



QUALIS
A2



FIFTEEN-YEAR-FOLLOWUP ON MANDIBULAR RECONSTRUCTION DUE TO GUNSHOT INJURY: A CASE REPORT¹

Natanael Carvalho de MESQUITA²

Federal University of Ceará (UFC)

E-mail: natanaelcarvalho8519@gmail.com

ORCID: <http://orcid.org/0000-0003-0219-6986>

Juliana Mara Oliveira SANTOS²

Federal University of Ceará (UFC)

E-mail: marajulianaos@gmail.com

ORCID: <http://orcid.org/0000-0002-9840-3670>

Abrahão Cavalcante Gomes de Souza CARVALHO³

Federal University of Ceará (UFC)

E-mail: abrahao@ufc.br

ORCID: <http://orcid.org/0000-0002-0581-2468>

Nayana Oliveira AZEVEDO²

Federal University of Ceará (UFC)

E-mail: azevedonayana@gmail.com

ORCID: <http://orcid.org/0009-0008-9436-1427>

Rafaela Alves CASTRO²

Federal University of Ceará (UFC)

E-mail: Rafaelacastro.odonto@gmail.com

ORCID: <http://orcid.org/0000-0001-9518-0881>

Renato Luiz Maia NOGUEIRA⁴

Federal University of Ceará (UFC)

E-mail: renatolmaia@terra.com.br

ORCID: <http://orcid.org/0000-0003-1940-0402>

ABSTRACT

Firearm wounds in the jaw region represent approximately 10% of cases in Brazil and firearm injuries account for 16% of general trauma cases, and their treatment remains complex due to extensive soft tissue damage and bone comminution. Mandibular reconstruction is typically performed using a reconstruction plate to bridge the defect. These rigid plates stabilize the remaining bone segments,

¹ COMO CITAR: (ABNT): MESQUITA, N. C.; SANTOS, J. M. O.; CARVALHO, A. C. G. S.; AZEVEDO, N. O.; CASTRO, R. A.; NOGUEIRA, R. L. M. Fifteen-Year-Followup on Mandibular Reconstruction due to Gunshot Injury: A Case Report. **JNT Facit Business and Technology Journal**. Qualis A2. ISSN: 2526-4281, Mês de Agosto de 2026 - Ed. 76. VOL. 01. Págs. 441-453. Disponível: <http://revistas.faculdefacit.edu.br>. Acesso em: __/__/__.

² MSc, Oral and Maxillofacial Surgery from Federal University of Ceara - UFC, Fortaleza/Ceara, Brazil.

³ PhD, Professor of Oral and Maxillofacial Surgery of Federal University of Ceara - UFC, Fortaleza/Ceara, Brazil.

⁴ PhD, Professor of Stomatology and Oral and Maxillofacial Surgery of Federal University of Ceara - UFC, Fortaleza/Ceara, Brazil.

maintaining occlusion and the facial contour. This report describes the clinical case of a patient with a mandibular defect caused by a firearm projectile. The patient was initially treated with two reconstruction plates and rehabilitated with implant-supported prostheses. After 15 years of follow-up, the plates fractured, necessitating a new surgical intervention. Specific characteristics of the mandibular defect in this case, such as its short length (25 mm) and lateral positioning, contributed to the greater longevity of the plates compared to findings reported by other researchers.

Keywords: Mandibular Gunshot Defect. Protocol-Type Implants. Oral Rehabilitation. Jaw Fractures. Gunshot Wounds.

INTRODUCTION

Gunshot wounds to the jaw region represent approximately 10% of cases in Brazil. Although this is not the region most commonly affected by fractures, firearm injuries account for 16% of general trauma cases, and their treatment remains complex due to extensive soft tissue damage and bone comminution [1,2,3]. The extent of damage is more closely related to the velocity of the projectile than its mass. High-velocity projectiles (>1200 feet per second [ps]) cause significant soft and hard tissue defects, while low-velocity projectiles (<1200 ps) may not result in extensive avulsive defects but can still cause comminution [4].

The wounding potential of a projectile is determined mainly by the kinetic energy transferred to the tissues, which increases with the square of its velocity. As the projectile passes through the face, it produces a permanent cavity along its track and a temporary cavity created by the radial dissipation of energy, which stretches and tears tissues located away from the visible wound path. When the projectile strikes the mandible, bone fragments may themselves act as secondary missiles, increasing soft tissue damage and contamination. For these reasons, injuries caused by high-velocity weapons typically present a small entrance wound and a much larger exit wound, whereas civilian injuries, most often caused by low-velocity handguns, tend to produce more limited avulsion but frequently result in comminuted fractures [4,10].

