

Neglected zygomaticomaxillary complex fracture: Report of two cases during the COVID-19 pandemic

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ABSTRACT

Background: The COVID-19 pandemic spread rapidly worldwide, including in Indonesia. As a result, people developed a fear of visiting hospitals and a tendency to ignore symptoms unrelated to COVID-19. A zygomaticomaxillary complex bone fracture is one of the most frequent midface fractures and is often accompanied by infraorbital nerve paresthesia. **Purpose:** This article aims to report two cases of neglected zygomaticomaxillary complex bone fractures with persistent infraorbital nerve paresthesia caused by the patient's fear of seeking medical care. **Cases:** The first case is a 19-year-old male with a history of trauma two weeks prior to hospital admission. He was diagnosed with a neglected zygomaticomaxillary complex bone fracture, which resulted in persistent infraorbital nerve paresthesia. This condition was due to the patient's fear of visiting the hospital. The second case is a 21-year-old female who presented with a history of persistent numbness on the left cheek and upper lip for one month prior to hospital admission. The symptoms originated from an accident where the patient fell from a ladder measuring two meters in height. **Case management:** Surgical intervention—open reduction and internal fixation (ORIF)—was performed on both patients to promote nerve recovery. However, there is ongoing debate regarding the safety of elective oral maxillofacial surgery procedures during the COVID-19 pandemic. After a follow-up period, both patients experienced a recovery of sensory function in the infraorbital nerve. **Conclusion:** Infraorbital nerve sensory disturbance along with zygomaticomaxillary complex bone fracture found during the COVID-19 pandemic should be managed with ORIF to improve nerve recovery.

Keywords: Coronavirus disease-19; fear; neglected diseases; paresthesia; zygomatic fractures

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INTRODUCTION

The World Health Organization declared COVID-19 as a pandemic on 11 March 2020 as it rapidly spread worldwide, including in Indonesia.^{1,2} This pandemic massively affected society's life through lockdown and behavior modifications like washing hands, wearing masks, and maintaining social distance.² In a pandemic, fear increases anxiety and stress levels which can lead to unwise decisions.³ Patients who have an injury as a result of an accident usually seek medical help immediately after the incident, especially for trauma related to the head and face.⁴ However, neglected maxillofacial fractures with multiple complications are still commonly found in lower-middle-class society.^{4,5}

Additionally, with the outbreak of the COVID-19 pandemic, people tended to fear visiting the hospital and ignored any symptoms that appeared due to disorders other than COVID-19.^{6,7}

The zygomaticomaxillary complex bone is in the most prominent position in the midface connected to the maxilla, frontal bone, and temporal bone. Therefore, the zygomaticomaxillary complex is commonly exposed to traumatic forces and is known to become one of the most frequent midface fractures.^{8,9} Management of zygomatic bone fractures varies from conservative to complex surgical methods.^{9,10} Function and aesthetics are two important factors that determine the indications for treatment of zygomaticomaxillary complex fractures.¹¹ While eye

function and dental occlusion are the significant goals in restoring midfacial function in fracture management,¹² zygomaticomaxillary complex bone fractures are often accompanied by infraorbital nerve injury which leads to altered sensation in the skin and mucous membranes of the middle portion of the face.¹¹ This injury is related to the infraorbital foramen as the weakest point of the zygomaticomaxillary complex. Nerve entrapment or impingement by the fracture segments is the main factor causing the injury.^{11,13} Many studies stated that recovery of infraorbital nerve sensory disturbances affected by the treatment selected and open reduction of fracture fragments followed by internal fixation is the preferred treatment because it meaningfully enhances recovery of the infraorbital nerve.¹⁴

Herein, we report on two cases of neglected zygomaticomaxillary complex bone trauma with infraorbital nerve paresthesia with the absence of other functional disturbances (dental malocclusion, eye function) during the COVID-19 pandemic. These cases were treated surgically with reduction of the bone, release of pressure on the infraorbital nerve, and internal fixation using plates and screws.

CASE 1

A 19-year-old male had a history of trauma from a fall while playing football two weeks before hospital admission (February 4, 2022). His right cheek hit the ground when he fell. He presented to the hospital with numbness in the front region of the right cheek, persistent since the accident. The patient stated that there was pain in the early days after the accident which was managed with analgesic medication.

