

## Management of fractures involving the mandibular body, parasymphiseal, and subcondylar regions

Redy Pristanto Putra <sup>1,\*</sup>, Dion Sandro Satrya <sup>1,\*</sup>, Gatot Baydowi <sup>2,\*</sup> and Indra Mulyawan <sup>3,\*</sup>

<sup>1</sup> Residency Program of Oral and Maxillofacial Surgery Department, Faculty of Dental Medicine, Airlangga University, Surabaya, East Java Province, Indonesia.

<sup>2</sup> Department of Oral and Maxillofacial Surgery, Haji General Hospital East Java Province, Surabaya, Indonesia.

<sup>3</sup> Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Airlangga University, Surabaya, Indonesia.

World Journal of Advanced Research and Reviews, 2024, 22(02), 259–265

Publication history: Received on 21 March 2024; revised on 28 April 2024; accepted on 01 May 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.22.2.1323>

### Abstract

**Background:** The mandibular bone plays a crucial role in various aspects of facial anatomy, including digestion, speech, and facial aesthetics. Given its significance in these functions, surgeons must not only address functional aspects but also consider aesthetic concerns during treatment. Mandibular fractures represent a prevalent form of traumatic injury in the maxillofacial region. Despite the existence of established treatment methods that have been in use for a considerable time, untreated fractures and complications following surgery can still significantly impact the patient's quality of life.

**Purpose:** Understand the principles of managing cases of mandibular corpus, mandibular parasymphysis, subcondyle fractures using a combination of Mini Plate and Reconstruction Plate.

**Case:** A 54-year-old man with mandibular parasymphysis fracture Dekstra, corpus mandibular fracture sinistra, subcondyle fracture sinistra, dentoalveolar fracture regions 32-42 accompanied by avulsions 32, 31, 41, 42, and hypertension was reported.

**Results:** The treatment in this case was Open Reduction and Internal Fixation (ORIF). Fixation of the fracture segments with 2 vertical mini-plates on the parasymphysis of the dextral mandible, 1 mini-plate and reconstruction plate on the corpus and subcondyle fracture sinistra.

**Conclusion:** The use of two plates and screws in the parasymphysis of the mandible, one mini-plate and one reconstruction plate in mandibular corpus and subcondyle fractures, resulted in good occlusion with minimal complications.

**Keywords:** Mandibular fracture; ORIF; Occlusion; Rigid; Semi-Rigid

### 1. Introduction

A mandibular fracture is a condition in which discontinuity of the mandible bone resulting from as a result of facial trauma or pathological conditions. A hard blow to the face can cause a fracture of the mandible. Cases of fracture of the mandible are quite common, despite the resistance of the resistance to impact forces greater than the other bones of the face. than other facial bones. The main aetiological factors of may vary from country to country. Data from developing countries show that the most common cause is road traffic accidents. Road traffic accidents. In addition,

\* Corresponding author: Redy Pristanto Putra

fractures of the mandible can also occur as a result of industrial accidents, domestic accidents drunkenness and fights or physical violence [1].

The lower jaw is divided into seven anatomical regions, namely condyle process, coronoid process, ramus, angulus, corpus, alveolus and the parasymphysis of the mandible. The weak areas of the mandible are the condyle-subcondyle region, the angulus, and the parasymphysis-symphysis region of the mandible. Frequency of fracture occurrence 29% in the condyle-subcondyle region, 24% in the mandibular angulus and 24% in the mandibular parasymphysis 22% [2].

Management of facial fractures has undergone many changes as with advances in medicine. The diagnosis and management of trauma to the was first documented by Costello in 1975. With the passage of time, techniques for mandibular fixation. Open reduction and internal fixation also known as open reduction and internal fixation (ORIF) for facial trauma was recognised in 1975. This technique applies the principle of orthopaedic materials to the facial bone using plates and the facial bones using plates and screws. This technique is considered simple because it by providing stability to fractured bone fragments fractures by compression [3].