The mandible, owing to its prominent position and its role as the only mobile bone of the facial skeleton, is particularly vulnerable to ballistic trauma. Loss of mandibular continuity compromises mastication, swallowing, speech, airway protection and facial contour, and the resulting functional and aesthetic impairment has a substantial impact on the social reintegration of these patients. Consequently,

the management of mandibular gunshot injuries must consider not only the immediate stabilization of bone fragments but also the long-term biomechanical behavior of the reconstruction and the possibility of future prosthetic rehabilitation [3,5].

Initial management of gunshot wounds adheres to the principles of Advanced Trauma Life Support (ATLS), which involve identifying life-threatening injuries, stabilizing the patient, managing the airway, controlling bleeding, and ensuring adequate circulation. Once the patient is stabilized, attention is directed to facial injuries. Early reconstruction, ideally performed within 72 hours post-trauma, involves anatomical reduction, rigid fixation of bone structures, and the use of bone grafts in cases of significant bone loss or severe comminution [3,5].

Mandibular reconstruction is typically achieved by bridging the defect with rigid reconstruction plates, which stabilize the remaining bone segments and preserve occlusion and facial contour. Following bone defect reconstruction, restoring masticatory function is essential. Dental rehabilitation presents a significant challenge, requiring a multidisciplinary approach to ensure treatment success. Rehabilitation is most commonly achieved through implant placement, which enhances the patient's aesthetics, chewing ability, and phonation [6].

Continuity defects of the mandible can be described according to their location and extent. The classification proposed by Jewer et al. [11] divides mandibular defects into central (C), lateral (L) and hemimandibular (H) segments, the latter including the condyle, and this system remains widely used to plan reconstruction and to compare results between studies. Lateral defects that preserve the condyle and the symphysis, such as the one described in this report, are generally considered more favorable, since the remaining segments maintain the mandibular arch form and are subjected to lower bending moments than defects involving the anterior region.

Several reconstructive alternatives are available for these defects. Vascularized bone flaps, particularly the fibula free flap introduced by Hidalgo [12], are considered the gold standard for large segmental defects because they provide well-vascularized bone of adequate length, allow primary bone union and support endosseous implants. Nonvascularized bone grafts, such as those harvested from the iliac crest, are a simpler option and are effective for short defects, usually smaller than 5 to 6 cm, in non-irradiated tissue and in patients who are medically unable to tolerate prolonged microsurgical procedures [13]. Finally, bridging the defect with a titanium reconstruction plate alone, with or without bone substitutes, is a less invasive option that preserves mandibular continuity and facial contour, although it is associated

with long-term complications such as plate exposure, screw loosening and plate fracture [14,15].

Oral rehabilitation with implant-supported prostheses for mandibular defects caused by gunshot wounds represents a significant intervention in improving patients' quality of life. This process not only addresses functional and aesthetic concerns but also impacts psychosocial aspects. In this context, Mersin et al. [7] emphasized the importance of reestablishing physical dimensions while considering the critical role of oral rehabilitation in enhancing social function. Improving speech and swallowing is a vital component of this process.

This report presents the clinical case of a patient with a mandibular defect caused by a firearm projectile. The patient was initially treated with two reconstruction plates and rehabilitated with implant-supported prostheses. After 15 years of follow-up, a plate fracture occurred, requiring additional surgical intervention.

Long-term follow-up reports of mandibular reconstruction after gunshot injury are scarce, and most published studies describe outcomes within the first few years after treatment. Therefore, the objective of this report is to describe the 15-year follow-up of a patient with a lateral mandibular defect caused by a firearm projectile, treated with reconstruction plates and rehabilitated with implant-supported prostheses, and to discuss the factors that may have contributed to the longevity of the fixation and to the subsequent fatigue fracture of the plates.

CASE REPORT

A 77-year-old male patient, O.M.S., presented with a history of a gunshot wound to the left jaw sustained in 2008. The trauma resulted in severe blood loss, leading to a 40-day period in an induced coma. After discharge from the hospital, the patient reported persistent pain in the affected region. His medical history included hypertension, diabetes, and a 30% reduction in renal function.

