

Management of Jaw Fracture Caused by Gunshot Wound - Case Report

**Manejo de fratura de mandíbula causada por ferimento por arma de fogo -
Relato de caso**

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ABSTRACT

Introduction: Firearm injuries rank second in the deaths and deaths of people in the urban area. The severity of the injury varies according to the caliber of the weapon used and the distance between a weapon and a victim. The maxillofacial complex has been the target of this type of injury, due to the aggravating increase in the rates of violence, especially in large urban centers. This article presents a case of serious gunshot injury to the jaw. **Presentation of Case:** Male patient, victim of urban violence, shot by a firearm projectile in the face, presenting comminuted fracture in the mandible with the projectile housed in the posterior, upper medial region of the mandibular branch. Being the patient submitted to treatment of the mandibular fracture. **Results:** Patient submitted to erich bar installation, and maxillomandibular block and after regression of the face edema, under general anesthesia, the jaw fracture was fixed with a 2.4 reconstruction plate, with 60-day outpatient follow-up. satisfactorily. **Discussion and Conclusion:** The treatment of maxillofacial injuries by firearm projectiles is a great challenge for surgeons and still controversial in the literature, in relation to the type of approach, whether conservative or surgical, and in relation to the optimal time to perform a possible intervention, with the advent of synthetic materials. The surgical approach has become the choice for the vast majority of cases of facial injuries caused by firearms.

Keywords: Firearm injury, Penetrating projectile head trauma, Mandible.

RESUMO

Introdução: Os ferimentos por arma de fogo ocupam o segundo lugar nos casos de lesões e morte de pessoas na zona urbana. A gravidade da lesão varia de acordo com o calibre da arma utilizada e a distância entre a arma e a vítima. O complexo maxilofacial tem sido alvo desse tipo de lesão, devido ao aumento considerável dos índices de violência, principalmente nos grandes centros urbanos. Este artigo apresenta um caso de ferimento grave por arma de fogo na mandíbula. **Apresentação do Caso:** Paciente do sexo masculino, vítima de violência urbana, atingido por projétil de arma de fogo na face, apresentando fratura cominutiva em mandíbula com o projétil alojado na região posterior, medial superior do ramo mandibular. Sendo o paciente submetido ao tratamento da fratura mandibular. **Resultados:** O paciente foi submetido à instalação de barra de Erich e bloqueio maxilomandibular e após regressão do edema facial, sob anestesia geral, a fratura de mandíbula foi fixada com placa de reconstrução 2.4, com seguimento ambulatorial de 60 dias. de forma satisfatória. **Discussão e Conclusão:** O tratamento das lesões maxilofaciais por projéteis de arma de fogo é um grande desafio para os cirurgiões e ainda controverso na literatura, em relação ao tipo de abordagem, se conservadora ou cirúrgica, e em relação ao momento ideal para realizar uma possível intervenção, com o advento dos materiais sintéticos. A abordagem cirúrgica torna-se a escolha para a grande maioria dos casos de lesões faciais por arma de fogo.

Palavras-chave: Lesão por arma de fogo, Traumatismo craniano penetrante por projétil, Mandíbula.

1 INTRODUCTION

The treatment of victims of gunshot wounds (FAF) in the face represents a challenge even for the most experienced surgeons in the area¹. Violence in large Brazilian cities is a risk factor that contributes to the increase in these injuries². The severity of the FAF depends on the shape, size, composition and speed of the projectile, in addition to the distance from the weapon to the target^{3,4}. Interactions resulting from these factors are the variations in kinetic energy, responsible for the destructive effect of its target⁵.

These injuries can vary from a simple fracture to a comminuted fracture, depending on the energy of the projectile, and can result in loss of bone and soft tissue⁶. FAF injuries are mainly the result of aggressions, accidents and suicide attempts¹.

Severely comminuted fractures were treated by closed surgery, however, with the advent of the rigid internal fixation system using titanium plates and screws, it was possible to achieve a level of stability of the fractured bone segments crucial for the treatment of comminuted mandible fractures. In addition, this system keeps the blood supply and bone healing of the fracture safe and promotes an early restoration of mandibular shape and function⁷.