In addition to functional and aesthetic considerations, there are biomechanical aspects to the treatment of mandibular fractures. The biomechanical approach to achieving the ideal line of fixation in mandibular fracture treatment has been described by Champy. At the corpus mandibularis, the pressure generated by the masticatory muscle causes stress on the alveolar process above the mandibular canal, while the underside of the mandible is subjected to pressure. In the event of a fracture of the mandibular corpus, the compression zone ensures proper contact, while the tension zone causes separation of the upper part of the mandibular corpus. These tension forces must be balanced by fixation [4].

The highest resultant force in a mandibular impact occurs at the symphysis. For fractures in this area, it's necessary to use two mini-plates, 4-5 mm apart, to counteract the torsional force. Biomechanically, the mandible resembles an arrow, with its strongest point at the centre or symphysis and its weakest points at the condyles on either side. This configuration corresponds to a Class III lever, with the fulcrum in the condyle region and the point of force application at the symphysis [5].

---

## 2. Case Report

A 54-year-old man was referred from Sumenep Hospital after falling down a flight of stairs and fracturing his lower jaw. The fall occurred at approximately 5:00 am, with the lower jaw hitting the floor from a height of approximately 5 metres. The patient reported that four lower front teeth were loose following the incident, but did not lose consciousness and experienced no bleeding from the nose or ears, nor any visual disturbances, nausea or vomiting. Following the fall, the patient sought treatment at a local health centre, where the lip wound was sutured and wires were placed in the mandibular teeth. The patient was then referred to Sumenep Hospital. Currently, the patient experiences pain when he tries to open his mouth and is unable to bite, although he is still able to consume soft and liquid foods.

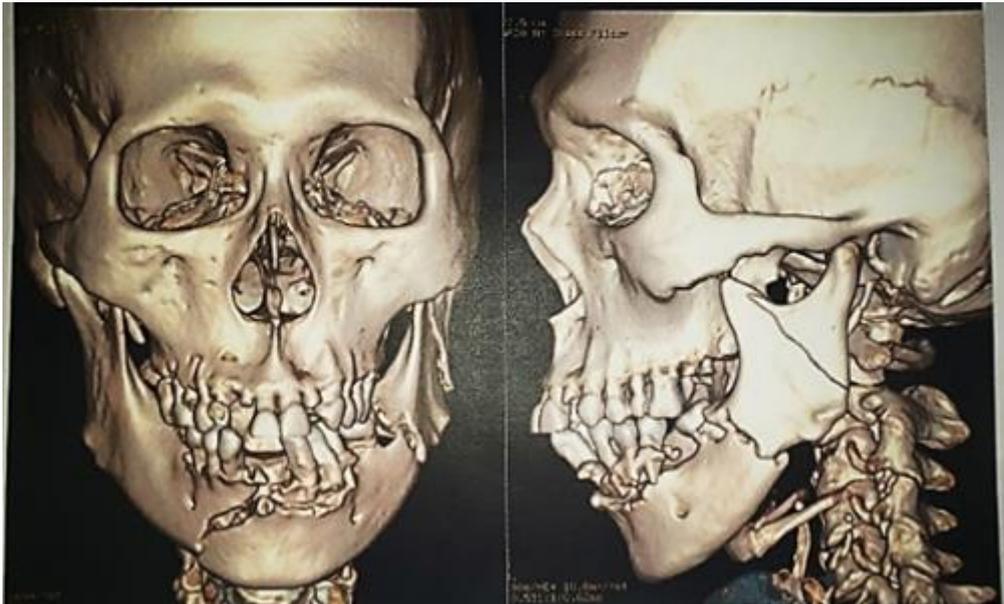


**Figure 1** Preoperative intra oral examination

Physical examination revealed facial asymmetry with swelling in the left mandibular region. The margins were diffuse and of the same colour as the surrounding tissues. There were also scars from previous injuries on the left buccal and inferior labial regions. A step-off was noted in the parasymphysis region of the right mandible, without crepitus. However, no step-off or crepitus was noted on palpation of the frontal region, orbital rhombus, nasal region, zygoma or maxilla. Symmetrical movement of the temporomandibular joint (TMJ) was also observed, without clicking, pain or paresthesia.

