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Case report

Comparison outcome of open and close reduction treatments for parasymphysis mandibular fractures

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ABSTRACT

Background: *Mandibular fracture is a condition of mandibular discontinuity. The treatment aims to reconstruct the appropriate anatomical position. Reduction is the process of repositioning fracture fragments to their original anatomical positions, which can be done by open and closed techniques. Open reduction is more invasive, and the possibility of nerve or blood vessel injury and infection postoperatively is greater. Closed reduction also has postoperative complications such as muscle atrophy, periodontal tissue and mucosa damage, speech disorders, and nutritional disorders. In the final determination of the treatment plan, the advantages, disadvantages, and risks of each treatment and the risk of complications should be sufficiently discussed with patients and the patient's guardians.* **Purpose:** *This case aims to compare the outcome of open reduction and internal fixation (ORIF) with closed reduction treatment in the management of mandibular parasymphysis fractures.* **Cases:** *Two case studies of mandibular parasymphysis fractures. Clinically, each patient had mandibular displacement and occlusion disturbance before treatment.* **Case Management:** *The treatment plan is considered by the patient's age and fracture type. One patient received ORIF, and the other received close reduction treatment with gradual repositioning. Malocclusion after treatment was absent in both cases.* **Conclusion:** *Open reduction is recommended for displaced parasymphysis fractures. In cases where the open reduction technique cannot be performed, the closed technique can be an alternative, especially on non-displaced or minimally displaced parasymphysis fractures.*

Keywords: *closed reduction; displaced parasymphysis fractures; medicine; open reduction and internal fixation; traffic accident and injury*
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INTRODUCTION

A fracture is defined as a linear deformity or bone discontinuity caused by force.[1] Mandibular fractures are more common than other facial bone fractures because of their prominent shape.[2] One classification of mandibular fracture is by the related anatomic area. Dingman and Natvig classified mandibular symphysis fractures as limited by vertical lines distal to the lower canine teeth. Fracture in this area is likewise generally alluded to as parasymphyseal.[3] Symphysis/parasymphysis fractures of the mandible have been reported to occur in 9% to 57% of cases.[4–6]

The treatment of parasymphysis fractures is the same as other mandible or maxillofacial fractures introduced by Hippocrates in 460–375 BC. It uses occlusion guidelines or the ideal relationship between the lower teeth and maxillary teeth.[7] The purpose of mandible fracture treatment is to obtain an anatomical reduction of the fracture line, restore the pre-injury occlusion, immobilize the mandible for a certain period of time to facilitate healing, maintain adequate nutrition, and prevent infection, malunion, and nonunion. In principle, there are two ways of managing mandibular fractures: the closed method, also known as conservative treatment, and the open method, which involves surgery. These two techniques are not always

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performed separately but are sometimes applied together or referred to as a combination procedure.[8] The aim of this study is to compare the outcome of open reduction and internal fixation (ORIF) with closed reduction treatment in the management of mandibular parasymphysis fractures.

CASE 1

A 30-year-old woman visited Universitas Airlangga Dental Hospital, Surabaya, Indonesia, with a complaint of lumps on her teeth and pain following a traffic accident three days earlier. During the accident, the patient's chin hit the asphalt from the left, but she was wearing a helmet. The patient had previously received treatment for suturing and wound debridement at the nearest health facility. The patient denied having any history of systemic disease.

On clinical examination, it was found that the general condition of the patient was excellent, *compos mentis*, cooperative, and had normal vital signs. On extraoral examination, no facial asymmetry was found. A step-off was palpated in the symphysis region. There was tenderness in the left subcondyle region and mandibular symphysis. There was a *vulnus apertum* in the submental region with a 3.0 silk suture and a *vulnus excoriation* in the philtrum of the lip. There were no indications of subconjunctival hemorrhage, brill hematoma, battle sign, or any signs of bloody rhinorrhea and bloody otorrhea.

On intraoral examination, the mouth opened normally (3.8 cm), and there was no deviation when closing the mouth. An open bite was observed in the anterior and right posterior regions. (Figure 1A) A step-off with tenderness was palpated in regions 41 and 42; tenderness is also present in regions 44 and 45. *Vulnus excoriation* appears on the superior labialis mucosa. Tooth 11 was observed to have a fracture of the 1/3 incisal crown; there was no mobility of the teeth.

