

EMERGENCY STATE OF MANDIBLE FRACTURE MANAGEMENT IN COVID-19 PANDEMIC AREA: A CASE REPORT

Popovski Vladimir¹, Benedetti A¹, Panchevski G¹, Bajro A¹, Stamoski A¹

¹University Clinic for Maxillofacial Surgery Skopje, Faculty of Dental Medicine, University „ Ss. Cyril and Methodius”, R of North Macedonia

Abstract

“Comminuted” mandibular fracture occurs when a high-energy impact on mandibular or different or multiple regions is applied, with disrupted lines of the lower jaw. Cartographic mapping of the maxillofacial complex should be carefully analyzed by a physician, because the diagnosis is difficult to be established due to facial edema masquerading the clinical features, and in most of the cases abnormal bite.

We describe a case of extensively complex comminuted mandibular fracture in *symphyseal* and *parasymphyseal area treated with* open reduction, internal fixation and reconstruction in a 20-year-old male patient. Reestablishing function, anatomy and aesthetics were the primary postsurgical goals regarding treatment modality. Immediate blood control was achieved and sound bone healing was confirmed in the second step surgery via extraoral surgery with anatomical landmarks. Surgical technique regarding fracture repositioning avoiding neurovascular damage and minimal facial scarring resulted with satisfactory occlusion. A follow-up period of 3 months did not show any changes, disadvantages and differences regarding treatment.

We have concluded and once again established that the existing and future surgical practice needs to undergo some changes according to proposed algorithms at the time of Covid19 infection.

Keywords: mandible fracture; comminuted fracture; ORIF; craniofacial trauma

Introduction

Mandibular fractures are frequent injuries in craniofacial skeleton where the trauma of the face has a significant aesthetic and function impact. There are many classification topographic systems regarding mandibular fractures. Some of them are useful for communication, but do not help in therapeutic decision because the mandible has zones of tensile and compressive force of masticatory muscles applied [1-3].

Due to the complexity, and large displacement of segments causing facial widening, there is a separate entity called comminuted which is a fracture where the bone has been shattered into fragments, or there is presence of multiple fracture lines resulting in many small pieces into different anatomical area, as a result of the extensive degree of violence. The “comminuted” mandibular fracture occurs when a high-energy impact on the oromandibular different or multiple regions is applied, with disrupted lines of the lower jaw [2, 4-7].

Initial assessment should be made in accordance with the Advanced Trauma Life Support protocol, verifying the mechanism of injury, and physical alteration with C-spine proceeding pathway diagnosis [8,9].

After assessing the first steps in preliminary investigation of patient’s health, following stabilization of any life-threatening situation, the cartographic mapping of the maxillo-facial complex should be carefully analyzed by a physician, because it is difficult to establish the diagnosis due to facial edema masquerading the clinical features, and in most of the cases abnormal bite

Radiographic assessment is integral in this type of fractures, although there are various available x-ray, computed tomography with 3D reconstruction imaging systems showing the highest sensitivity score and exploring hard tissue structures. The controversy about surgical approach still exists, particularly when the fracture is isolated and the dentition is not sufficient. Choosing the appropriate surgical *approach is the* key of successful treatment.

Case Report

During the current COVID-19 pandemic, a healthy 22-year-old patient, a non-smoker, presented to the emergency room with a history of severe facial trauma *sustained* in a traffic *accident*.

The patient was conscious and oriented. On extraoral clinical examination, he had lower jaw asymmetry with swollen right neck and intraoral open wound with necrotic bone piece and foul smell. Cervical lymph nodes were not palpable and tender. Intraoral palpation revealed a step deformity in his anterior border of mandible and coming out of lacerated wound following luxation of the mandibular central incisors. Limited opening of the mouth and lateral deviation of the mandible were noted.

Clinical and radiological examination (CT scan with 3D reconstruction) showed that there was a complete loss of anatomical integrity of mandibular bone classified as comminuted fracture and non-dislocated midface fracture to the left site with hematosinus (Figure 1).



Figure 1. Preoperative image of three-dimensional reconstruction view with scattered fragments

Orbital rim palpation allows the examiner to detect subtle *step-offs* of the rim and in our case medial rectus muscle was not deficient according to the adduction or abduction of the left eye.

CT scan revealed posterior (distal) displaced *symphyseal* and *parasymphyseal area of mandible* because of unfavorable muscle forces and *mandibular body fracture* that occurred between the distal aspect of the canine (Figure 2). The crushed symphyseal area looked like a triangle with the apex cranially oriented.