Clinical examination revealed that both intraoral and extraoral wounds had healed without signs of infection. The patient was edentulous in both arches and exhibited mandibular mobility. Computed tomography (CT) imaging demonstrated a comminuted fracture in the left mandibular angle measuring approximately 25 mm in length (Figure 1A).

Fracture fixation was performed at a private hospital under general anesthesia with nasal intubation. Submandibular access was utilized to expose the fracture site. Two plates from the 2.7 system were used to stabilize the fracture: one with 10 holes

and 7 screws in the stress-bearing region and another with 13 holes and 9 screws in the compression region (Figure 1B).

Two years later, the patient underwent oral rehabilitation, receiving both upper and lower implant-supported prostheses. In the mandible, five implants were strategically placed, avoiding the area of the bone defect. Six implants were installed in the maxilla to support the upper prosthesis. The patient experienced no complications until 2022, when he reported renewed pain and mobility in the left mandibular angle. A CT scan revealed that both plates had fractured due to fatigue over time, although all implants remained viable (Figures 1C, 1D).

Mandibular reconstruction was performed through a new surgical intervention under general anesthesia with nasal intubation. Submandibular access was used to approach the affected site (Figure 2A). A 2.7 reconstruction plate was first placed at the base of the mandible to stabilize the bone fragments (Figure 2B). The fractured plates were subsequently removed (Figure 2C), and the bone fragments were thoroughly cleaned (Figure 2D). Two additional 2.7 reconstruction plates were then fixed—one in the compression region and the other in the stress-bearing region (Figure 2E). Finally, a xenogenic bone graft was used to fill the bone defect, which measured approximately $2.0 \times 2.0 \times 1.5$ cm, and rehabilitation with prostheses was performed (Figure 2F).

DISCUSSION

The treatment of mandibular gunshot wounds remains both challenging and controversial due to the extensive damage to bone and soft tissue. While advances in bone reconstruction and oral rehabilitation techniques have improved patient outcomes, achieving optimal restoration of anatomy and masticatory function, improving quality of life, and minimizing the number of required interventions remain key goals. Various surgical techniques are available, ranging from fixation with plates and screws to the use of autogenous bone grafts, allografts, or combinations of both for reconstruction [1-5].

The literature describes two primary approaches to managing maxillofacial ballistic injuries: early and aggressive intervention or a more conservative approach. According to Brauner et al. [3], there has been a recent shift toward early, aggressive management, involving reduction, open surgical fixation, and reconstructive procedures in a single stage, including debridement and soft tissue closure. Advantages of this approach include greater tissue mobilization, reduced fibrosis, and shorter periods of facial deformity. However, conservative management remains the

preferred initial strategy in cases with uncertain lesion margins, with reconstructions typically deferred as secondary interventions [8].

Fernandes et al. [6] provide an illustrative example, proposing the use of a bone graft combined with a titanium mesh for reconstructing the central mandibular arch. Their study emphasized the synergistic use of maxillomandibular fixation, which not only stabilized the graft but also facilitated neovascularization, highlighting the importance of integrating surgical strategies to optimize outcomes for mandibular defect reconstruction.

The choice of reconstructive technique should take into account the size and location of the defect, the condition of the surrounding soft tissues and the general health of the patient. Foster et al. [13] demonstrated that vascularized bone flaps achieve higher rates of bone union and implant success than nonvascularized grafts, but they also recognized that nonvascularized grafts remain effective for short defects and for medically compromised patients. In the present case, the short length of the defect (25 mm), the preservation of the condyle and of the anterior mandible, and the presence of systemic comorbidities, including hypertension, diabetes and reduced renal function in an elderly patient, favored a less invasive approach based on rigid fixation with reconstruction plates, avoiding the additional operative time and donor site morbidity associated with microvascular reconstruction.

In many cases, the use of bone plates or grafts is essential for stabilizing fractures and promoting recovery. Ballistic trauma to the jaw often results in extensive damage, including multiple comminuted fractures and bone tissue loss. The primary objectives of treatment are to restore masticatory function, maintain facial aesthetics, and prevent complications such as infection or occlusal disorders. Achieving these goals establishes a solid foundation for subsequent soft tissue reconstruction and dental rehabilitation [4].