On the panoramic imaging (OPG) (Figure 1B), radiolucent lines are observed in the regions between teeth 41 and 42, as well as between teeth 44 and 45; no inferior mandibular discontinuity is observed. There is a radiolucent line with an oblique direction in the left subcondyle and the left coronoid, indicating the presence of close fractures in these areas. It is observed that teeth 41 and 45 are involved with the fracture line. Radiolucency was observed around the apical area of teeth 41 and 45. There was discontinuity of the crown of tooth 11, indicating a fractured crown. The crowns of teeth 21 and 22 show a radiopaque appearance, suggesting the presence of crown sheaths. Teeth 36 and 46 are not visible on the OPG image.

CASE MANAGEMENT 1

The patient was diagnosed with a close fracture parasymphysis mandibular dextra, close fracture symphysis mandibular dextra, close fracture subcondyle sinistra, close fracture coronoid sinistra, and a fracture ellis on the anterior first incisor dextra. Interdental wiring was installed on teeth 31, 41, 42, and 43 due to pulp necrosis on teeth 21 and 22. The first and second left incisors were

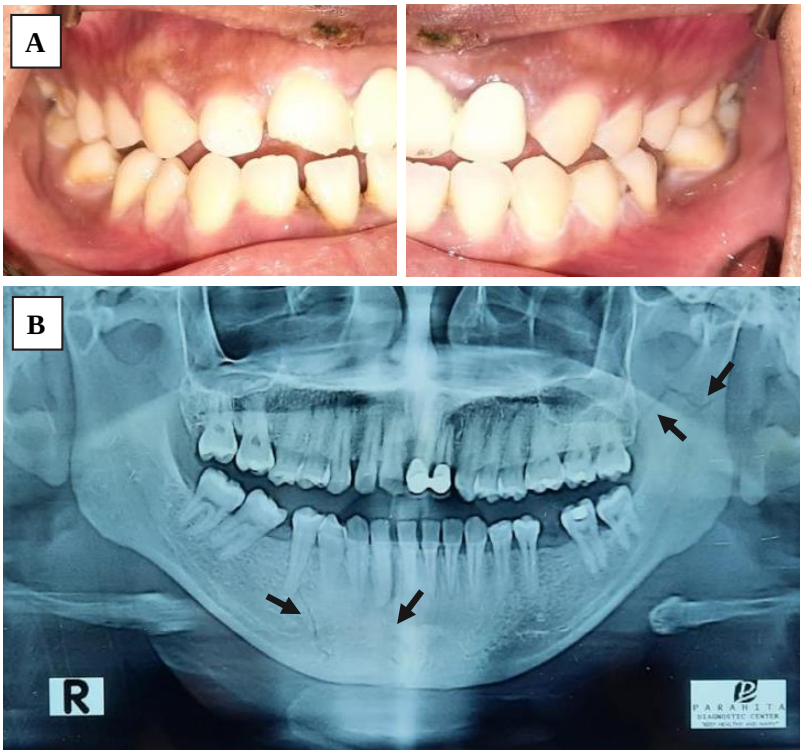

Figure 1. **A.** Intraoral open bite before treatment **B.** Panoramic before treatment.

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already treated and got crowns before the traffic accident. After interdental wiring, maxillary and mandibular arch bars were placed between teeth 17 and 27 and 37 and 47. Next, intermaxillary fixation (IMF) was used to gradually relocated teeth 17-27 and 37-47 (Figure 2A), using a 4.8 mm 4.5 oz rubber ligature. The patient was kept on a liquid diet, and the ligatures were maintained for six weeks with weekly control evaluations. After six weeks of IMF, there was no open bite, and the posterior and anterior occlusions were deemed satisfactory (Figure 2B).

CASE 2

A 24-year-old man visited Universitas Airlangga Hospital with two main complaints: loose teeth and a lump in his right lower front tooth. He described a recent incident where he fell from a height of 3 meters, landing with his chin hitting an LPG gas source first. The patient fainted, was taken to the nearest hospital, and regained consciousness after 30 minutes. There were no signs of bloody rhinorrhea or bloody otorrhea. The patient complained of a protruding

Figure 2. **A.** Intermaxillary fixation after three weeks of treatment **B.** Intraoral results after six weeks of intermaxillary fixation.