A physical examination revealed no facial asymmetry, no malocclusion, normal mouth opening, and no disturbance of eye function (Figure 1a and 1c). A multi-slice computed tomography (MSCT) scan without contrast revealed fracture line in the dextra zygomaticomaxillary complex bone involving maxillary bone and lateral orbital bone. There was also a comminuted fracture in the area of the infraorbital foramen (Figure 1b).

CASE 2

A 21-year-old female presented to the hospital with persistent numbness on the left cheek and upper lip for a month prior to hospital admission (May 21, 2022) when she had an accident, falling from a two-meter-high ladder. The patient stated that there was a history of swelling on the left eye, but it had subsided and recovered; currently, there were no complaints other than numbness. The patient asserted that there was no change in occlusion after the injury and no uncomfortable bite.

Extraoral examination showed no facial asymmetry, normal mouth opening, and no disturbance of eye

function (Figure 2a). Intraoral examination confirmed no altered occlusion since the accident and no other anatomical abnormalities (Figure 2b). An MSCT scan without contrast indicated a fracture line in the left zygomaticomaxillary complex bone involving infraorbital foramen, coronoid bone, and lateral orbital bone (Figure 2c).

CASE MANAGEMENT 1

The patient underwent surgical treatment to restore the comminuted bone fracture on the infraorbital foramen area and reduction of the maxillary bone. The fracture line was approached using maxillary vestibular incision and then a full-thickness flap was elevated. The infraorbital nerve compressed by the bone fragment was released and repositioning of the bone fracture was performed. After the surgeon achieved the appropriate position of the bone, fixation was done using two L-shape mini plates and eight screws (Figure 3). Intermaxillary fixation was performed with QuickFix during surgery, and the appliances were removed after proper fixation was achieved. There was no surgical intervention to the lateral orbital bone fracture because there was no bone displacement, no aesthetic concern, and no functional disturbance.

After the procedure, the patient was instructed to have a soft diet and was discharged three days later. One week after the surgery, the patient had the stitches removed and felt an improvement in the sensation of the right cheek. The patient reported no other complaints from the surgical wound. At one-and-a-half months post-surgery, the numbness had completely gone.

CASE MANAGEMENT 2

Under general anesthesia, the patient had surgical intervention for the zygomaticomaxillary complex bone fracture. QuickFix was installed on both jaws to maintain proper occlusion during bone manipulation. The fracture line was exposed by maxillary vestibular incision, then reduction of the bone fragment was conducted. Fixation was done using a six-hole miniplate and four screws (Figure 4). Intermaxillary fixation with QuickFix was removed after proper fixation was achieved.

After the procedure, the patient was instructed to have a soft diet and was discharged two days later. The patient visited the clinic seven days after the surgery to have the stitches removed. The patient still felt numbness on the left cheek and upper lip with no improvement. Vitamin B complex was prescribed for 14 days. At the next clinic visit, 21 days after the procedure, the patient reported improvement of sensation on the left cheek and several spontaneous electric shock sensations on the upper lip. At three months post-surgery, the numbness had completely gone.



Figure 1. Preoperative condition of the patient with dextra zygomaticomaxillary complex bone fracture with clinical appearance indicating no aesthetic disturbance (a) and no malocclusion (b). Three-dimensional imaging from MSCT scan of the patient shows a fracture line involving the right maxillary bone, lateral orbital bone, and infraorbital foramen (c).

