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Case report

Closed reduction and drainage incision for the treatment of neglected and infected mandibular fractures

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ABSTRACT

Background: *Jaw fracture is the most common facial fracture in oral and maxillofacial bone and is usually caused by trauma. The fracture itself could lead to infection due to bone and tissue damage, which is the port of entry for microorganisms. Fracture-related infection (FRI) in the patient discussed in this study manifested as a submandibular abscess. The goals of fracture treatment were achieving the anatomic reduction of the fracture line and regaining acceptable occlusion. There are two methods for treating mandibular fractures: the closed method, also called conservative treatment, and the open method, which requires advanced surgery. Closed method treatment uses a maxillomandibular fixation (MMF) device in order to reduce and immobilize fracture fragments. Treatment of FRI should use a multidisciplinary approach to achieve an outstanding result, such as wound debridement, antimicrobial therapy, and implant retention.* ***Purpose:*** *The purpose of this article is to report a case of neglected mandibular fracture with a submandibular abscess, which was treated with a combination of the closed reduction method and incision drainage.* ***Case:*** *A 25-year-old female visited Nala Husada Hospital because of a submandibular abscess on the neglected mandibular fracture of the right parasymphysis and left corpus.* ***Case management:*** *The case was managed using an arch bar in the mandible and an eyelet in the maxilla while continuing with MMF and an extra oral drainage incision.* ***Conclusion:*** *Combination therapy (MMF and incision drainage) was needed to treat this case because of the occurrence of a submandibular abscess due to a neglected mandibular fracture.*

Keywords: *closed reduction; drainage incision; mandibular fracture; neglected fracture; submandibular abscess*
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INTRODUCTION

Jaw fracture is the most common facial fracture in the oral and maxillofacial bone, which can be caused by direct or indirect trauma and pathological conditions such as degenerative bone disorders/osteoporosis. The external wound involves the skin, mucosa, or periodontal membrane associated with the fracture site.[1] Mandibular fractures may develop several complications such as malocclusion, infection (abscesses and osteomyelitis), and delayed wound healing (malunion and non-union fractures as well as wound dehiscence).[2]

The fracture itself could lead to infection due to bone and tissue damage, which is the port of entry for microorganisms.[3] Bone and tissue damage, if not treated properly in time, are also one of the causes of infection.[4] Microorganisms in fracture-related infections (FRI) are Staphylococcus aureus (30–42%), Coagulase-negative staphylococci (20–39%), Enterobacteriaceae (14–27%), Anaerobes (16%), and Streptococci (11%).[5] The FRI in this patient manifested as a submandibular abscess because of pus formation in the submandibular space and occurs due to infection.[3]

The submandibular space is the most common site for deep neck space infections. The usual symptoms are fever and neck pain accompanied by swelling under the mandible and/or under the tongue and possibly trismus.[6] Evacuation of the abscess can be performed under local anesthesia for shallow and localized abscesses or under general anesthesia if the abscess is deep and wide. Early

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incision and drainage should always be considered for the patient, even in seemingly noncritical cases. Drainage can be performed through either intraoral or extraoral incisions, depending on the site of infection.[7]

Among all maxillofacial fractures, mandibular fractures are thought to have the greatest infection rates.[8] The systemic health of the patient, type of injury, timing of medical treatment, and type of treatment employed are a few examples of factors that can raise the risk of infection. The pharynx, submandibular lymph nodes, floor of the mouth, and teeth are the most common sources of infection in the submandibular area.[9] In addition to being caused by dental infection, infection in the submandibular space can be caused by lymphadenitis, trauma, or surgery and can also be a continuation of deep neck space infection. In addition to bacteria, infection in mandibular fractures can result from inadequate interfragmentary stability, foreign bodies, loose screws from an open reduction internal fixation system, a tooth or a part of a tooth in the fracture line, and necrotic bone fragments.[10]

Management of mandibular fractures requires a comprehensive understanding of anatomical, biomechanical, and occlusion factors. The goal of fracture treatment is achieving an anatomical reduction of the fracture line and regaining acceptable occlusion. Depending on whether direct visual access to the fracture site is available, reduction procedures used to treat mandibular fractures can be characterized as either open or closed. In contrast to open reduction, which requires direct visual access to the fracture site through a surgical incision, closed reduction enables manipulation of the fracture segment with guided tooth occlusion.[11,12] Closed reduction and maxillomandibular fixation (MMF) can be performed using splints such as bonded orthodontic brackets, arch bars, or eyelet wire. The closed reduction method of treating mandibular fractures is referred to as non-surgical treatment, since it involves manually realigning the fractured pieces, gradually realigning the teeth, and immobilizing the teeth and jaws with MMF.[8,11]

In the following case, we will discuss the treatment of a neglected mandibular fracture with a submandibular abscess due to FRI. The purpose of this case report is to understand how to manage FRI.