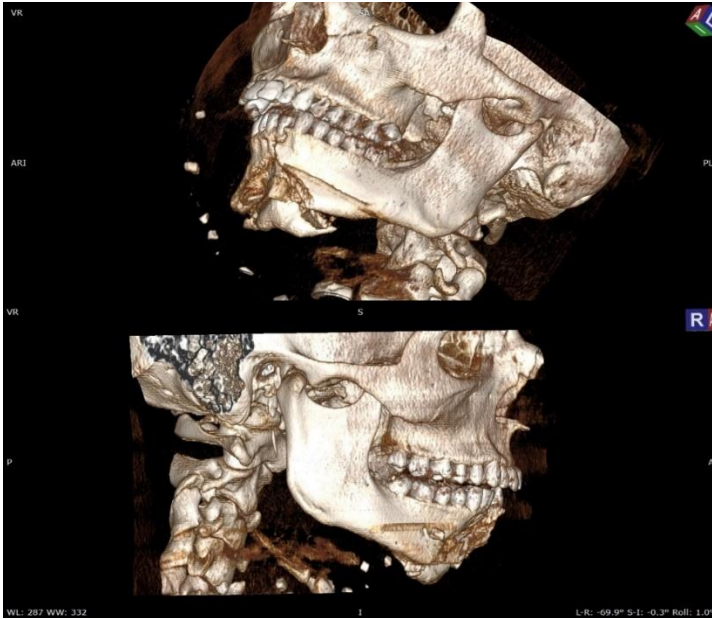


Figure 2 (a, b). Evident displacement of the symphyseal segment and superficial radiodense retained foreign bodies are easily detected to the right side of the neck. CT 3D view showing the degree of comminution

Puncture wounds caused by shattered glass were noted and they were seen as pointed object in a neck (Figure 3).

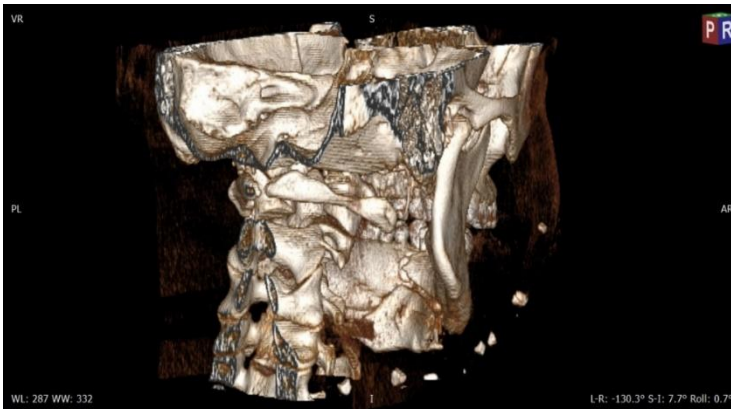


Figure 3. Postero-anterior view of lingual detached fragment in 3D reconstruction view showing the impact of muscles force

Because of severe bleeding, hematomas and soft tissue swelling, emergency first surgery of trauma management “picking up the pieces” was performed with proper personal protective equipment, FFP3 mask with visors in the operating room.

The patient sustained no significant cranial injuries. The result of the COVID-19 status of the patient could not be immediately obtained, and the negative result came one day later. This was the

imperative for realization of the second step surgery which was well planned. An open reduction and internal fixation (ORIF) were planned for the comminuted mandible fracture.

An open reduction and internal fixation were planned for the comminuted mandibular fracture using a well-adapted plate through an extraoral approach via the submental route (Figure 4 a,b).



Figure 4. Intraoperative image showing reconstruction of mandible which was performed in the secondary surgical care, preservation of bilateral mental nerves is presented

After primary surgical treatment, the second surgery was carried out under general anesthesia with nasotracheal intubation. A routine blood investigation was done and complete blood count parameters were made with no evidence of inflammatory associated process or abnormal bleeding.

The blunt dissection of the underlying tissues with preservation of nearby structures was performed followed by manipulation and reduction of the comminuted fragments.

Fracture fragments and other multiple bone fragments were reduced. Two plates were adapted and fixed with interlocking titanium screws. After achieving complete hemostasis and wound closure, intermaxillary fixation was done with Erich eyelet wiring method.

The postoperative recovery was uneventful showing good healing with acceptable anatomical contour and restoration of occlusal relationships, and no deviation mouth opening was noted (Figure 5, Figure 6).