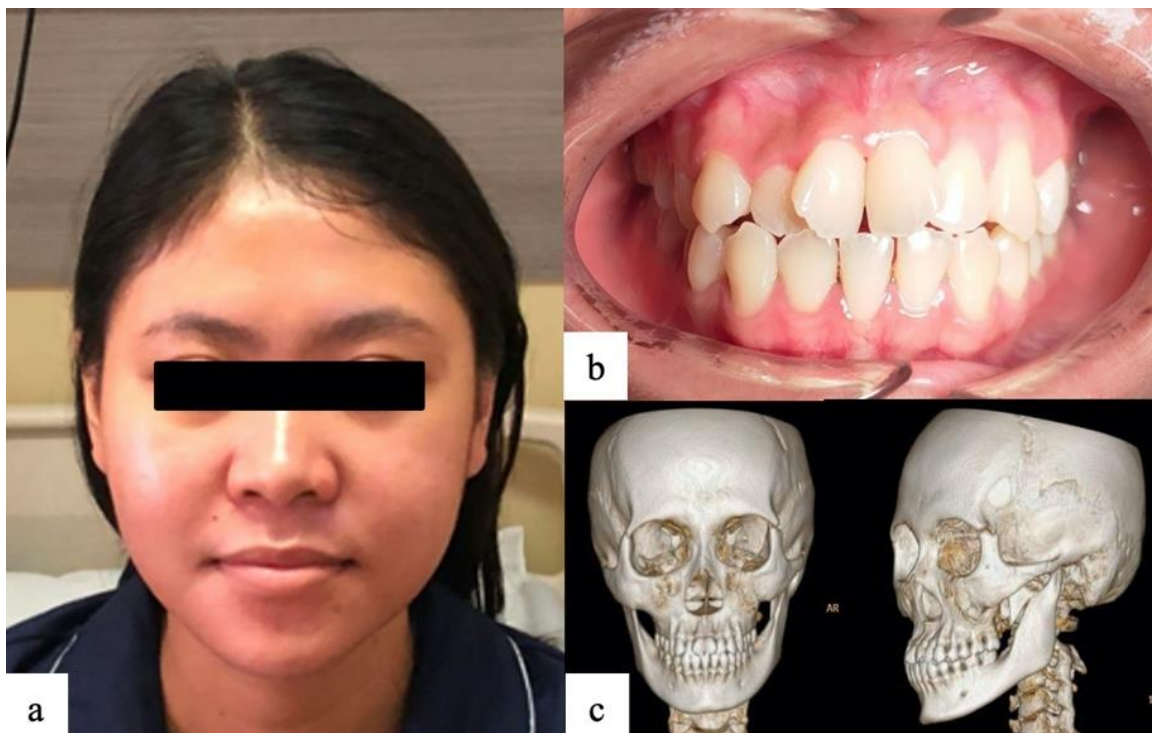


Figure 2. Preoperative condition of patient with sinistra zygomaticomaxillary complex bone fracture with clinical appearance no aesthetic disturbance (a) and no change in occlusion before injury (b). Three-dimensional imaging from MSCT scan of the patient shows fracture line in the left zygomaticomaxillary complex bone, coronoid bone, and lateral orbital bone (c).

DISCUSSION

We reported two cases of neglected zygomaticomaxillary complex bone fracture with similar clinical findings and patient behavior during COVID-19 pandemic. At the time, the level of the COVID-19 pandemic in Indonesia had not subsided. In July 2022, the number of new cases per day in Indonesia was around 1,000-2,500 cases per day.¹⁵ This condition was stressful for people, causing overwhelming fear and anxiety. One of the most common psychological reactions in pandemic outbreaks is mass panic, which is highly related to the psychological feeling of “fear of contagion” that includes fear of the virus transmitting and the fear of getting infected at any time.¹⁶

Even in normal times, maxillofacial trauma on its own is a life-changing event as it causes emotional and psychological consequences besides the physical trauma. A study conducted by Tan et al. showed that maxillofacial injury has an increased tendency to develop anxiety, depression, and posttraumatic stress disorder (PTSD).¹⁷ The incidence of PTSD in patients with facial trauma is around 23–41% and a significantly higher level of PTSD was noted

in zygomaticomaxillary complex injuries compared to other maxillofacial area injuries.¹⁸ One of the core symptoms of PTSD is avoidance, in which the patient tends to avoid thoughts or feelings related to the trauma, and also tries to stay away from places, events, or objects related to the trauma.¹⁹ These symptoms surely contributed to the unwise decision of these patients to neglect the condition of their fractures.

