INTERNATIONAL SEVEN JOURNAL
OF HEALTH RESEARCH
ISSN: 2764-9415

COMPLICATIONS ASSOCIATED WITH MANDIBULAR RECONSTRUCTION WITH ILIAC CREST BONE GRAFT: A CASE REPORT

https://doi.org/10.56238/isevjhv4n2-001

Receipt of originals: 02/10/2025 **Acceptance for publication:** 03/10/2025

Carolina Rosa Barros Oliveira[1], Rair de Miranda Santos[2], Elias Almeida dos Santos[3], Maria Carolina Santos dos Santos[4] and Adriano Freitas de Assis[5]

ABSTRACT

The use of iliac crest bone grafts has become one of the main methods of mandibular bone reconstruction, due to factors that include anatomical similarity and resistance to masticatory forces. Several aspects are determinant for the success of this technique, including shape, location, and size of the bone defect; age, medical condition, and oral hygiene of the patient. In addition, the etiology of the fracture should be considered in the prognosis of surgical treatment. Fractures caused by firearm projectiles, for example, tend to result in postoperative infections, due to the contamination of the wound. The present study aims to present the use of iliac crest bone grafts and associated complications through a clinical case report. Patient M.R.S., male, victim of an accident caused by a firearm projectile in 2017, sought the Oral and Maxillofacial Surgery and Traumatology service of the General Hospital of the State of Bahia with pain in the left hemimandible. On physical examination, the patient presented atypical mobility on mandibular manipulation and the presence of a submandibular fistula on the left with serous drainage at milking. Computed tomography showed a bone defect in the mandibular body region with the presence of a fractured reconstruction plate. Reconstruction of the defect was performed with a free iliac crest graft and reconstruction plates. However, the patient developed a graft infection, and its removal

[1] Resident in Oral and Maxillofacial Surgery and Traumatology – Federal University of Bahia
Salvador/BA- Brazil. Zip Code:41100-150
E-mail: carolinarosabo@gmail.com
ORCID: 0000-0002-4993-1135
LATTES: http://lattes.cnpq.br/0947108296546102
[2] Oral and Maxillofacial Surgeon – Federal University of Bahia
Salvador/BA- Brazil. Zip Code:41100-150
E-mail: rair.miranda@hotmail.com
ORCID: 0009-0009-5982-7487
LATTES: http://lattes.cnpq.br/5686066711351519
[3] Oral and Maxillofacial Surgeon – Federal University of Bahia
Salvador/BA- Brazil. Zip Code:41100-150
E-mail: elias.almeidast@gmail.com
ORCID: 0000-0003-1592-468X
LATTES: http://lattes.cnpq.br/6197932609983613
[4] Dental Surgeon - Faculty of Technology and Sciences - UniFTC
Salvador/BA- Brazil. Zip Code: 41741-590
E-mail: mcarolinasant@gmail.com
ORCID: 0009-0002-3088-572X
LATTES: http://lattes.cnpq.br/1554618595573019
[5] Preceptor of the Oral and Maxillofacial Surgery and Traumatology Service of the State General Hospital (HGE)
Salvador/BA- Brazil. Zip Code:40286-901
E-mail: Adrianoassis@hotmaill.com
ORCID: 0000-0001-6177-944x
LATTES: http://lattes.cnpq.br/6809174154355691

was recommended, without further complications. Accurate diagnosis and planning, and good execution of the technique contribute to the success of the procedure. However, associated complications are possible, as with any surgical procedure.

Keywords: Mandibular reconstruction. Infections. Complications. Allografts.

INTRODUCTION

Several etiological factors trigger maxillofacial bone defects. Pathologies such as ameloblastoma, squamous cell carcinoma, and sarcomas, in addition to facial trauma resulting mainly from physical aggression, car and motorcycle accidents, or injuries caused by firearm projectiles (FAP) have been described in the literature as the main determinants of bone structural discontinuity, especially in the lower third of the face (Barros *et al.*, 2021; Silva *et al*., 2021; Fernandes, Silva, Araújo., 2021).