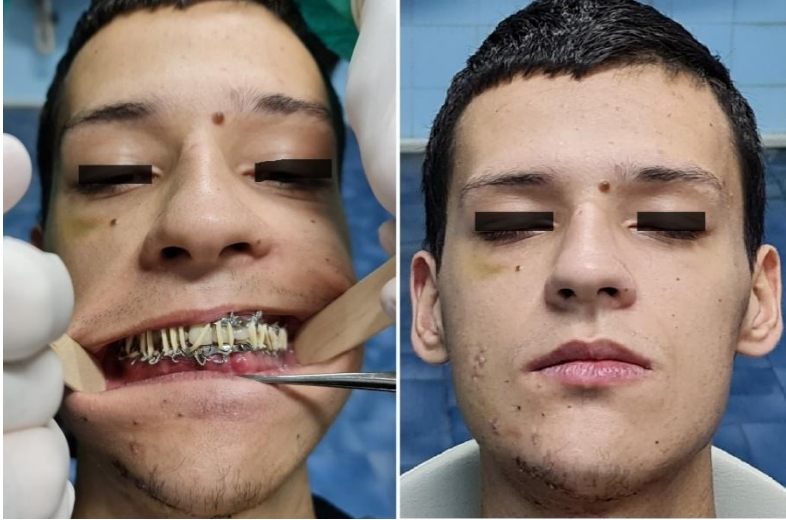


Figure 5. Facial view after 1 month postoperatively showing favorable healing

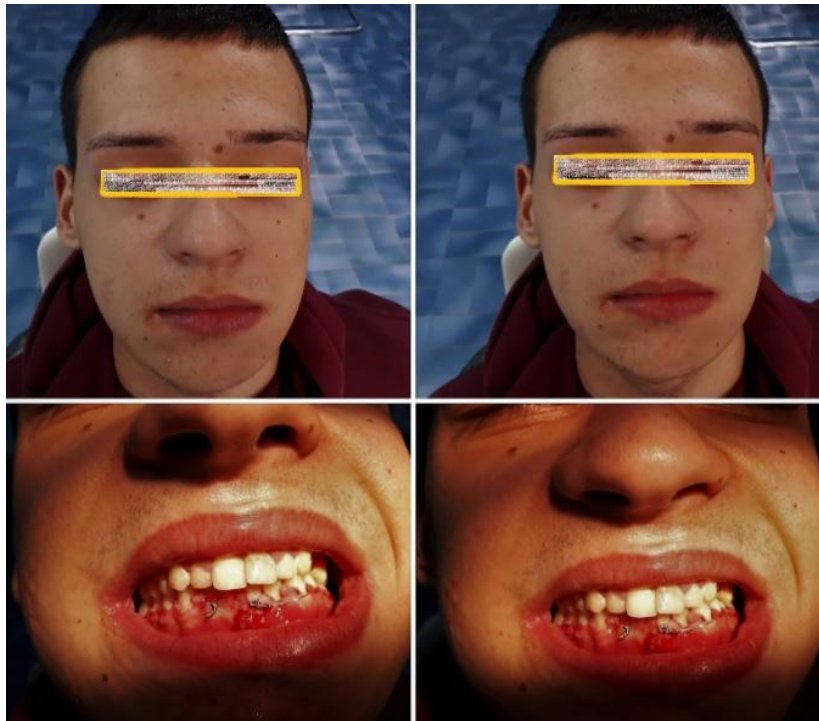


Figure 6. At 3 months a complete recovery treatment with minimal gingival inflammation

Discussion

Treatment of mandibular fractures such as comminuted types is a big challenge for the surgeon, because it requires acquired reduction and fixation of all fragments according to the favorable or unfavorable muscle force. Fractures occur more frequently than any other facial skeleton fractures

[2,5,7,8,10]. Comminuted fractures of lower jaw may have extensive loss of both, hard and soft tissues. Direct violence and high-impact trauma to the bone body, symphysis and parasymphysis anteriorly from penetrating sharp objects, missile injuries or gunshot wound may cause limited and extensive comminution.

The classical paradigm of mandibular fractures is well known. Although the condyle remains the commonest fracture, the body and parasymphysis have the highest impact of direct forces following general signs and symptoms. Diagnosis of traumatic injuries should be followed up with essential steps with ABCD exposure and Glasgow coma scale [9-13].

In addition, when the fracture involves mandible only, the occlusal rehabilitation and mobilization with good control of bleeding should be the first steps of extensive treatments in this kind of mandible fractures. Tongue falling back should be avoided and prevent following infection control. Treatment plan depends on precise diagnostic radiological findings [1,3,6,7,9].

Although there are many treatment options available, intraoral approach should be alternative vs. extraoral approach which is a commonly used surgical exposure with principles for open reduction and rigid internal fixation.

Finally, achieving biological environment and early return of TMJ following maxilla-mandibular fixation also helps in restoring all cranio-maxillofacial anatomic remodeling shape and form with load-bearing fixation mini plates and reconstructive systems for most of the proximal and distal segments [2,4,8,9,11,12].