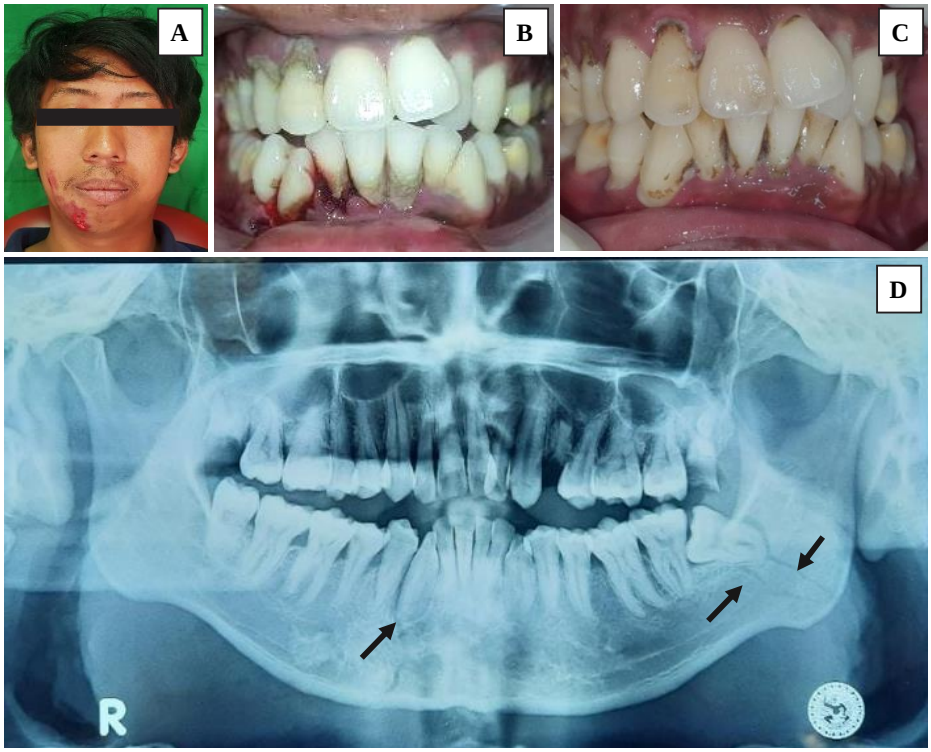

Figure 3. **A.** Extraoral before treatment **B.** Intraoral open bite before treatment **C.** Intraoral results after ORIF **D.** Panoramic before treatment.

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bite on the right side. However, he had no difficulty opening his mouth and did not experience any numbness in the right chin. The patient denied having any history of systemic disease.

During the extraoral examination (Figure 3A), no facial asymmetry was observed. However, upon palpation, a step-off was identified on the right parasymphysis region. On mental to the corpus and mandibular angle dextra region, tenderness palpated. There were no signs of paresthesia or TMJ anomalies. During the intraoral examination, the patient displayed a maximal interincisal opening of 3 cm with no mandibular deviation. An open bite was evident (Figure 3B) in the regions of teeth 43 and 44, and crepitation was palpated in these areas. The tooth mobility was palpated on teeth 43, 44, and 45, and a thermal vitality test revealed that they were still vital. Furthermore, the right mental region mandibular angle dextra exhibited tenderness upon palpitation. The intraoral results after ORIF can be seen in Figure 3C. On the OPG image (Figure 3D), radiolucent lines were observed in the regions between teeth 43 and 44 and the mandibular angle dextra region. However, there was no evidence of inferior mandibular discontinuity. It is observed that tooth 38 is involved with the fracture line, and radiolucency was detected around its apical area.

CASE MANAGEMENT 2

In the second case, the patient was diagnosed with a fracture parasymphysis dextra and a fracture mandibular angle sinistra. Additionally, there was a dentoalveolar fracture involving teeth 43, 44, and 45. A combination procedure was done to address these fractures. First, maxillary and mandibular arch bars were placed in the regions of teeth 17 and 27 and 37 and 47. Then gradual repositioning with IMF using a 4.8 mm 4.5 oz rubber ligature from teeth 17 to 27 and 37 to 47. The patient underwent open reduction and internal fixation using the miniplate 2.0 system on the symphysis and mandibular angle sinistra. However, after one month, the IMF had to be removed as the patient was unable to control it effectively due to work-related reasons. Monthly control evaluations have been conducted since then. There was no evidence of an open bite after treatment, and both the posterior and anterior occlusion were deemed satisfactory.