The longevity of reconstruction plates is relatively high, with survival rates of 96.2% at one year, 91.8% at two years, and 87.9% at five years. Plate complications, such as fractures, are statistically correlated with the size of the bone defect. Short to moderate defects (40–80 mm) and medium defects (81–120 mm) have lower complication rates compared to larger defects [1,2]. In this case, the mandibular defect measured only 25 mm, likely contributing to the prolonged survival of the reconstruction plates.

Fractures of reconstruction plates often occur near the bone segment of the mandible, particularly at the notch of the plate's screw holes, where flexural stresses are highest. Repeated masticatory forces can weaken the plate through fatigue.

According to Almansoori et al. [1], patients with fewer occluded teeth have longer plate survival times due to reduced masticatory forces acting on the plates.

Data from long-term studies help to place the present case in context. Maurer et al. [14], evaluating 102 patients with mandibular continuity defects over a 10-year period, reported complications related to the reconstruction plate in 39% of cases, with plate fracture occurring in 5% of patients; all fractures were observed at least six months after surgery, reinforcing the role of cumulative fatigue loading. In that study, the risk of plate failure was significantly higher in men and in smokers, whereas the anatomical site of the defect did not significantly influence the outcome. These findings indicate that plate fracture is a late complication, which can only be detected with prolonged follow-up such as that reported here.

From a biomechanical standpoint, a reconstruction plate bridging a continuity defect behaves as a load-bearing device, receiving all of the functional loads that would normally be shared with the bone. Each masticatory cycle produces repetitive bending and torsional stresses, which concentrate at the screw holes adjacent to the bone ends and at sites where the plate has been bent during contouring. Over time, these cyclical stresses lead to the initiation and propagation of microcracks, ultimately resulting in fatigue fracture. In the present case, the use of two plates, positioned in the tension and compression zones, probably distributed functional loads more favorably and contributed to the long survival of the fixation. Nevertheless, the absence of bone union across the defect meant that the plates continued to function as load-bearing devices throughout the entire follow-up period, which explains their eventual failure.

Recent technological advances have been introduced to reduce plate-related complications. Virtual surgical planning and computer-aided design and computer-aided manufacturing (CAD/CAM) allow the production of patient-specific reconstruction plates that do not require intraoperative bending, thereby reducing residual stresses in the material and improving the adaptation of the plate to the bone surface [15]. However, Rendenbach et al. [16], comparing patient-specific and conventional fixation in 128 osseous free flaps, did not find a reduction in plate-related complications with customized plates, and identified radiotherapy and multisegment flaps as the main risk factors. Thus, conventional reconstruction plates, which are widely available and less costly, remain a valid option, particularly in short lateral defects such as the one described in this report.

In seeking effective oral rehabilitation for patients with mandibular defects caused by ballistic trauma, protocol-type implants have demonstrated encouraging

results. These implants, characterized by immediate fixation and early functional loading, enhance force distribution and hygiene maintenance. Brauner et al. [3] emphasized that implant-supported prostheses, especially fixed hybrid prostheses, are the most satisfactory option for such patients. These prostheses provide better force distribution, improved stability, and greater retention, compensating for the unique challenges posed by ballistic trauma.

The systemic condition of the patient must also be considered when planning implant-supported rehabilitation. Diabetes mellitus has historically been regarded as a relative contraindication to implant therapy because hyperglycemia impairs bone metabolism and wound healing. However, a systematic review by Javed and Romanos [17] concluded that osseointegration can be successfully achieved in patients with diabetes who maintain good metabolic control, with success rates similar to those of non-diabetic individuals. In the present case, despite the patient's age and comorbidities, all implants remained viable throughout the follow-up period, which highlights the importance of careful patient selection, systemic control and regular maintenance.

In the present case, oral rehabilitation was achieved using five implants in the mandible, strategically placed to avoid the bone defect area. This approach mirrors that described by Gökçen-Röhlig et al. [9] in a case involving an anterolateral mandibular defect caused by a gunshot wound. In their study, a bone graft initially failed, but three implants were successfully placed during the same procedure after removing necrotic tissue. At two years postoperatively, the patient showed no signs of bone resorption or inflammation around the implants.

When implants are placed directly in reconstructed bone, survival rates comparable to those obtained in native bone have been reported. Chiapasco et al. [18] observed cumulative implant survival and success rates of 93.1% and 98.6%, respectively, for implants placed in fibula free flaps. Similarly, the review by Jensen and Terheyden [19] showed that the survival of implants placed in augmented bone is comparable to that of implants placed in pristine bone. In the present case, the implants were deliberately positioned away from the defect, in native bone, which avoided loading the reconstructed region directly. The xenogeneic bone graft used during the second intervention to fill the $2.0 \times 2.0 \times 1.5$ cm gap acts as an osteoconductive scaffold that may favor bone formation between the segments, potentially reducing the load borne exclusively by the new plates over time.

