

Treatment of mandibular fracture by bio-absorbable fixation – case report

*Tratamento de fratura de mandíbula através de material reabsorvível
– relato de caso*

José Lacet de Lima Jr.*
Kilma Keilla Honório de Góes**
Eduardo Dias Ribeiro**
Julierme Ferreira-Rocha**
Andréa Lins Leitão da Cunha**
Vânio Santos Costa***
Clóvis Marzola****

Abstract

Among the fractures in oral and maxillofacial trauma compound, the one in the lower third occupy prominent place due to its frequency and immediate esthetic and functional damage. Several techniques and materials are used for its treatment, for example, the titanium screws and plates and, more recently, a bio-absorbable system in which, once installed the plate and screws, it will be degraded by the organism. The present work describes a clinical case of a facial trauma with consequent mandible fracture in a female patient aging 39 years old. Once reduced the fracture, the stabilization was accomplished by the bio-absorbable system. There was not any rejection to the material and the patient developed satisfactorily after the treatment.

Key words: Mandibular fracture. Fracture fixation. Absorbable implants.

Introduction

Mandible fractures have a very important epidemiological role, causing many disabilities to the individual and due to this, serious morphofunctional disturbance. Craniofacial development alterations, temporal-mandibular and salivary disorders, deficient occlusions, sleep disorders due to apnea and chronic facial pains are possible complications and sequels of mandible fractures¹.

Mandible fracture can be classified according to its anatomic position² in: condylar, of the angle, of the body, of the symphysis, alveolar, of the branch and of the coronoid process.

The incidence of maxillofacial fractures was observed in 326 South African patients with, at the most, 18 years old. It was observed that these fractures were the most common, 64%, and, regarding the etymologies, fights, assaults and injuries caused by fire weapons, sum up 48%³.

Analyzing mandible fractures were founds results in which the male gender is the most common victim, the menthol region is the most affected and the main etiologies were automobile accidents, in which rigid internal fixation was considered a satisfactory treatment⁴.

* Department of Oral and Maxillofacial Surgery, Emergency and Trauma Hospital, João Pessoa, Paraíba; Dental School of Potiguar University, Natal, Rio Grande do Norte, Brazil.

** Department of Oral and Maxillofacial Surgery, Emergency and Trauma Hospital, João Pessoa, Paraíba; Dental School of Federal University, João Pessoa, Paraíba.

*** Department of Oral Radiology, Emergency and Trauma Hospital, João Pessoa, Paraíba, Brazil; Dental School of Potiguar University, Natal, Rio Grande do Norte, Brazil.

**** Titular professor of Surgery pensioner of the USP of Bauru and Titular of the UNIP of Bauru, São Paulo, Brazil. Professor of the Course of Specialization and Person who orientates of the Research.

The most common causes observed in epidemiological studies were physical aggressions, accidental falls, car and motorcycle accidents, and sport related and industrial traumas⁵.

In a prevalent study, traffic accidents were reported as the most frequent etiologies, with 40% of occurrence, physical aggressions in second place, with 32%, and the other etiologies summing up 28%. The most common age is between 21 and 30 years old with 35%, followed by 31 to 40 years old with 21.2%, and from 11 to 20 years with 20%. The most affected regions are the nose 31.47%, the zygomatic complex 28%, alveolodental 17.4% and the mandible 13.5%. The male is the most common gender with 83.3%¹.

In a study with 227 patients, in which were observed 274 maxillofacial fractures, 70% were male gender and the mandible was the most affected bone, with 169 cases (74.5%). The most frequent causes were accidental falls 52%, automobile accidents 20%, assaults 17%, sport related accidents 8% and other causes such as horse kicks, that sum up 3%⁶.

In a study with 62 patients victims of facial damage associated with horses, it was discovered that the female gender was the most commonly affected with 76%. The most usual cause was fall from horses but, if kicked by one, the damage was much more serious. The most frequent offences were to abrasion/contusion 39%, followed by lacerations 32% and fractures 29%. It was also reported the importance of the use of helmets, due to the fact that, even though they do not add any protection to the face, the education of the horse riders and also supervision of the younger riders is necessary⁷.