CASE

A 25-year-old Indonesian female was referred from a private dental clinic to the Oral and Maxillofacial Surgery Department at Nala Husada Hospital, Surabaya, Indonesia, in June 2022. She was diagnosed with a left submandibular abscess due to a neglected mandibular fracture. Her record revealed that the patient had been involved in a fight last month and had been given painkillers. One week after treatment, the patient's face was swollen and painful, which did not decrease even though she used the painkillers as prescribed. Later, the patient returned to the private dental clinic and was given two different drugs to reduce the swelling. The patient did not know the name of the medicines. One week after this treatment, the swelling and pain still existed, so the treating doctor suggested a radiographic examination; however, the patient had had a radiographic examination only two weeks ago. The patient consulted another private dental clinic and was referred to Nala Husada Hospital. Extra-oral clinical examination showed swelling of the left submandibular region, approximately 3x2x1 cm in size, more erythematous than the surrounding tissue, clear boundaries, painful palpation, and fluctuations (Figure 1). There is no intraoral picture because the patient was not able to open her mouth widely due to submandibular swelling. The radiograph shows a radiolucent line from the alveolar bone distal at tooth 37 and 43 to the inferior border of the mandible (Figure 2). Based on the history, clinical examination, and panoramic

Figure 1. Clinical photo of the patient on her first day at the hospital. (A) large swelling over her left submandibular and angle of the mandible showing limited mouth open; (B) with her mouth in centric occlusion, no malocclusion detected.

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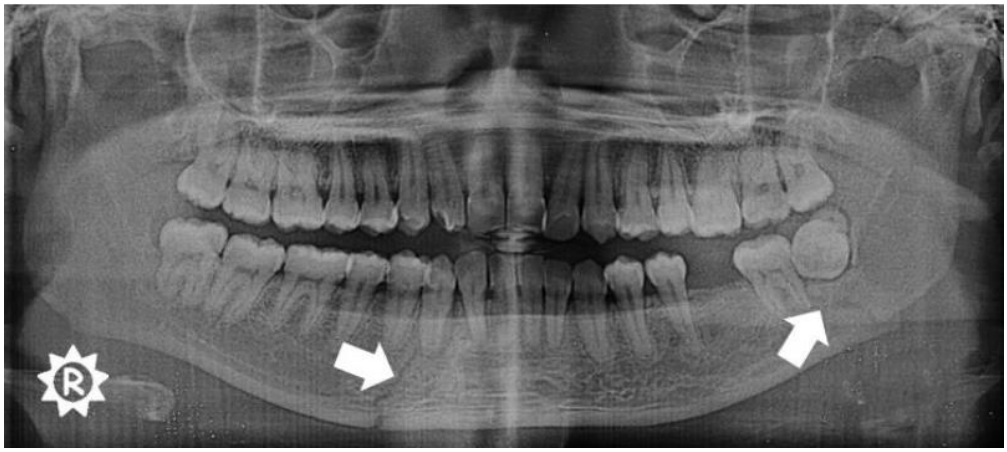

Figure 2. Panoramic radiograph shows a radiolucent line (white arrows) from the crest of the alveolar bone at distal tooth 37 to the mandibular border and from the crest of the alveolar bone at distal tooth 43 to the mandibular border.

Figure 3. (A) An extraoral incision has been made, and a rubber drain has been placed in the submandibular space to drain pus and decompress abscess space. (B) The patient has been treated with MMF, with eyelet wire on the maxilla and Erich bar on the mandibula. She showed normal centric occlusion while intermaxillary wiring was being applied.