This report has limitations inherent to its design. As a single case, its findings cannot be generalized, and factors such as masticatory force, occlusal scheme,

prosthesis design and plate material were not quantitatively assessed. Nevertheless, the 15-year follow-up provides valuable information on the long-term behavior of reconstruction plates in short lateral mandibular defects, a scenario rarely documented in the literature. Prospective studies with larger samples and standardized long-term radiographic follow-up are needed to better define the survival of reconstruction plates and the factors that influence their failure.

Managing reconstructions of firearm-induced trauma requires significant anatomical knowledge and technical skill from the oral and maxillofacial surgeon. Although the reconstruction plate in this case fractured after 15 years of follow-up, its longevity exceeded that reported in the literature, likely due to the small size of the mandibular defect (25 mm). Furthermore, the implant-supported prostheses remained functional and aesthetically intact, underscoring their critical role in achieving long-term oral rehabilitation success.

CONCLUSION

Reconstruction of a short lateral mandibular defect caused by a firearm projectile using two 2.7 system reconstruction plates, followed by rehabilitation with implant-supported prostheses, provided stable function and facial contour for 15 years. The eventual fracture of the plates was consistent with long-term fatigue, since the plates functioned as load-bearing devices in the absence of bone union across the defect. The small size and lateral position of the defect, together with the use of two plates in the tension and compression zones, probably contributed to a longevity greater than that reported in the literature. Secondary reconstruction with new plates and a xenogeneic bone graft allowed the preservation of the existing implants and prostheses.

Patients with mandibular reconstruction plates should be followed up over the long term, with periodic clinical and tomographic evaluation, so that signs of fatigue or loosening can be detected early and managed before more extensive complications occur.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest regarding the publication of this article.

ETHICAL APPROVAL

All ethical considerations were strictly followed in accordance with international guidelines. The patient provided informed consent through a signed Term of Free and Informed Consent (TFIC) form, ensuring their voluntary participation and understanding of the purpose, risks, and benefits of the study. Confidentiality and anonymity were safeguarded, with all personal identifiers removed to protect the patient's privacy. The study was conducted in compliance with ethical standards set forth by the Declaration of Helsinki and approved by the relevant institutional review board.