There is a noticeable step-off on the mesial side of tooth 33, together with a detectable misalignment of the alveolar process segment in the region of teeth 33-35. In addition, there is palpable crepitation on the lingual side of the region involving teeth 34-35, accompanied by tenderness. There is palpable swelling with diffuse borders extending from region 37 to the retromolar area, associated with tenderness. There is a palpable step-off on the distal side of tooth 37 without crepitation. There is no palpable evidence of maxillary floating. (see figure 1)

Upon visual examination of the panoramic X-ray, fracture lines were evident in the right mandibular parasymphysis, the left mandibular body, and the left mandibular subcondyle. The computed tomography examination, along with 3D reconstruction of the face, indicated segmental fractures in the right parasymphysis of the mandible, the left mandibular body, and a fracture of the left mandibular subcondyle. Additionally, there was a dentoalveolar fracture involving regions 35-42, along with avulsion of teeth 32, 31, 41, and 42 (see figure 2).



**Figure 2** Preoperative 3D reconstruction

Initial management involved the application of wire fixation on the maxillary and mandibular posterior teeth, followed by maxillo-mandibular fixation (MMF) to achieve proper occlusion. Mandibular surgery began with a vestibular incision in the 38-45 region with debridement and identification of the fracture line. Reduction of the right parasymphyseal fracture segment was then performed using a bone clamp and fixation was achieved using two mini plates (2.0) with five holes each, positioned perpendicular to the Champy line, 5 mm apart and secured with four screws per plate. Next, the left mandibular body segment was reduced and fixed with a single five hole mini-plate (2.0) positioned on the external oblique line and secured with four screws.

To access the subcondylar fracture segment, a risdon incision was made in the left submandibular area, extending towards the retro mandible. The subcondyle fracture segment was then reduced with a bone clamp, followed by fixation with a single five hole mini-plate (2.0) positioned on the external oblique line and secured with four screws. In addition, a five hole reconstruction plate (2.0) was placed along the inferior margin of the mandible, spanning the fracture line of the subcondyle region and the left mandibular body, and secured with six screws (see Figure 3).



**Figure 3** Surgical procedure for the installation of plates and screws



**Figure 4** Post operative panoramic radiography and skull AP/lateral

Post-operative evaluation was performed using panoramic radiographs and AP/lateral skull views and demonstrated successful repositioning of the fracture segments. Continuity was observed along the inferior border of the mandible extending to the ascending ramus of the left mandible, with the mini-plates and reconstruction plate securely attached to all fracture segments (see Figure 4). Intra-oral evaluation revealed well sutured post-operative wounds both intra- and extra-orally, with the patient demonstrating the ability to close the mouth properly and achieve good occlusion. The patient demonstrated good mobility and was discharged from the hospital on the third postoperative day. The patient was instructed to follow a soft diet for one month and to avoid any impact on the jaw. The patient was also advised to continue with outpatient treatment.

The patient returned for a follow-up one year after the installation of the lower jaw plate, with achieving optimal occlusion, there were no postoperative signs of infection in any of the patients. reporting no complaints of obstructive bites or difficulty in mouth opening. (see figure 6) Radiological assessment via panoramic imaging confirmed the proper placement of the lower jaw plate, with no evidence of mandibular fracture lines. (see figure 5) Subsequently, a surgical procedure to remove the jaw plates is scheduled.



**Figure 5** Panoramic radiology 1 year postoperatively

### 3. Result and Discussion

The mandible, as the only mobile bone in the maxillofacial structure, is susceptible to fracture due to its mechanically fragile composition and exposure to external forces. Previous research has shown a strong association between the occurrence of mandibular fractures and factors such as age, gender, soft tissue injury, and the pattern and location of other maxillofacial fractures in patients. The analysis showed that the main cause of fractures (57.6%) was due to everyday activities such as falls and collisions [6].