The advent of the internal rigid fixation (IRF) represented an important advance for the facial fractures, due to the fact that it enables the stable maintenance of the reduction obtained by surgery, even under precocious functional activities. The benefits include the abbreviation or elimination of the postoperative intermaxillary block, giving the patient better buccal hygiene and nourishment, more appropriate phonetics, and it prevents the functional restriction of the articulation due to disuse, decreasing the complication related to bone reappears⁸.

In studies, regarding the use of osteotomies with bio-absorbable screws in mandible bodies of sheep, they were fixated and microscopically analyzed, and the results found that the material is biocompatible and the screws have high potential in fixation in oral and maxillofacial surgeries⁹.

In a survey of 29 orthognathic surgeries, using the bio-absorbable system, it was acknowledged that all patients, except one, showed satisfactory wound healing with no sign of infection or local in-

flammation. In the immediate postoperative period 6 patients had altered maxillary mobility, but they regained stability in the following 6 weeks¹⁰.

The osteosynthesis system, composed of polylactic acid (82%) and polyglycolic acid (18%), maintains a suitable resistance longer than necessary for the bone callus to form, with indication of use in surger-ies of fractures in the medium third of the face and craniofacial skeleton reconstruction¹¹.

The fixation can be achieved with compression screws or even stabilization plates (plates for mandible reinforcement). It is important to point out that the bio-absorbable plates decrease the risk of radiotherapy reflex, allowing the postoperative study, using computerized tomography and magnetic nuclear resonance (Biosorb SystemTM). In an evaluation of four trades through the simulation of finite three-dimensional element method, it was investigated the bi-cortical mechanical tension on the mandible osteotomies and when the chewing forces, during the postoperative period, damage the osteosynthesis open, obtaining results of values of stability and maximum chewing forces supported: 464 N (LactosorbTM), 132 N (Harada and EnomotoTM), 117 N (IsosorbTM) and 115 N (Bio SorbFXTM). All four screws where considered stable enough for osteotomy openings¹². This technique was developed mostly to avoid a second surgery that is sometimes needed to remove the metallic implant, but is not necessary when the plates and screws are Poly-L-LacticAcid-PolyGlycolic Acid (PLLA-PGA), due to the fact that they are absorbed after the first year. Usually the complete absorption of the PLLA-PGA happens between 18 and 24 months after the implantation¹³.

The purpose of this study is to show the high possibility of the use of this material by all surgeons, with many benefits for the patient.

Case report

A 39-year-old woman was referred to the Oral and Maxillofacial Surgery division of the Emergency and Trauma Hospital, João Pessoa, Paraíba, Brazil, victim of trauma caused by a horse kick on the inferior lip region, corresponding to the symphysis. In the extra-buccal clinical exam, it was observed a wound in the related region with exposure of bone fragments, bleeding and loco-regional edema (Fig. 1). Through local exam it was observed bone crepitation and abnormal bone structure mobility. The intra-buccal exam found laceration on the gingival-labial sulcus inferior, occlusal step on the symphysis region, mobility of the lower anterior teeth, bloody sialorrhoea and bone exposure. At all times the patient was aware and cooperative, showing no neurological damage.



Figure 1 - Preoperative clinical aspect. Observe mandible deviation to the right

A mandible computerized tomography with three-dimensional colored reconstruction was requested, along with preoperative routine laboratory exams (hemogram, coagulogram, glycemia, blood type + Rh factor), and also the clinical evaluation, surgery risk and pre-anesthesia. The tomography showed a comminuted mandible fracture on the symphysis region and left mandible body, and also alveolodental fractures of the lower teeth from right to left canine (Fig. 2).