Some authors proposed several guidelines where not all comminuted fractures have been treated with this treatment (titanium reconstructive plates and screws) compared with external pin fixation.

Conclusion

Considering the limitations of this one case report and the follow-up period, we have concluded and once again established the reconstructive principle for ostesynthesis treatment in comminuted mandibular fractures and body by achieving satisfactory results avoiding injuries of terminal branches with regard to facial nerve muscles expression.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

1. Takahiro Kanno, Shintaro Sukegawa, Yoshiki Nariai, Hiroto Tatsumi, Hiroaki Ishibashi, Yoshihiko Furuki, Joji Sekine. Surgical treatment of comminuted mandibular fractures using a low-profile locking mandibular reconstruction plate system. *Ann Maxillofac Surg.* 2014 Jul-Dec; 4(2): 144–149. doi: 10.4103/2231-0746.147103
2. Kwonwoo Lee, Kyuho Yoon, Kwan-Soo Park, Jeongkwon Cheong, Jaemyung Shin, Jungho Bae, Inchan Ko, Hyungkoo Park. Treatment of extensive comminuted mandibular fracture between both mandibular angles with bilateral condylar fractures using a reconstruction plate: a case report. *J Korean Assoc Oral Maxillofac Surg.* 2014 Jun; 40(3): 135–139. Published online 2014 Jun 27. doi: 10.5125/jkaoms.2014.40.3.135
3. Ellis E, 3rd, McFadden D, Simon P, et al. Surgical complications with open treatment of mandibular condylar process fractures. *J Oral Maxillofac Surg.* 2000;58:950–958.
4. Coletti DP, Salama A, Caccamese JF., Jr Application of intermaxillary fixation screws in maxillofacial trauma. *J Oral Maxillofac Surg.* 2007;65:1746–1750.

5. Ellis E, Zide MF, Manson PN. Surgical approaches to the facial skeleton. Baltimore: Williams & Wilkins; 1995.
6. American Association of Oral and Maxillofacial Surgeons [Internet] Rosemont: American Association of Oral and Maxillofacial Surgeons; c2012. [cited 2012 Jul 7]. Available from: <http://www.aaoms.org/>
7. Rathna Paramaswamy. Airway management in a displaced comminuted fracture of the mandible and atlas with a vertebral artery injury: A case report. *J Dent Anesth Pain Med.* 2018 Jun; 18(3): 183–187. Published online 2018 Jun 29. doi: 10.17245/jdapm.2018.18.3.183.
8. Junli Ma, Limin Ma, Zhifa Wang, Xiongjie Zhu, Weijian Wang. The use of 3D-printed titanium mesh tray in treating complex comminuted mandibular fractures: A case report. *Medicine (Baltimore)* 2017 Jul; 96(27): e7250. Published online 2017 Jul 7. doi: 10.1097/MD.00000000000007250.
9. Cassiano Costa Silva Pereira, Pâmela Leticia dos Santos, Ellen Cristina Gaetti Jardim, Idelmo Rangel Garcia Júnior, Elio Hitoshi Shinohara, Marcelo Marotta Araujo. The Use of 2.4-mm Locking Plate System in Treating Comminuted Mandibular Fracture by Firearm. *Craniofac Trauma Reconstr.* 2012 Jun; 5(2): 91–96. Prepublished online 2012 May 8.
10. Eva Gómez Roselló, Ana M. Quiles Granado, Miquel Artajona Garcia, Sergi Juanpere Martí, Gemma Laguillo Sala, Brigitte Beltrán Mármol, Salvador Pedraza Gutiérrez. Facial fractures: classification and highlights for a useful report. *Insights Imaging.* 2020 Dec; 11: 49. Published online 2020 Mar 19. doi: 10.1186/s13244-020-00847-w
11. John C. Koshy, Evan M. Feldman, Chuma J. Chike-Obi, Jamal M. Bullocks. Pearls of Mandibular Trauma Management. *Semin Plast Surg.* 2010 Nov; 24(4): 357–374. doi: 10.1055/s-0030-1269765.
12. Joshua J. DeSerres, Sultan Z. Al-Shaqsi, Oleh M. Antonyshyn, Jeffrey A. Fialkov. Best Practice Guidelines for the Management of Acute Craniofacial Trauma During the COVID-19 Pandemic. *J Craniofac Surg.* 2020 May 11 : 10.1097/SCS.00000000000006654. Published online 2020 May 11.
13. Mena Said, Victoria Ngo, Joshua Hwang, David B. Hom. Navigating telemedicine for facial trauma during the COVID-19 pandemic. *Laryngoscope Investig Otolaryngol.* 2020 Aug; 5(4): 649–656. Published online 2020 Jul 9. doi: 10.1002/lio2.428.