The first priority for a trauma patient is to ensure airway clearance. There's a risk of airway obstruction from foreign bodies such as broken teeth or intraoral bleeding. To facilitate breathing, the lower jaw can be pulled forward with a correctly positioned cervical collar. However, it's important to note that patients with compound fractures may find it difficult to position the mandible with a cervical collar [7]. Therefore, one of the first steps in this scenario is to place an interdental wire to move the fractured segment of the mandible forward. This is essential as the contraction of the floor of the mouth muscles can potentially push the tongue backwards, creating a risk of airway obstruction.

In this case, it was not possible to perform MMF with arch bars on both the maxilla and mandible, mainly due to the limited number of remaining teeth. Therefore, occlusion could only be achieved by wiring the few remaining teeth in both the maxilla and the mandible. Consequently, to provide stability in the multiple fracture segments of the left mandible, a reconstruction plate supported by a mini-plate was placed along the external oblique line. This method offered the advantage of being able to remove the MMF wire fixation immediately after surgery, allowing the patient to transition to a soft diet without the inconvenience of intraoral wire fixation.

Antibiotics are usually recommended, especially for open fractures and delayed healing. Anti-inflammatory drugs should also be given. If the wound isn't clean, it's important to consider the need for a tetanus vaccination. Studies have shown that the incidence of infection in patients with compound mandibular fractures who did not receive antibiotics can be as high as 50%. However, the use of prophylactic antibiotics has significantly reduced this incidence to as low as 6% [8].

Based on the patient's medical history and a basic physical examination, it was evident that there was a fracture either in the symphysis or the body of the mandible. This was indicated by a laceration in the lower gum, a discrepancy in occlusion, and bruising on the floor of the mouth. The primary goal of fracture treatment is to restore the mechanical integrity of the fracture site to its pre-injury state and to improve the normal function of the masticatory muscles. The initial phase of treatment involves repositioning the fracture fragments back into their original anatomical alignment, known as reduction. This is followed by securing the fragments in their normal anatomical position, known as fixation. If the trauma has occurred within the last 8-10 days, manual fixation of the fractures may be sufficient. Local anaesthesia may be used to control pain during the procedure. Mobile dentoalveolar structures should be stabilised with wires or similar techniques [1].

A segmental fracture involving the parasymphysis and body of the mandible in this case results in malocclusion, evident by step defects. Additionally, the fracture fragments are pulled towards the tongue direction by the mylohyoid and geniohyoid muscles. As the jaw opens and closes, there is resistance on both sides of the condyle and occlusal points, creating a biomechanical process of pressure exertion in two opposite directions, both superiorly and inferiorly on the mandibular border. Considering these biomechanics, the management of fractures like this typically involves the use of

two 2.0 plates positioned with a 1–3 mm gap between them to withstand tensile forces on the superior side and counteract pushing forces on the inferior side. Additionally, in cases where there is another fracture in the subcondyle segment of the left mandible, a reconstruction plate is required to simultaneously stabilize both segments of the left mandible.

Subcondylar fractures can be treated either conservatively or surgically. Traditionally, conservative treatment of these fractures was preferred. However, the trend changed after the first open reduction of a low subcondylar fracture in 1925. Nowadays, surgical intervention has become more common, probably due to advances such as the introduction of plate and screw fixation devices, which allow effective stabilisation of these injuries. Many surgeons favour open reduction for displaced fractures because it allows precise anatomical realignment and immediate function with rigid fixation. While the optimal treatment for subcondylar fractures remains controversial, several studies have shown that open reduction and rigid fixation produces more favourable results than non-operative approaches [9].