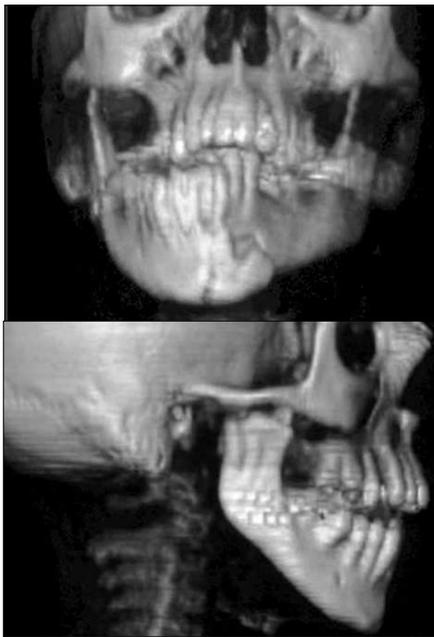


Figure 2 - 3D reconstruction tomography of the mandible

The surgery was performed under general anesthesia, using nasotracheal intubation. Once accomplished intra-oral surgical access, a mucoperiosteum displacement was carried out, exposing the fractured region and fulfilling the osteosynthesis with the bio-absorbable PLLA-PGA system (Delta System-Leibinger/Stryker™, Mühlheim-Stetten, Freiburg, Alemanha) with 2.2 mm diameter and

screws with 8 mm extension. Due to the flexibility of the plates, instability of the symphysis region and the alveolodental fracture, it was achieved a contra-balance with a nº 1 steel wire from the left mandibular canine to right mandibular canine in a rigid brace and a 2.0 x 20 mm trans-cortical titanium screw on the mandible base (Fig. 3 and 4). The patient left the room without intermaxillary block, being installed afterwards with the help of brackets with tractioning staples, associated with rubber bands, during 45 days, once the PLLA-PGA plates and screws suffer the functional movement action of the mandible. After 45 days the block was removed showing a primary functional stability.



Figure 3 - Aspect of the comminuted and complex fracture of the mandible, symphysis region, left mandible body and alveolus

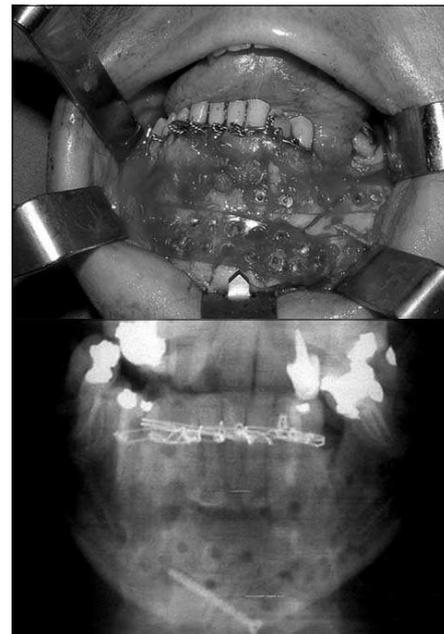


Figure 4 - Osteosynthesis with the absorbable PLLA-PGA system (2.2 mm diameter) contra-balanced with a nº 1 steel wire, from the left mandibular canine to right mandibular canine, and a titanium screw (2.0 x 20 mm) on the base of the mandible

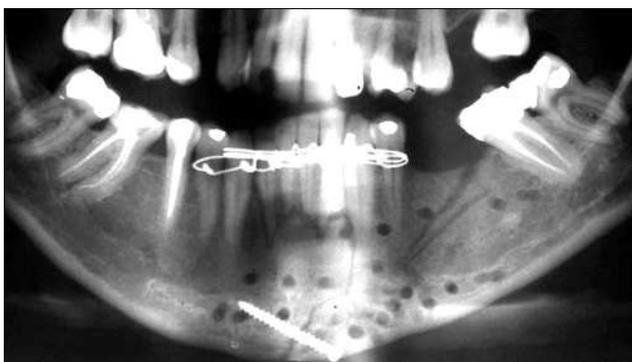


Figure 5 - Panoramic radiography from the seventh day of the postoperative period

A panoramic radiography of the maxilla was requested with 7 days of the surgery, showing a favorable coaptation of the fragments, and the bio-absorbable screws installation orifices, due to the fact that the PLLA-PGA is radiolucid, not showing radiography images of the synthesis material (Fig. 5 and 6).