The most common complications of these cases are bone sequestration, soft tissue infections, osteomyelitis, plaque exposure and wound dehiscence, the latter being more common in plaques installed by intraoral approach⁸.

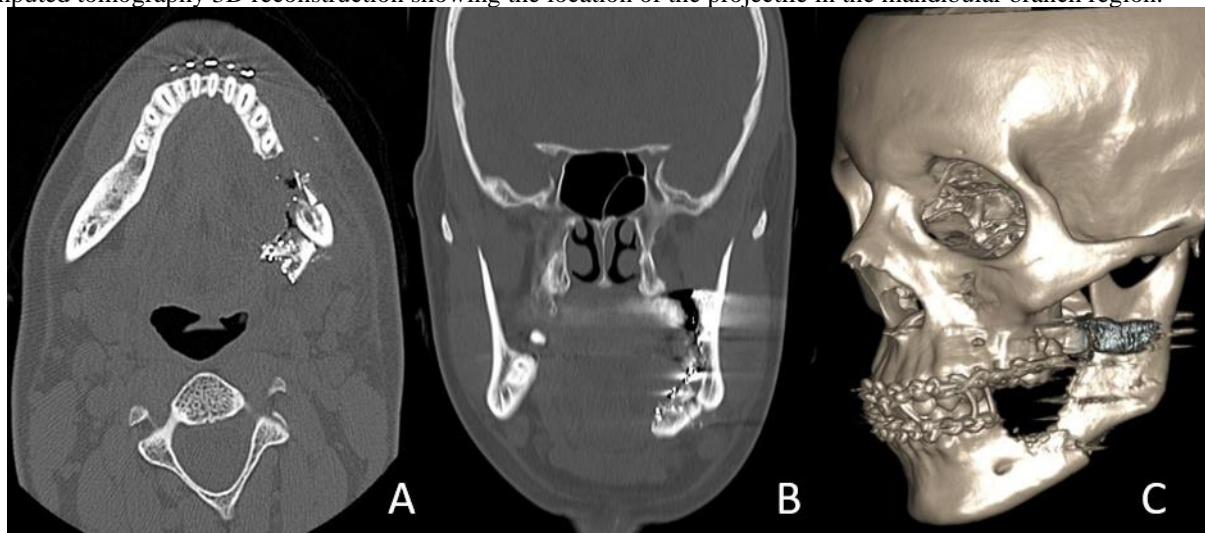
Therefore, the objectives of this article are to report a clinical-surgical approach of a young male patient who is a victim of FAF in the face, evolving with a comminuted fracture of the left mandibular body.

2 CASE DESCRIPTION AND RESULTS

Male patient, 24 years old, caucasian, victim of FAF in the face, referred to the Bucomaxillofacial Surgery and Traumatology team at the Hospital de Clínicas of the Federal University of Uberlândia / Brazil, evolving with a comminuted fracture of the left mandibular body, without airway involvement.

On extra-oral clinical examination, an entry wound of the projectile was noted, with no bleeding present and edema on the face. On intraoral examination, there was a laceration of the gingival mucosa, dental fractures, loose bone fragments and unstable occlusion. Upon examination of computed tomography of the face, in the axial section (Figure-1A) and in the coronal section (Figure-1B), a comminuted fracture of the left mandibular body region was noted, with extensive destruction and in the 3D reconstruction image, location of the projectile close to the mandibular branch (Figure-1C). The patient underwent local anesthesia to debridement of the intra-oral holiday, removal of bone fragments and teeth compromised by the trauma and installation of Erich bars and rigid maxillomandibular block.