---

#### 4. Conclusion

One of the challenges in managing mandibular fractures is restoring occlusion and stabilizing the tensile strength of muscles originating from or inserting into the mandible. Considering the anatomical aspects, occlusion, and biomechanics involved in mandibular fractures, comprehensive planning is essential to restore both function and aesthetics effectively. When closed treatment is not possible or has been unsuccessful, open reduction is the preferred approach. This involves using a surgical technique to reposition the fracture segments into their original anatomical alignment, known as reduction. This is followed by fixation, which can be either rigid or semi-rigid. Rigid fixation involves the use of compression plates and bicortical screws. Although this method is reliable and allows the patient to return to daily activities quickly.

Despite attempts at surgical management aimed at achieving improved outcomes, certain challenges persist. These include difficulties in accessing the fracture site and achieving adequate reduction of the fracture. In cases where reduction of the condylar fragment is inadequate and the condyle becomes rigidly fixed in a non-physiological position, there is a heightened risk of postoperative remodeling and degenerative changes due to increased functional loading. Additionally, the risk of inferior alveolar nerve injury is a concern that must be addressed. Consequently, careful consideration is necessary to balance treatment efficacy with overall patient comfort when developing a treatment plan for subcondylar fractures. Optimal surgical outcomes for mandibular fractures involving the body and/or symphysis depend on a combination of accurate diagnosis, a well-designed treatment plan, and execution of the appropriate surgical procedure.

---

#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

##### *Statement of ethical approval*

This case was approved by the local ethical committee and all procedures were performed in accordance with the principles of the Declaration of Helsinki

##### *Statement of informed consent*

Written informed consent was obtained from the patient or/and guardian for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

---

#### References

- [1] Saini, P. (2013). Oral and maxillofacial trauma, 4th edition. British Dental Journal, 214(9), 480–480.
- [2] Reksodiputro, M. H., and Aldino, N. (2018). Penatalaksanaan fraktur simfisis mandibula dengan dua perpendicular mini-plates. Oto Rhino Laryngologica Indonesiana, 47(2), 185. <https://doi.org/10.32637/orli.v47i2.228>

- [3] Katsarelis, H., Lees, T. F. A., and McLeod, N. M. H. (2016). Mandibular fractures – towards a national standard for “time to theatre” - national audit by the BAOMS Trauma Specialist Interest Group. *British Journal of Oral and Maxillofacial Surgery*, 54(7), 796–800.
- [4] Goodday, R. H. B. (2013). Management of fractures of the mandibular body and symphysis. In *Oral and Maxillofacial Surgery Clinics of North America* (Vol. 25, Issue 4, pp. 601–616).
- [5] Cornelius, C. P., Audigé, L., Kunz, C., Rudderman, R., Buitrago-Télez, C. H., Frodel, J., and Prein, J. (2014). The comprehensive AOCMF classification system: Mandible fractures-level 3 tutorial. *Craniomaxillofacial Trauma and Reconstruction*, 7(3), S31–S43.
- [6] Cha, S., Park, G., Lee, B. S., Kwon, Y. D., Choi, B. J., Lee, J. W., Jung, J., and Ohe, J. (2022). Retrospective clinical study of mandible fractures. *Maxillofacial Plastic and Reconstructive Surgery*, 44(1).
- [7] Murray, J. M. (2013). Mandible Fractures and Dental Trauma. In *Emergency Medicine Clinics of North America* (Vol. 31, Issue 2, pp. 553–573).
- [8] Omar Abubaker, A. O., and Rollert, M. K. (2001). Postoperative antibiotic prophylaxis in mandibular fractures: A preliminary randomized, double-blind, and placebo-controlled clinical study. *Journal of Oral and Maxillofacial Surgery*, 59(12), 1415–1419.
- [9] Kang, D. H. (2012). Surgical management of a mandible subcondylar fracture. *Archives of Plastic Surgery*, 39(4), 284–290.
- [10] Reksodiputro, M. H., and Aldino, N. (2018). Penatalaksanaan fraktur simfisis mandibula dengan dua perpendicular mini-plates. *Oto Rhino Laryngologica Indonesiana*, 47(2), 185. <https://doi.org/10.32637/orli.v47i2.228>