DISCUSSION

Clinically, mandibular fractures have symptoms such as pain, edema, hematoma, malocclusion, displacement, mobility of the fracture segment, facial asymmetry, and dysphonia.[9] Extraoral examinations, like skin abrasions and lacerations, can help determine the direction and force of the trauma. Intraoral common signs of a symphysis or *corpus* fracture may include gingival lacerations and a step-like defect in the occlusion.[10]

In the first case, open bite malocclusion was found on the right side. There were close fractures on the right parasymphysis mandibular and symphysis mandibular. With a fracture in the mandibular parasymphysis area, the zone of compression is favorable for maintaining bony contact; however, the zone of tension tends to pull the bone apart.[11] Fractures were also observed in the subcondyle and coronoid regions. Direct trauma to the anterior mandible can result in the proximal transmission of force, leading to injury of the mandibular condyle. This can occur when the condyle gets trapped in the glenoid fossa. The direction of an ipsilateral injury often causes a fracture on the contralateral condyle.[12]

In the second case, malocclusion on the right side and an open bite in the region of teeth 43 and 44, along with a displaced fragment, were found. In mandibular fractures, the fractured fragment can be displaced due to the pull of the masticatory muscles, such as the temporalis, masseter, and suprahyoid muscles, as well as by muscles in the floor of the mouth, including the mylohyoid and digastric muscles. In this case, both mandibular displacements exist. During functional mouth movements, the displaced fragment experiences rotational force or twisting.[8]

In the dentate patient, a fracture of the symphysis or corpus often involves a tooth in the line of fracture. In the first case, tooth 41 was affected by the fracture line; it was crossed by the periodontium along the root. As for tooth 45, the fracture line encircled the roots bilaterally and then continued to the alveolar bone. Teeth 41 and 45 were retained because they were considered viable; there was no mobility in these two teeth. In the second case, the fracture line was confined to the apex of the third left molar. The teeth were extracted due to extensive periapical lesions (infection). The degree of damage to the tooth at the fracture line can affect the healing process.[9]

The reduction and fixation of mandibular fractures must counteract the pull of the masticatory muscles.[13] Both patients were informed about the standard treatment for mandibular displaced fractures, particularly in the symphysis and parasymphysis regions, which is the use of ORIF. The main objectives of rigid internal fixation are to stabilize bone fragments to minimize movement, in conjunction with having the smallest gap possible between the fractured margins.[14] The reduction can be done more optimally, and the treatment time is shorter using open reduction. According to Fonseca (2013), using only closed reduction techniques to treat displaced symphysis and parasymphysis fractures caused by traction on the mylohyoid, gastric, geniohyoid, and genioglossus muscles can result in an opening at the inferior border with the superior aspect of the segment rotating medially from the point fixation. This can result in the lingual cusps of premolars and molars being out of occlusal contact.[15] An open reduction approach to the symphysis and corpus mandibular region of the mandible provides excellent access to the fracture and the ability to observe the occlusion during the reduction and application of rigid fixation. In

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the second case, IMF was used to restore the patient's pre-surgery occlusion and stabilize the bone before the surgery.[14]

Due to socioeconomic problems, the patient in the first case chose the closed reduction technique with IMF. The closed reduction technique is performed in cases with favorable fractures with stable occlusion and adequate anchoring teeth, as well as for comminuted and condylar fractures. In adults, IMF is maintained for 4 to 6 weeks.[1] The closed reduction procedure involves using intraoral elastic traction on the maxillary and mandibular teeth to gradually reposition them laterally.[16] Tooth occlusion can be achieved by IMF and elastic traction. The treatment plan also includes general health care measures, such as administering antibiotics and analgesics, *roborantia,* nutritious food, maintaining oral hygiene, and providing physiotherapy.[7]

In conclusion, mandibular fractures, especially in symphysis, parasymphysis, and corpus mandibular, are exceptionally normal and frequently involve multiple fracture sites. In general, patients with displaced fragment fractures are treated by ORIF, including on parasymphysis fracture cases.[17] The greatest advantage of ORIF on displaced fractures is the elimination of interfragment mobility. Fixation that is truly rigid results in a low incidence of infection. However, nondisplaced or minimally displaced parasymphysis fractures can be managed conservatively through a combination of regular observation, a soft diet, analgesics, and immobilization. Non-invasive therapy reduces the risk of complications and morbidity, such as nerve injury in patients. Patients who choose the closed reduction method must be cooperative, as the success rate of this approach is influenced by the patient's behavior and compliance.

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