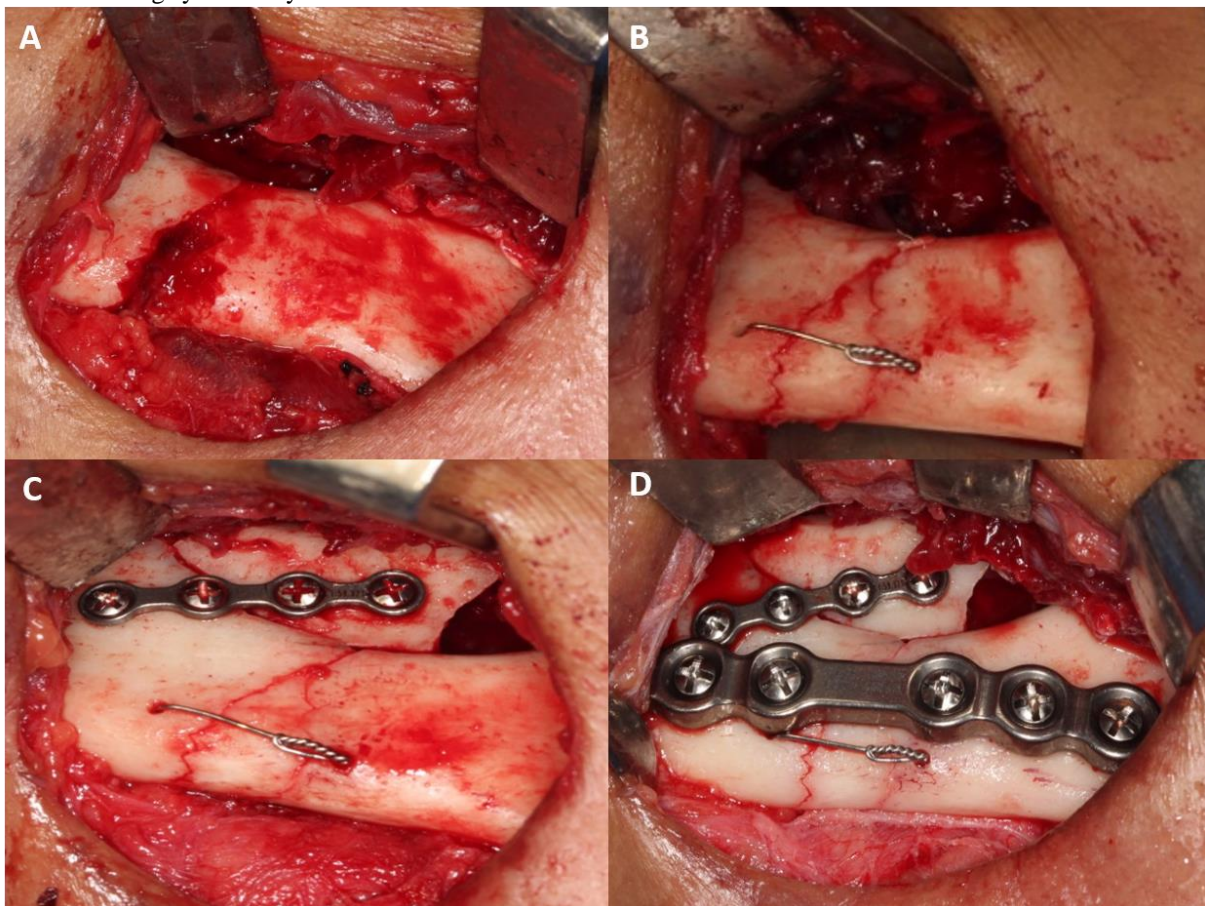
Figure 1. Computed tomography in (A) axial section and (B) coronal section showing comminuted mandible fracture. (C) Computed tomography 3D reconstruction showing the location of the projectile in the mandibular branch region.



The patient was referred for pre-anesthetic evaluation, where there were no contraindications for the team to approach. Under general anesthesia and nasotracheal intubation, reduction and fixation

of the mandible fracture was performed. After submandibular extra-oral access, the mandibular fracture was located (Figure-2A) and, after the installation of rigid maxillomandibular block, the fracture was reduced with steel wire (Figure 2B) and the simplification of viable bone fragments with 2.0mm fixation system (Figure-2C), with subsequent fixing of the remaining stumps with 2.7mm load bearing type reconstruction plate (Figure-2D). At the trans-surgical moment, it was decided not to remove the projectile due to its location of difficult access, since it was in the upper region of the branch and in its medial portion, close to the noble structures. After 24h, the patient was discharged from the hospital and was medicated with Amoxicillin 500mg associated with 125mg of Potassium Clavulanate 8 / 8h for seven days, Metronidazole 400mg 3 times a day for seven days, Dexamethasone 4mg twice a day and Dipyrone Sodium 500mg 4 times a day for three days, associated with hourly ice packs for three days.