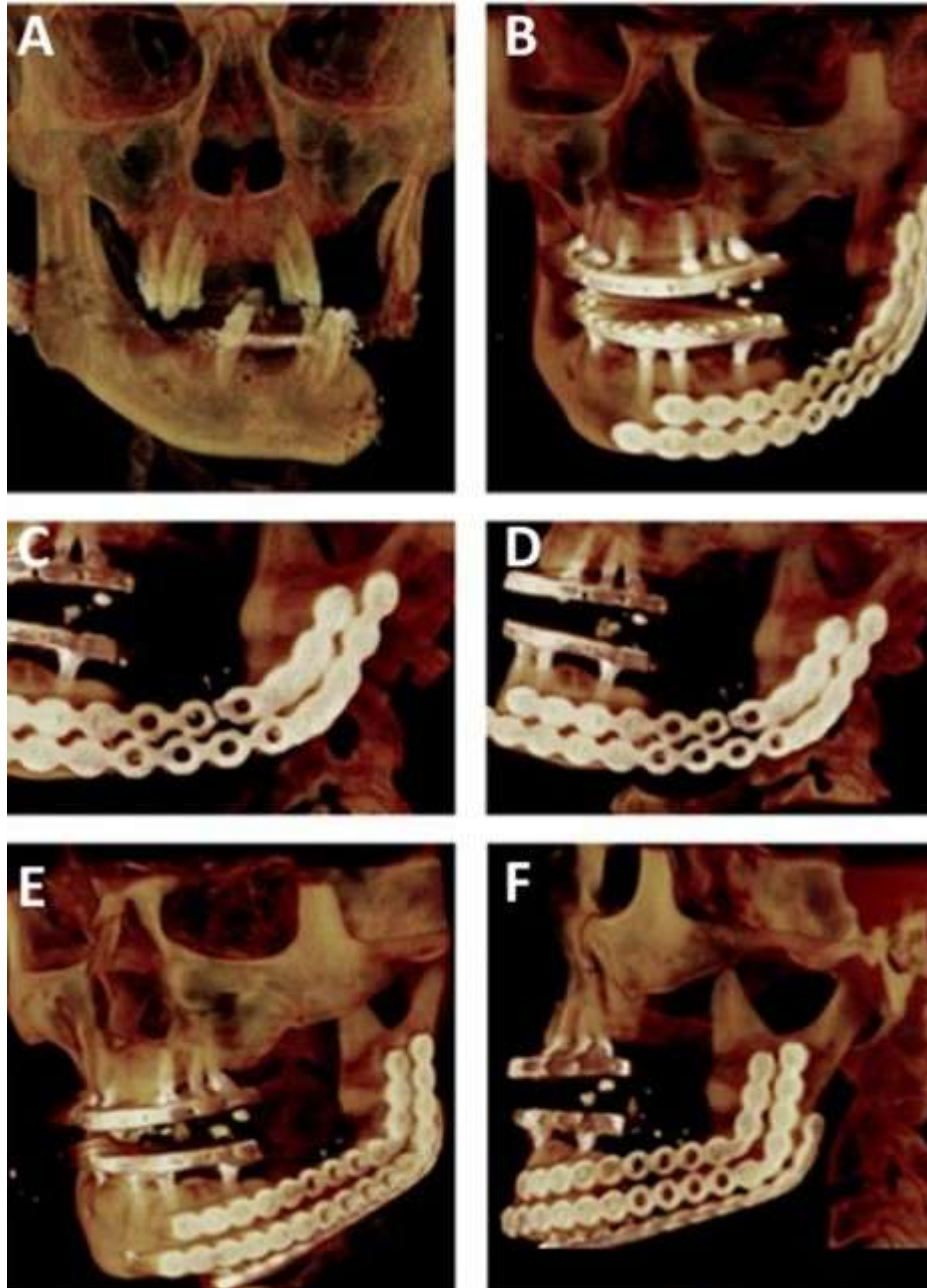
REFERENCES

- [1] Almansoori AA, Choung HW, Kim B, Park JY, Kim SM, Lee JH. Fracture of standard titanium mandibular reconstruction plates and preliminary study of three-dimensional printed reconstruction plates. *J Oral Maxillofac Surg.* 2020;78:153-66. DOI: 10.1016/j.joms.2019.07.016. PMID: 31473106.
- [2] Bede SYH, Ismael WK, Hashim EA. Reconstruction plate-related complications in mandibular continuity defects. *Oral Maxillofac Surg.* 2019;23:193-99. DOI: 10.1007/s10006-019-00762-5. PMID: 31044342.
- [3] Brauner E, Laudoni F, Amelina G, Cantore M, Armida M, Bellizzi A et al. Dental management of maxillofacial ballistic trauma. *J Pers Med.* 2022;12:934. DOI: 10.3390/jpm12060934. PMID: 35743719; PMCID: PMC9225066.
- [4] McLean JN, Moore CE, Yellin SA. Gunshot wounds to the face—acute management. *Facial Plast Surg.* 2005;21:191-98. DOI: 10.1055/s-2005-922859. PMID: 16307399.
- [5] Khatib B, Gelesko S, Amundson M, Cheng A, Patel A, Bui T et al. Updates in management of craniomaxillofacial gunshot wounds and reconstruction of the mandible. *Facial Plast Surg Clin North Am.* 2017;25:563-76. DOI: 10.1016/j.fsc.2017.06.007. PMID: 28941508.
- [6] Fernandes BDR, Mendes BC, Mulinari-Santos G, Okamoto R, Homsy N, Rocha-Jr HVD et al. Strategy of mandibular central arch reconstruction after firearm injury. *J Craniofac Surg.* 2019;30:e629-30. DOI: 10.1097/SCS.0000000000005655. PMID: 31157639.
- [7] Mersin TÖ, Kılıçarslan MA, Tetik E. Improvement of speech by facial prosthesis in a midfacial defect with a gunshot injury: A case report. *J Prosthodont.* 2023;32:553-59. DOI: 10.1111/jopr.13693. PMID: 37038304.
- [8] Cetira Filho EL, Oliveira Neto JQ, Vasconcelos RB, Carvalho ACGS. Early reconstruction of gunshot mandible fracture: A modified approach. *J Craniofac Surg.* 2019;30:e653-55. DOI: 10.1097/SCS.0000000000005723. PMID: 31490443.