Such bone defects directly affect masticatory, phonatory, and swallowing functions, in addition to interfering with the patient's facial anatomical configuration and severely affecting their quality of life (Silva *et al*., 2021; Santana *et al.*, 2024). In the beginning, surgery to repair the discontinuity of the mandibular bone consisted only of the installation of reconstruction plates. However, this isolated method resulted in complications such as unwanted plate fractures (Silva *et al*., 2021).

Delayed bone union is characterized when the bone repair time exceeds that normally observed for a given type of fracture. This is also a complication commonly observed in fractures in which errors occur in the choice of osteosynthesis method. Thus, the prolonged healing period can result in a poor union, a consolidation without satisfactory anatomical alignment, and an incorrect union of the bone fragments. It is also possible to result from non-union of the fracture, a failure in the grouping of bone fragments after all signs of osteogenic activity cease at the site (Fernandes, Leite, Miyauchi., 2008).

Given this, the use of bone grafting was introduced. This technique, which consists of transplanting a bone substitute to treat the defect, aims at functional reestablishment and restoration of the aesthetics of the recipient bed. (Barros *et al.*, 2021; Silva *et al*., 2021). Recently, several forms of mandibular bone reconstruction have been proposed with the use of different types of grafts ranging from: vascularized or non-vascularized autogenous, allografts, xenogens, and alloplastics (Anjos *et al*., 2021).

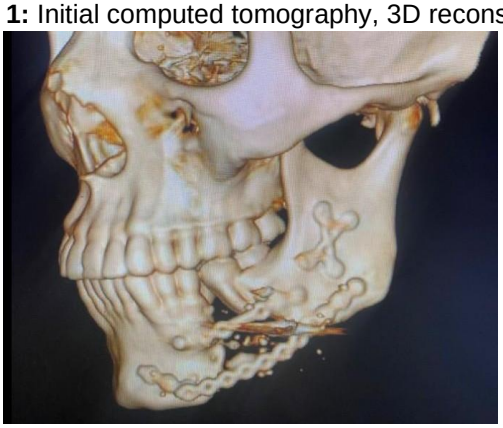
The process of integrating the donor tissue with the new bone produced by the recipient bed should result in a good incorporation of bone grafts, thus the ideal graft needs to have good biocompatibility, high osteogenic potential, osteoconductive and osteoinductive, and resistance to masticatory forces and fracture (Portinho *et al.,* 2016). For these reasons, the autogenous graft is considered the "gold standard", being the only one that offers cells with the capacity for bone neoformation, growth factors, and bone

structure immunologically identical to that of the recipient bed (Barros *et al.*, 2021; Anjos *et al*., 2021). In addition, determining factors for the choice of a donor site should include the extent of the defect, the condition of the recipient bed, the patient's age and systemic status, bone quality of the donor site, the complexity of the surgical access, postoperative morbidity level, and anatomical compatibility with the recipient bed, to provide good aesthetic results. Functional and satisfactory bone contour (Silva *et al*., 2021; Fernandes, Silva, Araújo., 2021).

Bone grafting failure is mainly associated with late treatment, leading to unfavorable aesthetic results, greater morbidity, slower rehabilitation, and sequelae associated with extemporaneous reconstruction. In addition, the risk of bone graft rejection increases when the recipient bed derives from gunshot wounds, since when they reach the bone, they tend to fragment, exposing the underlying region to a large surface area of lead, which when retained in the tissues can generate a series of complications (Portinho *et al.,* 2016; McQuirter *et al.,* 2001)).

Therefore, the present study aims to report a clinical case of reoperation in a patient who was a victim of FAP with the replacement of a fractured reconstruction plate with a reconstruction of a mandibular defect with an autogenous bone graft from the iliac crest and installation of a new reconstruction plate.

Figure 1: Initial computed tomography, 3D reconstruction.



Source: Personal archive.

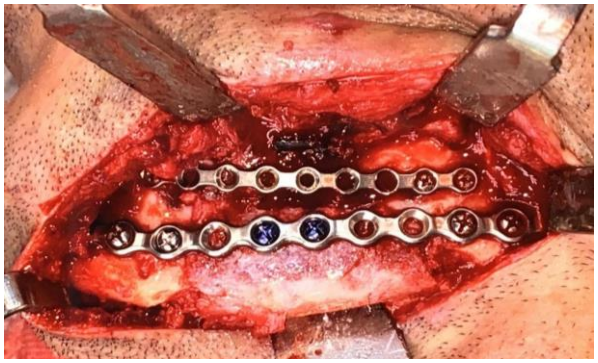
Figure 2: Access and exposure of the bone defect evidencing the defect.