In addition to psychological fear, strict social containment also contributed to the reduction of hospital visits for diseases other than COVID-19.^{20,21} Therefore, a reduced number of surgeries was expected.²⁰ In oral maxillofacial surgery, there were recommendations to not perform elective procedures during the COVID-19 pandemic because oral maxillofacial surgeons routinely perform aerosol-generating procedures.^{22,23} As SARS-CoV-2 is found in saliva, these procedures can transmit COVID-19 through aerosolized saliva which would put surgeons at an increased risk of infection.²³ Closed fractures with limited impairment of function are classified as intermediate procedures and it was suggested that these were performed when the COVID-19 pandemic situation

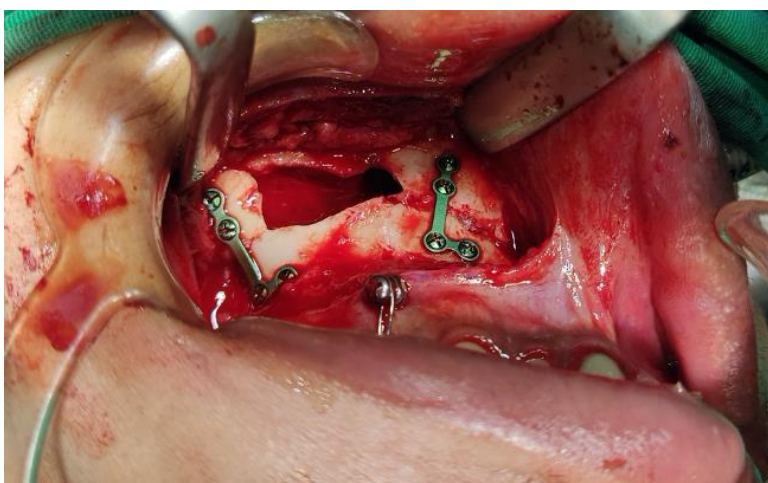


Figure 3. During the surgery, fixation was done using two L-shaped four-hole mini plates and eight screws.



Figure 4. Fixation of the bone fragments was done using a six-hole miniplate and four screws.

settled.²² More specific recommendations from Edward et al. stated that fractures of zygomaticomaxillary complex should be given delayed management because the vast majority of these fractures do not need to be treated in acute setting.²⁴ However, several studies agree that the timing of surgery is important and failure to restore the fracture within a timely period would lead to functional problems.⁸

Paresthesia following facial trauma is related to nerve injury which can be caused by direct injury or a variety of other pathophysiologies such as traction, compression, ischemia, inflammation.^{13,14} Infraorbital nerve damage is the second most common nerve damage following maxillofacial trauma after trigeminal. Moreover, the incidence of infraorbital nerve injury following zygomaticomaxillary complex fractures ranges from 70–94%.¹⁴ This condition is associated with the infraorbital foramen being the weakest point of the zygomaticomaxillary complex. Some 95% of zygomatic fractures with infraorbital injury have a fracture line that involves the infraorbital fissure, canal, or foramen.

The complexity of the fracture is related to nerve recovery. A higher number of sensory disturbances and slower recovery can be expected where there is a displaced fracture line.¹³ Another factor that affects nerve function recovery is the severity of nerve injuries. There are three types of nerve injuries: neurotmesis, axonotmesis, and neuropraxia. Neurotmesis is a condition in which the nerve has been completely divided; disturbance of nerve function in neurotmesis unable to heal unless microsurgery to restore the nerve is performed. Axonotmesis is axonal nerve damage that does not completely sever the surrounding endoneurial sheath and keeps the more intimate supporting structure connected. This type of injury preserves the nerve in continuity so that regeneration can take place. Neuropraxia is the mildest type of peripheral nerve injury induced by focal demyelination or ischemia. All the structures of the nerve remain intact, yet conduction of the nerve impulses is blocked. Neuropraxia has a great prognosis; usually, the nerve can recover spontaneously when the nerve completes remyelination.^{13,25}