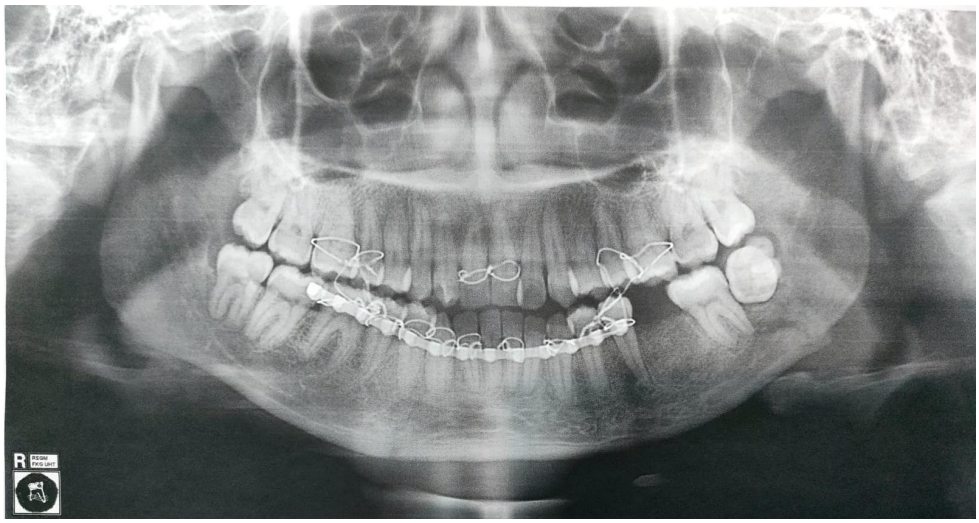

Figure 4. Panoramic radiograph shows a reduction of the radiolucent line at the right parasymphysis and right corpus mandibula; meanwhile, the left body mandible has not been manipulated due to infection.

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radiographic examination, the patient was diagnosed with a left submandibular abscess due to either a neglected mandibular fracture (left body and right parasymphysis mandibular region) or a lower left wisdom tooth infection, which occurred before her injury.

CASE MANAGEMENT

The management of this case was carried out in combination, namely closed reduction and a drainage incision with minor surgery. The patient was pre-medicated before the procedure, and both procedures were performed simultaneously.

The first time, the submandibular abscess was incised and drained with a rubber drain in the left submandibular space. The wound was closed with sterile gauze and adhesive flexible tape (Figure 3A). After draining out the pus in the left submandibular space, the mandibular fractures were able to be treated by closed reduction and cross-jaw ties MMF. In the lower jaw, an Erich bar was placed on teeth 37 to 46, and an eyelet wire was placed in the upper jaw on teeth 15–16, 11–21, and 25–26. The MMF was installed by joining the wire through the eyelet loop attached to the upper jaw and the Erich bar on the lower jaw (Figure 3B). After the procedure, the patient was given antibiotics (Amoxicillin tablet 500 mg and Metronidazole tablet 500 mg) every eight hours (three times a day) and pain-reliever medication (Mefenamic Acid caplet 500mg) three times a day.

The patient was instructed to maintain oral hygiene, take medication as prescribed, and change extra oral gauze every day or every time the gauze became wet with pus. She was instructed to come for check-ins every two to three days until there was no pus production or if the rubber drain came off. The patient came on the second day to change the gauze and have the intraoral region cleaned, whereas the drain was changed every two days or if the drain was detached with saline irrigation. Two weeks later, the MMF was removed temporarily, the patient was trained to open her mouth, the intraoral area was irrigated with 0.9% NaCl, and then the MMF wire ligature was reattached. The MMF was permanently removed after eight weeks, and radiographs showed a reduction of the radiolucent line (Figure 4).

DISCUSION

Open fractures can generally be regarded as contaminated. Since fractures in the dentate area have contact with the oral cavity, these are considered open fractures.[13] In this case, the patient developed a left submandibular abscess from injuries untreated on her lower jaw. Moreover, in her panoramic radiograph, there was a partial eruption of the lower left wisdom tooth, and radiolucent imaging surrounded the distal crown of M3 (Figure 4). The prediction was that her impacted tooth around the fracture line became the port of entry for FRI (submandibular abscess). The impacted tooth on the left side of the mandible also increased mandibular fracture possibilities.[14,15] The hypothesis that the M3 level of impaction further increases the risk of angle fractures originated with the work of Reitzik et al.[16] The reasoning behind this hypothesis is that when M3 occupies more osseous space, it weakens the mandible against outside stresses.[14]