Source: Personal archive.

Figure 3: Adaptation of the iliac crest bone block.

Source: Personal archive

Figure 4: Bone block fixation and reconstruction plate installation systems 2.0 and 2.4 respectively.



Source: Personal archive

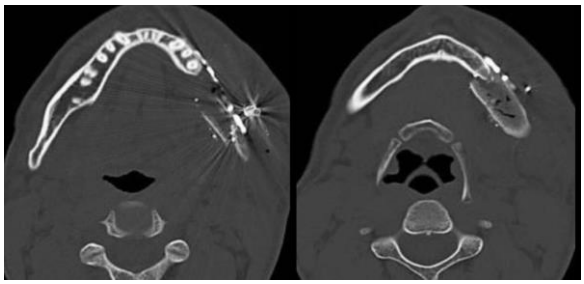
Figures 5 and 6: Patient presenting an increase in volume in the lower third of the face on the right, on the 18th POD.

Source: Personal archive.

Figure 7: Computed tomography (3D reconstruction) after bone graft reconstruction.

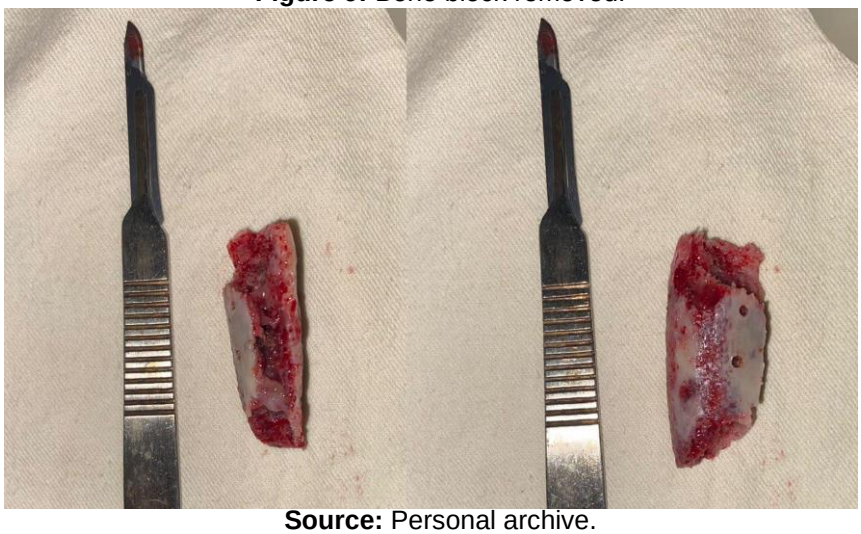
Source: Personal archive.

Figure 8: Computed tomography scan (axial section) showing edema in the face after reconstruction with a bone graft.



Source: Personal archive.

Figure 9: Bone block removed.



Source: Personal archive.

METHODOLOGY

From a clinical case that occurred at the General Hospital of the State of Bahia, associated with his dental record, a case report study was carried out, in which information was collected on a scientific basis, in **PubMed, Scielo, and Google Scholar** databases, obtaining a total of 19 references covering the Portuguese and English languages, aiming to support the ideas discussed in this article.

CASE REPORT

Patient M.S.R., 31 years old, male, Caucasian, victim of an accident due to a firearm perforation (FAP) in 2017, presented to the Oral and Maxillofacial Surgery and Traumatology service of the General Hospital of the State of Bahia (HGE), with a failure of synthesis material, presenting painful symptoms for 15 days.

Oral and maxillofacial physical examination showed the presence of atypical mandibular manipulation mobility, associated with the presence of a submandibular fistula on the left with serous drainage on milking, limited mouth opening, occlusal dystopia and a report of hypoesthesia in the lower third of the left face.

Computed tomography of the face showed a bone defect in the left region of the mandibular body (Figure 1) and the presence of fractured synthesis material. Given the clinical picture and imaging tests, a surgical reapproach was chosen as treatment. After routine preoperative examinations, surgical planning was performed for the reconstruction of the mandibular defect with a free iliac crest graft.