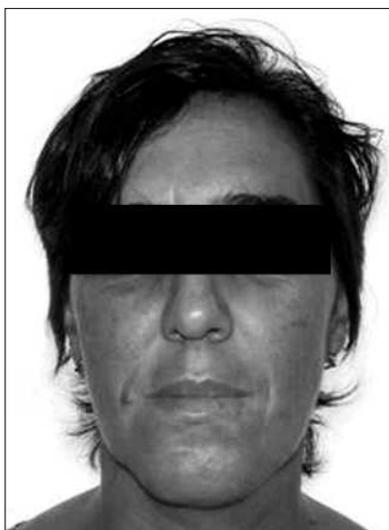


Figure 6 - Post-operative clinical and occlusal aspect, two years after trauma

Discussion

The incidence of the bucomaxillofacial traumas may vary according to the geographic area where the sample was collected, the distribution and the social-economic tendencies in the universe containing the sample, and also the traffic legislations and seasonal variations.

Sobreira et al.¹(2002) reports fracture nasal bones as being the most usual. Regarding the etiologies, the most common were associated to assaults, fights, fire weapon wounds¹, traffic accidents^{1,4,6}, physical aggressions, accidental falls, car and mo-

torcycle accidents, sport related and industrial traumas^{1,5,6}, and also accidents caused by animals (horses)⁷. Regarding the gender, the most affected was the male^{1,4,6} but according to Ueeck et al.⁷ (2004) it is the female gender.

The intra-buccal access, being a region that involves esthetic, is, by most authors, chosen, when treating simple fractures, little extensive or even comminuted, when there are lacerations of the gingival-labial sulcus that allow access to the fracture⁸.

Due to the considerable charges received, when treating a mandible fracture, the internal fixation method is the most effective⁴, considering that, in this method, there is a decrease of the bone repair time and elimination of the necessity of inter-maxillary block, granting the patient more comfort in the postoperative period⁸. In many cases of facial bone fractures, a combination of methods is necessary to reduce and immobilize the fracture².

Bio-absorbable materials are an alternative to try and overcome possible problems found with the metallic osteosynthesis, such as the liberation of ions, continuous mechanic stimulus, radiographic interferences and the production of artifacts in computerized tomography and magnetic resonance¹⁴.

It means that the bio-absorbable system is gaining strength before the metallic system. PLLA-PGA plates and screws maintain their strength during the fracture curing period and they are absorbed after 12 to 24 months of the implantation. But according to Edwards et al.¹³ (2001) the absorption happens 18 to 24 months after the surgery.

Plates and screws from the bio-absorbable system decrease the radiographic reflex, allowing the examination using computerized tomography and magnetic resonance, due to the fact that they are radio lucid, not being seen in radiographies, where only the screw implantation orifices are seen, these ones having larger diameter than the titanium screws¹⁵.

Conclusion

When analyzing the case report, it was concluded from this study that, the use of the bio-absorbable plates and screws is considered an advance for the internal fixation technique because it keeps their structural integrity during the bone callus formation period. It is malleable and, therefore, it is considered a semi-rigid internal fixation, with the necessity of inter-maxillary block and contra-balance. It has a very high cost, making the routine use and the use in public hospital, difficult.

Resumo

Entre as fraturas traumáticas do componente oral e maxilofacial, aquelas do terço inferior da face ocupam um lugar de destaque, em razão da frequência e dos danos estéticos e funcionais imediatos. Diversas técnicas e materiais são usados para seu tratamento, como, por exemplo, os parafusos de titânio e as placas e, mais recentemente, um sistema reabsorvível, no qual, uma vez instalado, as placas e os parafusos serão degradados pelo organismo. O presente trabalho descreve um exemplo clínico de trauma facial com a conseqüente fratura da mandíbula, num paciente do gênero feminino, com 39 anos de idade. Reduzida a fratura, a estabilização foi realizada pelo sistema reabsorvível. Não houve nenhuma rejeição ao material e a paciente evoluiu satisfatoriamente após o tratamento.

Palavras-chave: Fratura mandibular. Fixação de fratura. Implantes absorvíveis.

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Correspondence to

José Lacet de Lima Junior
Rua Major Salustiano Ribeiro 98
Tambauzinho
58042-090 João Pessoa - PB
Tel: +55-83-3244-3015;
E-mail: lacetbmf@oi.com.br

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