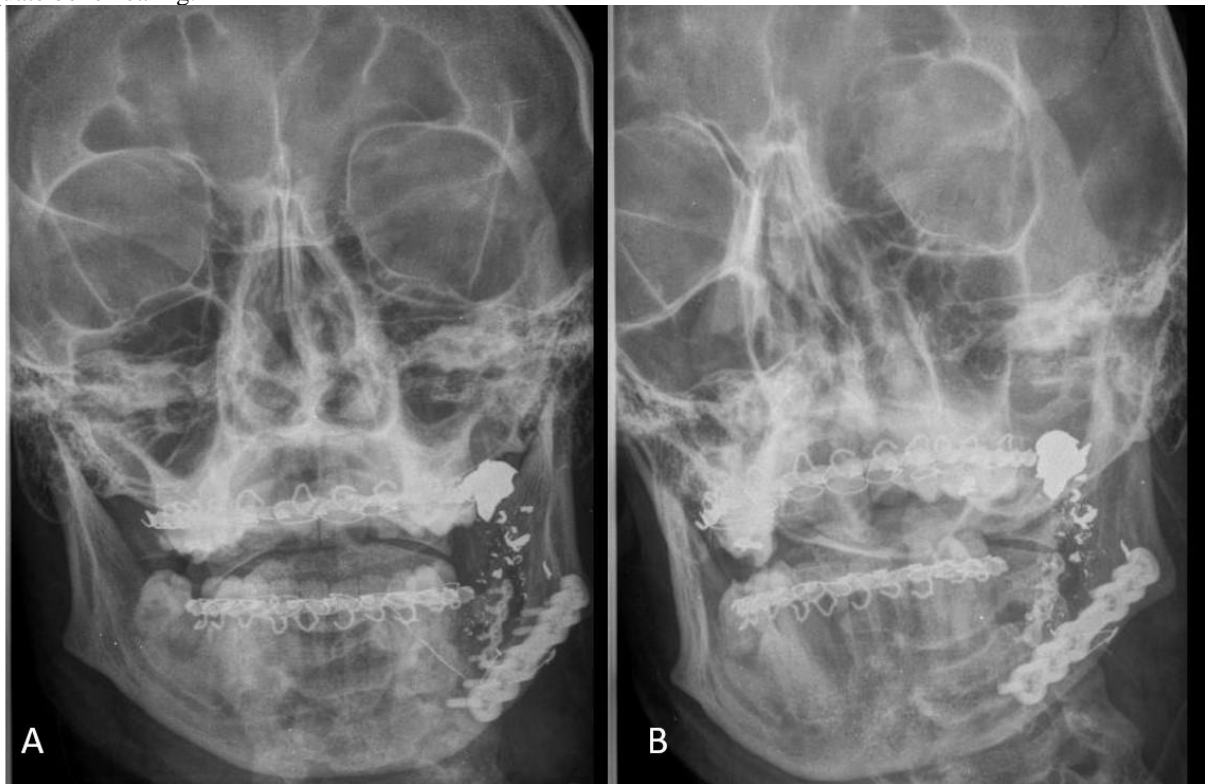
Figure 2. (A) Extra-oral access showing fracture of the mandible. (B) Reduction of jaw fracture with steel wire. (C) Simplification of viable bone fragment with system 2.0 synthesis material. (D) Fixation of the mandible fracture with a 2.7mm load bearing synthesis system.



On weekly outpatient visits, the patient presented a satisfactory evolution, without pain complaints, absence of phlogistic signs and with considerable mouth opening limitation (17mm), soon a muscle relaxant was prescribed and physiotherapy was started to increase the width of the mouth opening.