Under general anesthesia, the procedure was followed by intubation of the patient through the nasotracheal route, and initial intervention with the orthopedics and traumatology team of the HGE, which performed the surgical access and removal of the bone graft en bloc from the anterior region of the iliac crest, which was regularized and reserved in 0.9% saline solution. At the same surgical time, the Oral and Maxillofacial Surgery and Traumatology team of the HGE exposed the bone defect through the Ridson access, through the preexisting scar, followed by divulsion by planes and mucoperiosteal detachment to expose the fractured material. After the fractured reconstruction plate was removed, the recipient bed was prepared by osteotomy and curettage of the infected bone (Figure 2).

To remove future infectious foci, dental unit 37, which had root exposure, was extracted. The graft was then positioned and adjusted, obtaining a good adaptation (Figure 3). Fixation was performed with a new 2.4mm system reconstruction plate and a 2.0mm system plate (Figure 4). In conjunction with the iliac crest graft, crushed bone fragments were added to promote a better adaptation between the bone stumps. After hemostasis and irrigation with 0.9% saline solution, the suture was performed by planes with 3-0 Vicryl resorbable thread and 4-0 Nylon skin.

The patient remained under postoperative observation in the days following the surgical intervention, presenting a surgical site in good general condition, clean and

occluded sutures with no signs of infection and/or dehiscence, stable dental occlusion, and aesthetic and functional reestablishment. Regarding the region of the donor site, there were no signs suggestive of nerve lesions or complaints of ambulation.

On the 7th postoperative day, the patient had an infectious process at the operative site associated with the presence of purulent secretion. Extraoral drainage was performed in the submandibular region on the left, and a Penrose drain was installed, it remained under the care of the Oral and Maxillofacial Surgery and Traumatology team of the HGE, in clinical treatment with antibiotic therapy for the infectious process that had been installed.

After 18 days postpartum, a new surgical intervention was necessary, aiming at a new drainage and debridement of the grafted area, and possible removal of the graft. On physical examination, the patient presented an increase in volume in the submandibular region on the left, with drainage of purulent secretion on milking, a region of surgical accesses with a good healing appearance, and the presence of a compressive dressing in the submandibular region on the left, dirty, with an appearance of purulent secretion.

The mandible was accessed over the scar present and during the divulsion by planes there was drainage of purulent secretion. After debridement, it was decided to remove the grafted bone block due to the contamination present in the region. After the maxillomandibular block, the distal and proximal segments of the bone defects were fixed with 01 2.4mm system plate and 01 2.0mm system plate. The suture was made by planes with 3-0 Vicryl resorbable thread and 4-0 Nylon skin.

RESULTS

The use of an unstable mandibular reconstruction technique favored an unsatisfactory treatment result, leading to poor adaptation of the reconstruction plate and subsequent fracture, triggering significant aesthetic-functional complications for the patient. Currently, as reported in several literatures, the use of iliac crest bone grafts is highly indicated, especially in cases of mandibular defects, since in addition to providing resistance to masticatory forces, it provides satisfactory aesthetic results, due to its curved anatomy.

Even so, even though it was considered the most indicated approach, the patient showed signs of infection days after the surgical approach. Several factors are associated with the failure of bone grafting, in this clinical case, among those that may

have contributed to the rejection of the bone block, include: injury derived from perforation by firearm, treatment of late grafting, and poor hygiene of the surgical wound, requiring the removal of the graft and reinstallation of a reconstruction plate as a form of treatment.

DISCUSSION

The mandible is formed by a rigid bone mass, characterized by the presence of lines of resistance and reinforcement. Nevertheless, some situations have a high capacity to promote the structural discontinuity of this bone, especially in patients affected by severe facial trauma (Silva *et al*., 2021). A large bone defect leads to deleterious effects, to interferes in a transitory or permanent way with the patient's quality of life, from chewing or phonation difficulty to inadequate lip closure, rupture of muscle attachments, facial deconfiguration, or psychological changes. (Silva *et al*., 2021; Santana *et al.*, 2024; Araújo *et al.*, 2020).