FRI in this patient manifested as a submandibular abscess. Fracture consolidation, soft tissue envelope restoration, functional recovery, prevention of persistent chronic infection, and infection eradication are all essential components of effective FRI care. Debridement, antimicrobial treatment, and implant retention are the main ideas of surgical management of FRI.[3]

The success of this case's treatment is due to the use of appropriate techniques for closed reduction and drainage incision as well as the operative patient. The gold standard for the treatment of mandibular fractures is repositioning/reduction, fixation, and immobilization, using either the Open Reduction and Rigid Internal Fixation method or the Closed Reduction method, depending on the circumstances of each individual case.[17] Due to the non-displacement of the fracture fragments and the normal occlusion of the patient's teeth, the mandibular fracture in this case was treated with the closed reduction method. Fixing the fracture fragments in this case is done primarily to make them anatomically fit together.[17,18] To better immobilize the fracture fragments, the operator used closed reduction fixation with an arch bar on the lower jaw and eyelet wire on the upper jaw, followed by MMF for two weeks. The benefit of closed reduction is that it does not necessitate surgery, so there is no risk of scar tissue or infection after the procedure. Additionally, this procedure has fewer complications and is less expensive.[9,19]

The arch bar was used to reduce and repair fracture fragments in the mandible due to its rigid metal cross-section and function as an adjustable splint for the jaw arch. The arch bar's length is also adjustable to the work area, and its installation is relatively simple.[20] Placing eyelets is a wire splinting technique that requires 0.4 mm-diameter wire placed on the left and right maxillary posterior teeth. The placement of eyelets on the maxilla serves as an instrument for MMF. Eyelets were chosen because it is a relatively simple wiring technique, so little food debris gets left on the wire, and the patient can manage her oral hygiene compare. In this instance, MMF was performed by attaching the wire to the arch bar and loop eyelets for additional immobilization. MMF and eyelets wire can be removed after two weeks because a callus has formed on the fracture fragment, thereby eliminating the need for additional intermaxillary immobilization.[21] The arch bar is kept in place for up to eight weeks because it accommodates for new bone formation between fracture fragments.[21,22]

A subjective examination of the patient revealed that the mandibular fracture was caused by a fight that occurred one month prior to the patient's visit to the oral surgery clinic of

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Nala Husada Hospital. The patient's fracture fragment did not heal because she was not immediately treated for her injury and was only given painkillers (neglected fracture). A neglected fracture is a fracture with or without dislocation that is improperly treated, resulting in a deterioration of the condition and/or disability.[6] In this instance, the patient developed a left submandibular abscess as a result of a neglected fracture.

The left submandibular abscess was treated with an incision for drainage, which is done so that the inflammatory products in the submandibular space can be excreted properly, and tissue oxygenation can be increased, allowing anaerobic bacteria to be eradicated and promoting faster healing. According to a study conducted by the University of Witwatersrand, Streptococcus and Staphylococcus bacteria were the predominant flora found in pus cultures of submandibular abscess cases.[23] Administration of antibiotics, empirically Amoxicillin 500 mg tablets and Metronidazole 500 mg tablets, are considered to be in accordance with the literature, though culture and antibiotic sensitivity tests are required for more definitive treatment.[17] Following the drainage incision, the physician also prescribed 500 mg of Mefenamic Acid every eight hours to reduce the patient's pain after treatment.

FRI such as this case should be treated immediately and appropriately. Incision draining of abscesses followed with closed reduction fracture treatment and antimicrobial prescription will decrease the patient's morbidity and lead to the bone healing quickly. This patient's fracture was resolved with a single arch bar on the mandible and eyelet wiring for the upper jaw coupled with MMF. This indicated that the treatment for this case was adequate to reduce, fixate, and immobilize fragment fractures.

In conclusion, FRI often happens from open fractures in dentate areas, with untreated fractures triggering a more serious infection. In this case, the patient had an impacted tooth around the fracture line on the left lower jaw, which increases FRI possibility. For treatment, an incision was made, and the abscess drained in her left submandibular space. Her jaws were then fixated using an arch bar in the mandible and eyelets in the maxilla with MMF, in accordance with the main concepts of surgical management for FRI.

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