- [9] Gökçen-Röhlig B, Atalay B, Baca E, Işık D, Meriç U. Prosthetic rehabilitation of a patient with a mandibular defect caused by a gunshot wound. *J Craniofac Surg*. 2009;20:1614-17. DOI: 10.1097/SCS.0b013e3181b14749. PMID: 19816311.
- [10] Peled M, Leiser Y, Emodi O, Krausz A. Treatment protocol for high velocity/high energy gunshot injuries to the face. *Craniofac Trauma Reconstr*. 2012;5:31-40. DOI: 10.1055/s-0031-1293518. PMID: 23449809; PMCID: PMC3348750.
- [11] Jewer DD, Boyd JB, Manktelow RT, Zuker RM, Rosen IB, Gullane PJ et al. Orofacial and mandibular reconstruction with the iliac crest free flap: a review of 60 cases and a new method of classification. *Plast Reconstr Surg*. 1989;84:391-403. PMID: 2762397.
- [12] Hidalgo DA. Fibula free flap: a new method of mandible reconstruction. *Plast Reconstr Surg*. 1989;84:71-9. PMID: 2734406.
- [13] Foster RD, Anthony JP, Sharma A, Pogrel MA. Vascularized bone flaps versus nonvascularized bone grafts for mandibular reconstruction: an outcome analysis of primary bony union and endosseous implant success. *Head Neck*. 1999;21:66-71. DOI: 10.1002/(sici)1097-0347(199901)21:1<66::aid-hed9>3.0.co;2-z. PMID: 9890353.
- [14] Maurer P, Eckert AW, Kriwalsky MS, Schubert J. Scope and limitations of methods of mandibular reconstruction: a long-term follow-up. *Br J Oral Maxillofac Surg*. 2010;48:100-4. DOI: 10.1016/j.bjoms.2009.07.005. PMID: 19647911.
- [15] Kakarala K, Shnayder Y, Tsue TT, Girod DA. Mandibular reconstruction. *Oral Oncol*. 2018;77:111-17. DOI: 10.1016/j.oraloncology.2017.12.020. PMID: 29362116.
- [16] Rendenbach C, Steffen C, Hanken H, Schluermann K, Henningsen A, Beck-Broichsitter B et al. Complication rates and clinical outcomes of osseous free flaps: a retrospective comparison of CAD/CAM versus conventional fixation in 128 patients. *Int J Oral Maxillofac Surg*. 2019;48:1156-62. DOI: 10.1016/j.ijom.2019.01.029. PMID: 30792087.
- [17] Javed F, Romanos GE. Impact of diabetes mellitus and glycemic control on the osseointegration of dental implants: a systematic literature review. *J Periodontol*. 2009;80:1719-30. DOI: 10.1902/jop.2009.090283. PMID: 19905942.
- [18] Chiapasco M, Biglioli F, Autelitano L, Romeo E, Brusati R. Clinical outcome of dental implants placed in fibula-free flaps used for the reconstruction of maxillo-mandibular defects following ablation for tumors or osteoradionecrosis. *Clin Oral Implants Res*. 2006;17:220-8. DOI: 10.1111/j.1600-0501.2005.01212.x. PMID: 16584419.
- [19] Jensen SS, Terheyden H. Bone augmentation procedures in localized defects in the alveolar ridge: clinical results with different bone grafts and bone-substitute materials. *Int J Oral Maxillofac Implants*. 2009;24 Suppl:218-36. PMID: 19885447.