Given its aesthetic-functional importance, the techniques for reconstructing this anatomical structure have been evolving over the last century to restore the height and contour in the missing region effectively and safely (Silva *et al*., 2021; Pereira *et al*., 2017). Initially, studies preached the use of reconstruction plates as the best form of treatment for these types of fractures. However, this technique has been associated with several complications, such as the high incidence of intra/extra oral plaque exposure, and difficulty in prosthetic dental rehabilitation, in addition to a considerable increase in cases of unwanted plate fracture (Silva *et al*., 2021).

Bone reconstruction through grafts has become, therefore, a viable alternative for the treatment of defects, given its ability to better stabilize the mandibular fracture, reduce the risk of plate fracture, maintain the facial contour, and promote an area conducive to dental rehabilitation (Silva *et al*., 2021). The determination of the type of graft indicated for mandibular reconstruction occurs according to the characteristics of the injured region, including shape, location, size, and height. Considered the "gold standard" by the world literature, autogenous bone has the characteristics closest to the ideal, with the advantages of its potential for osteogenesis, osteoinduction, and osteoconduction (Santana *et al.*, 2024; Moussa, Fan, Dyn., 2021).

There is an extensive variety of anatomical sites that donate extraoral autogenous grafts, such as the iliac crest, rib, radius, fibula, tibia, scapula, and calvarial bones

(Fernandes, Silva, Araújo., 2021). In 2011, Rana *et al*. conducted a study evaluating 178 patients who underwent mandible reconstruction and concluded that, in this region, the rib grafts had a higher resorption rate when compared to the others, while the iliac crest bone and free fibula bone grafts showed satisfactory aesthetic and functional results. The iliac crest region, in addition to presenting good bone availability with satisfactory quality, is composed of cortical bone and has a curved anatomy, similar to the mandible, and is indicated for large reconstructions in the mandibular base region, as in the case reported in this study. (Santana *et al.*, 2024; Fonseca *et al.,* 2022; Souza *et al.,* 2020).

According to Pogrel *et. al.* (1997, apud França et al., 2016), the failure rate of bone grafting increases when a non-vascularized free graft is used in defects with wide lengths. França et al. (2016) concluded in their study, carried out in 2016, that mandibular segments larger than 6 cm treated with non-vascularized free bone grafts tend to have a higher rate of postoperative complications, while Freitas (2008, apud França et.al., 2016) stated that in areas larger than 7 cm, microvascularized flaps are indicated since conventional bone grafts have a high complication rate. In the case reported, the defect found had a segment smaller than 6 cm, which led the treatment to the use of non-vascularized iliac bone grafts.

The etiology of the fracture is another important factor to be analyzed to determine the success rate of the treatment to be instituted. A study conducted by McQuirter et al. (2001) demonstrated that firearm projectiles when retained in tissues can generate a series of complications. The bullets commonly used in these weapons are made of lead, which when not fully coated deform or fragment upon hitting the bone, exposing the underlying tissue to a large surface area of lead. The incorporation of lead into the bone matrix, the communication with the oral environment through the periodontal ligament by a contaminant, and the corrosion of metals due to electrochemical attack when in contact with the body's liquids make the rates of infections in FAP lesions considerably high (Morais H.H.A, *et al*., 2010).

Although bone rehabilitation with a free iliac crest graft often results in significant improvement for patients, complications inherent to the surgical procedure may occur, ranging from limitation in the amount of bone gain, graft resorption, morbidity associated with the donor bed, or infections that may lead to partial or total graft loss. The patient's medical condition, the state of oral hygiene, the complexity of the fracture, and the time from injury to treatment are potential factors that can trigger such complications (Silva *et*

al., 2021). In this clinical case, there were complications associated with infection of the recipient bed, requiring a surgical reapproach to remove the graft. The patient evolved well after graft removal and continues to be followed up postoperatively to this day, with no signs of infection, good mouth opening, stable occlusion, and satisfaction with the functional aesthetic result.

In summary, the surgical treatment of mandibular fractures with extensive segment loss, through reconstruction with an autologous iliac crest graft is a possibility to be considered, aiming at the clinical-functional benefits and the low complication rates described in the literature.

CONCLUSION

Although several reconstructive methods are available, the mandibular repair process presents impasses about the full restoration of bone continuity. Accurate diagnosis, detailed planning, and good technical execution are essential for the success of the procedure. However, even so, associated complications are possible, as with any surgical procedure. Thus, the reconstruction of the mandibular bone remains a challenge.

