bone union postoperatively. Five evaluation points, including the Z—F junction, sphenoid—zygomatic (S—Z) junction, inferior orbital rim, zygomatic arch, and lateral buttress, were assessed in a series of CT scans preoperatively and 6 months postoperatively (Table 1).

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