In the 60-day postoperative period, the patient presented with no complaints, with improved mouth opening (38mm), satisfactory occlusion and without any sign of dehiscence, bone sequestration, ischemia or infectious condition. In the postero-anterior radiographic examination of the face and left oblique radiography of the mandible, an appropriate bone consolidation was evidenced (Figures 3A and 3B). Erich bars were then removed and the patient was discharged on an outpatient basis.

Figure 3. Postoperative radiograph (A) postero-anterior of the face and (B) oblique of the mandible showing fixation and adequate bone healing.



3 DISCUSSION

Firearm injuries in the face are known to be devastating, most often resulting in comminuted fractures of the affected bones and facial disfigurement. Various forms of treatment for this condition have been described in the literature. The closed reduction with maxillomandibular block of these fractures has the advantage of preserving the periosteum with the maintenance of the blood supply and

lower infection rate, however, the treatment time is longer, nutrition is restricted and the hygiene of the patient is difficult⁹.

Regarding the treatment by means of open reduction with internal fixation, it is extremely important to understand that the stage of wound debridement and removal of any and all tissues that prove to be unfeasible, be it part of soft or hard tissues, can dictate the success of the chosen treatment, thus decreasing the probability of infection of the affected bed^{9,10}. In the case described, the debridement procedure was performed, making the prognosis more favorable by adopting measures that prevent the onset of an infectious condition.

In conventional load sharing fixation systems with 2.0mm plates and screws, used to simplify viable fragments, and 2.4mm, used to support all muscle-occlusal loads until bone consolidation, stability is achieved by locking the screw in the bone⁹. This approach method results in a decrease in blood supply due to the periosteal elevation for fracture accesses, favoring infections and bone sequestration, in a process of bone resorption in contact with the system, subsequently causing a loosening of the screw and loss of stability of the screws. newly reduced segments^{11,12}. Despite these factors, the degree of comminution and bone displacement will dictate the choice of open or closed treatment.

Therefore, the evolution of surgical techniques and locking systems for load bearing reconstruction plates with diameters 2.4 and 2.7mm brought a great advance for the treatment of severely comminuted fractures. This type of fixation presents greater stability and the capacity to support the mastication loads, even acting as a bridge over the fragmented or discontinuous region of the jaw, since screws have their locking on the plate^{11,12}. In the case referred to, as it is a comminuted mandibular fracture, the absolute indication of rigid fixation with a load bearing system was chosen, for better surgical predictability.

It is of fundamental importance to understand that because it is a trauma that causes avulsion, in many cases, of soft and bone tissues, and the infection rate is relatively higher than in conventional trauma, the application of preoperative antibiotic therapy, with continuity postoperative for at least 7 days for a favorable prognosis, in order to avoid acute short-term infections and long-term osteomyelitis, with antibiotic therapy of first choice in these cases being penicillins associated with beta-lactams, such as Ampicillin + Sulbactam or Amoxicillin + Potassium clavulanate^{6,8}. As in the case presented, there was loss of bone tissue and exposure of the intra-oral wound, and because it is a wound caused by a firearm, the antibiotic therapy protocol was systematically followed, for the best possible evolution of a challenging case like this.

The postoperative period of this type of intervention must be monitored in a systematic and rigid manner, since the surgical accesses and the level of tissue manipulation is extensive, generating edema of great magnitude, in addition to the possibility of wound dehiscence both intra and extra-oral infections and postoperative infection even with the use of antibiotic therapy^{13,14}. Thus, supervision in the first 15 postoperative days is essential¹⁵, after which muscle physiotherapy is initiated through spatula therapy and bi-digital mouth opening, being essential for gaining amplitude in the mouth opening and avoiding excessive muscle fibrosis, as was conducted in the case described.

4 CONCLUSION

Facial fractures caused by firearms are of great complexity and of enormous challenge to maxillofacial surgeons, as it is a trauma of more adverse results, since most of the time there is loss of substance, be it caused by the projectile or because of infections, very common in trauma resulting from firearms.

Within the world literature, there are still points against the treatment of choice for fractures resulting from these traumas, either in its conservative scope or by a surgical approach. In the case in question, the adoption of surgery and with strict outpatient monitoring; resulted in functional and aesthetic restoration of the patient, in a satisfactory manner, thus governing adequate management of the case presented.

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