Failure to properly diagnose and manage zygomaticomaxillary complex fractures can be a major factor in the development of posttraumatic sensory disturbances. A study by Soh et al. showed that early surgical management of zygomaticomaxillary complex fracture resulted in a higher incidence of infraorbital nerve recovery. Patients who underwent surgery within 14 days of the injury had a higher rate of nerve recovery compared to patients operated on later.¹³ This is in line with our cases where the first patient experienced a faster sensory recovery than the second patient. Our first patient had the surgery 14 days after the accident, while it took a month for the second patient to have the surgery. The zygomaticomaxillary complex bone should ideally be repaired within seven to ten days of the initial injury. The manipulation of bone fragments will be more difficult if it is done within two to six weeks post-injury due to fibrosis and scarring. Fracture

repair past six weeks is challenging since the remodeling stage of the bone healing process has already begun.²⁶

In summary, there are three treatment modalities for zygomaticomaxillary complex bone fracture management: conservative management, closed reduction, and open reduction and internal fixation (ORIF – surgical intervention). Conservative management is done by observing and monitoring the patient's recovery progress by taking physical measurements until the end of the follow-up period. Drug therapy based on the patient's symptoms (analgesic or decongestion medication) is also included in conservative management. This treatment is indicated for cases with minimal or no displacement of fracture segments.^{13,26}

Closed reduction is a less invasive approach used for stable and minimally displaced zygomaticomaxillary complex fractures. The original approach for closed reduction was first described by Gillies et al.; the first incision is on the temporal area to put an elevator below the zygomatic arch, and the temporalis muscle fascia is incised to approach the zygomatic bone. The second incision is made 2 cm laterally to the temporal canthus, then a bone hook is inserted through the skin under zygomatic bone to perform the bone reposition. This method remains widely used today although there are other methods using different devices to perform the closed reduction.^{27,28} However, treatment decisions should be tailored to each patient's unique condition and symptoms. Cases involving paresthesia, as in this article, may require alternative treatments such as ORIF to address nerve-related concerns effectively. Careful evaluation is essential to achieve optimal outcomes while minimizing complications.

ORIF is the most common technique used for treating zygomaticomaxillary complex bone fracture. Surgical procedure is necessary to gain functional and cosmetic results, especially in the presence of infraorbital nerve injury.¹³ Several studies agreed that ORIF treatment plays an important role in the recovery of infraorbital nerve sensory abnormalities. A higher rate of functional nerve reactivation is found when patients are treated with ORIF in contrast to closed reduction. A study conducted by Baloch et al. concluded that every zygomatic fracture involving the infraorbital nerve should be treated with ORIF to achieve appropriate nerve recovery.²⁹

The decision to treat our cases with ORIF is based on the prognosis of infraorbital nerve recovery. Our patients ventured to seek help after experiencing fear due to the COVID-19 pandemic and trauma because of significant discomfort produced by the infraorbital nerve sensory disturbance. In addition, a study by Tanaka et al. in Japan showed that there was no COVID-19 transmission from patients to medical staff in dental and oral maxillofacial surgical practice during the pandemic as long as appropriate protective measures were taken.²³ Recommendations to postpone elective surgical procedures were already published, however, today we face the fact that we will have to live with this virus for an undetermined period.

Gradually, elective procedures should be done to better achieve patients' quality of life and prevent any unnecessary complications.^{30,31} Both our patients tested negative for COVID-19 one day before the surgery was carried out and no medical staff got COVID-19 around that time.

One limitation of this case report is the relatively short follow-up period for both cases, with case one having a follow-up duration of one-and-a-half months and case two of three months. In reality, monitoring bone healing until maturity typically requires more than three months; however, this shorter follow-up period was due to the patients' work commitments and difficulties in taking leave to visit the hospital regularly. As a result, the long-term progress of bone healing beyond the reported follow-up periods remains unknown. This limitation highlights the need for more extended follow-up periods in future cases to gain a comprehensive understanding of treatment outcomes and potential complications.

In conclusion, the COVID-19 pandemic has caused changes to oral maxillofacial trauma management and impacted patients' behavior. Infraorbital nerve sensory disturbances along with zygomaticomaxillary complex bone fractures found during the COVID-19 pandemic should still be managed with ORIF to improve nerve recovery. To prevent occurrences like these in the future, it is crucial to educate the public about the importance of adhering to health protocols to prevent the transmission of COVID-19. This will help alleviate excessive fear of seeking medical attention at hospitals and seeking help in emergency cases.

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