REFERENCES

1. Barros, M. et al. Autogenous bone graft of the iliac crest for the treatment of mandibular defect. *Arch Health Invest,* vol. 10, no. 4, p. 615–618, Apr. 2021.

2. Souza, A. L., et al. Iliac free graft in mandibular reconstruction: A case report. *The Open Brazilian Dentistry Journal*. vol. 1, no. 1 p. 148-155, Jan. 2020

3. Silva, C.C.G, et al. Mandibular reconstruction with a free graft of the iliac crest: case report. *Odontol. Clinic-Cient.* vol. 20 , nº 3, p. 88-92, set. 2021.

4. Santana, D.C, et al. Mandibular reconstruction with free iliac bone graft after resection of central giant cell granuloma: Case report. *Research, Society, and Development.* vol. 13, nº 2, fev. 2024.

5. Moussa, N.; Fan, Y.; Dym, H. Maxillofacial Bone Grafting Materials: 2021 Update. *Dental Clinics of North America*. vol. 65, nº 1, jan. 2021.

6. Fernandes G.C.S.; Silva, J.S.; Araújo J.S.S. Reconstructions of central and lateral mandibular defects with non-vascularized autogenous grafts: a review of current perspectives. *Brazilian Journal of Development.* Curitiba. vol. 7. nº 2, p.14744-14760. Feb. 2021

7. Zhang H.Y, et al. Analysis of intraoral microvascular anastomosis in maxilla facial defects reconstruction. Journal of Cranio Maxillofacial Surgery. vol 51, nº 1, p. 31-43. Jan. 2023.

8. Hidalgo D. A.; Pusic A. L. Free-Flap Mandibular Reconstruction: A 10-Year Follow-Up Study. *Plastic and Reconstructive Surgery*. vol. 110, nº 2, p. 438-449. Ago. 2002.

9. Fonseca V.J, et al. Anatomical and technical considerations for planning anterior iliac crest graft cutting guide for mandibular reconstruction: a case report. *Brazilian Journal of Development*. vol. 8, nº 4, p. 28246-28252. Apr. 2022

10. McQuirter J. L, et al. The effects of retained lead bullets on body lead burden. *The Journal of Trauma*. vol. 50, nº 5, p.892-899. Mai. 2001.

11. França, A.J.B, et al. Microvascularized bone graft in mandibular reconstruction: case report. *Journal of Oral and Maxillofacial Traumatology Surgery.* vol. 16, nº 1, p. 45-49. Mar. 2016.

12. Araújo F.A., et al. Use of the Load Bearing system for mandibular fracture fixation: Case report. *Brazilian Journal of Surgery and Clinical Research*. vol. 33, nº 1, p. 19-21. Ten. 2020.

13. Rocha A.S, et al. Facial Traumas by Firearm Projectiles - Literature Review.*Brazilian Journal of Surgery and Clinical Research*. vol. 40, nº 2, p. 24-28. Set. 2022.

14. Anjos L.M, et al. Bone grafts in dentistry – an integrative review of the literature. *Research, Society, and Development*. vol. 10. nº 12. p.e522101220954. set. 2021

15. Pereira R. S, et al. Surgical treatment of atrophic mandible fracture using the AO technique: case report. *Archives of Health Investigation*. vol. 6, no. 3. P 145-149. Jan. 2017.

16. Morais H.H.A, et al. Immediate treatment of mandible fracture by firearm projectile. *Revista Gaúcha de Odontologia*. vol. 58, nº 3, p. 399-403. 2010. Jul/Sept. 2010.

17. Fernandes D.P.; D.A.S. Milk; Miyauchi T.M. Surgical treatment of delayed union and nonunion of fractures in dogs: review*. PUBVET.* vol. 2, nº 26. Jul. 2008.

18. Pogrel M, et al. A comparison of vascularized and nonvascularized bone grafts for reconstruction of mandibular continuity defects. *Journal of oral and maxillofacial surgery*. vol. 55, nº 11, p. 1200-1206. 2010. nov. 1997.

19. Portinho C. P, et al. Microsurgical reconstruction of the mandible with a fibula-free flap. *AMRIGS Magazine.* vol. 59, nº1, p. 39-54, mar. 2016.