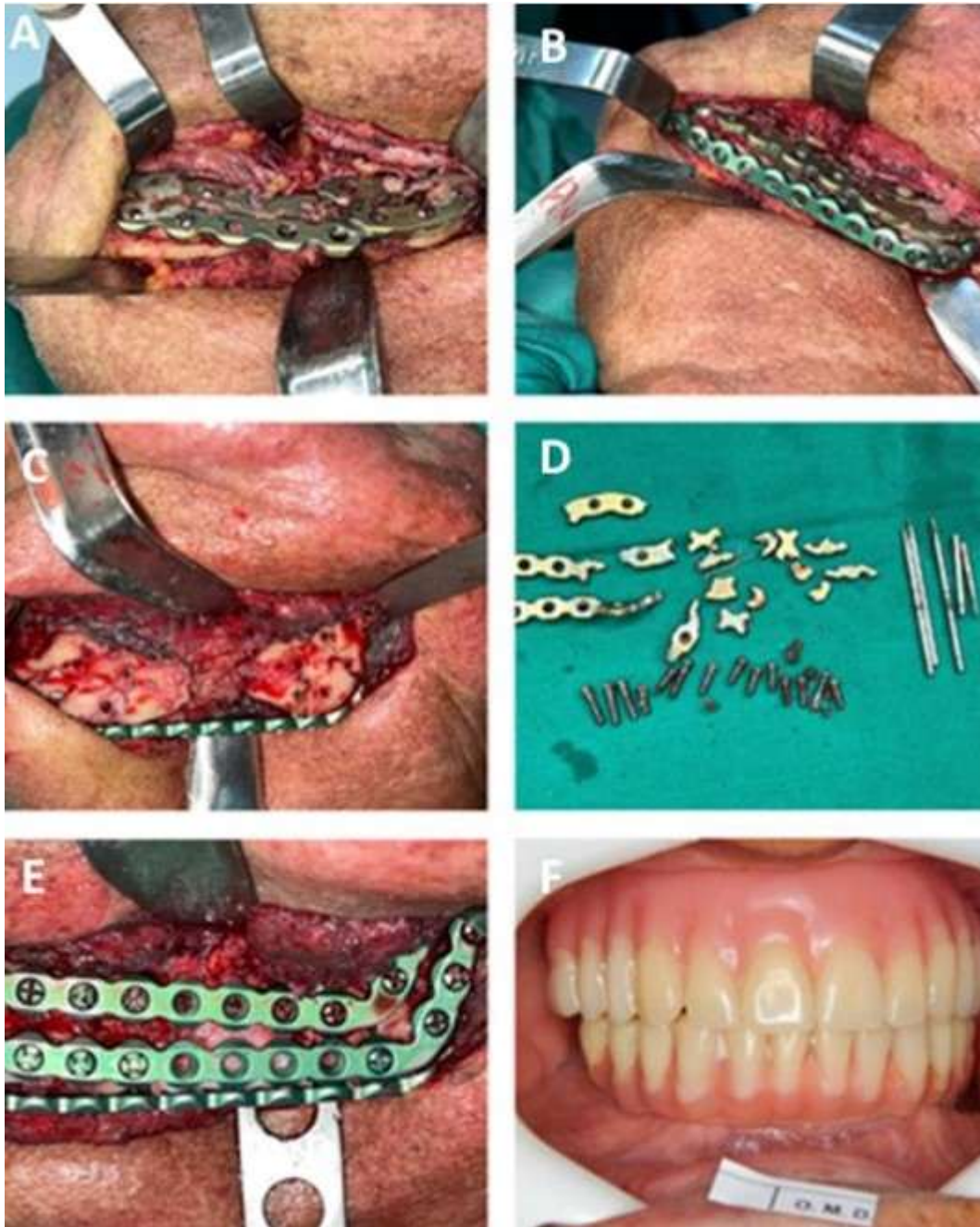
FIGURAS

Figure 1: (A) Initial computed tomography in 2008 with a comminuted fracture in the left mandibular angle measuring 2.5 cm in length, caused by a firearm projectile, (B) Computed tomography in 2010 with implant protocols in the upper and lower arches and with the two mandibular surface plates of the 2.7 system placed in 2008, (C-D) Computed tomography scans in 2022 with both plates fractured and intact implants, (E) Computed tomography in 2022 with 3 mandibular destruction plates of the 2.7 system placed in the mandible: at its base, in the specification region, and another in the tension region, (F) Computed tomography in 2022 with xenogeneic bone graft in the bone gap, measuring approximately 2.0 x 2.0 x 1.5 cm.



Source: Authors' personal archive (clinical records and images of the patient described in this report).

Figure 2: (A) Submandibular surgical approach with visualization of two fractured plates, (B) Mandible stabilized with reconstruction plate in the mandibular angle region, (C) Mandibular region after removal of the fractured plates, (D) Fragments of the fractured plates removed, (E) Two plates inserted in addition to the existing one for reconstruction of the mandibular bone defect, (F) Patient in occlusion rehabilitated with upper and lower prosthesis supported by implants.



Source: Authors' personal archive (clinical records and images of the patient described in this report).