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Clinical Case

Reduction and Fixation of a Mandibular Angle Fracture Resulting from a Motorcycle Accident: a Clinical Case Report

Redução e Fixação de Fratura de Ângulo Mandibular decorrente de Trauma Motociclístico: Relato de Caso Clínico

Reducción y Fijación de Fractura del Ángulo Mandibular resultante de Trauma por Motocicleta: Reporte de Caso Clínico

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Abstract

Mandibular fractures are among the most common injuries in maxillofacial trauma, generally associated with high-energy accidents, such as motorcycle accidents. Due to its anatomical position and mobility, the mandible is particularly susceptible to direct impacts. The diagnosis of these fractures is based on clinical evaluation combined with imaging studies, with computed tomography (CT) being the gold standard. Treatment varies according to the complexity of the case, with open reduction and internal fixation being widely used because it provides stability and early functional recovery. The aim of this study is to report on a clinical case of a right mandibular angle fracture resulting from a motorcycle accident. A 25-year-old male patient presented with pain, limited mouth opening, edema, and malocclusion. A CT scan confirmed the diagnosis. The surgical procedure was performed under general anesthesia, with reduction and internal fixation of the fracture using two 2.0-system titanium plates and screws, combined with intraoperative maxillomandibular block. The postoperative course was satisfactory, without complications, with progressive improvement in mandibular function. It is concluded that the surgical approach employed proved effective, promoting adequate bone stability and functional recovery, reinforcing its indication for mandibular fractures with displacement.

Descriptors: Mandibular Fractures; Facial Injuries; Fracture Fixation, Internal.

Resumo

As fraturas mandibulares estão entre as lesões mais frequentes no trauma maxilofacial, geralmente associadas a acidentes de alta energia, como colisões motociclísticas. A mandíbula, por sua posição anatômica e mobilidade, apresenta maior susceptibilidade a impactos diretos. O diagnóstico dessas fraturas baseia-se na avaliação clínica associada a exames de imagem, com destaque para a tomografia computadorizada helicoidal (TC) como padrão-ouro. O tratamento varia conforme a complexidade do caso, sendo a redução aberta com fixação interna amplamente utilizada por proporcionar estabilidade e recuperação funcional precoce. O presente trabalho tem como objetivo relatar um caso clínico de fratura de ângulo mandibular direito decorrente de acidente motociclístico. Paciente do sexo masculino, 25 anos, apresentou dor, limitação de abertura bucal, edema e má oclusão. A TC confirmou o diagnóstico. O procedimento cirúrgico foi realizado sob anestesia geral, com redução e fixação interna da fratura, por meio de duas placas e parafusos de titânio do sistema 2.0, associada ao bloqueio maxilomandibular transoperatório. O pós-operatório evoluiu de forma satisfatória, sem intercorrências, com melhora progressiva da função mandibular. Conclui-se que a abordagem cirúrgica empregada se mostrou eficaz, promovendo adequada estabilidade óssea e recuperação funcional, reforçando sua indicação em fraturas mandibulares com deslocamento.

Descritores: Fraturas Mandibulares; Traumatismos Faciais; Fixação Interna de Fraturas.

Resumen

Las fracturas mandibulares se encuentran entre las lesiones más frecuentes en traumatismos maxilofaciales, generalmente asociadas a accidentes de alta energía, como colisiones de motocicleta. Debido a su posición anatómica y movilidad, la mandíbula es más susceptible a impactos directos. El diagnóstico de estas fracturas se basa en la evaluación clínica combinada con exámenes de imagen, siendo la tomografía computarizada helicoidal (TC) considerada el método de referencia. El tratamiento varía según la complejidad del caso, siendo la reducción abierta con fijación interna ampliamente utilizada, ya que proporciona estabilidad y una pronta recuperación funcional. Este artículo tiene como objetivo reportar un caso clínico de fractura del ángulo mandibular derecho resultante de un accidente de motocicleta. Un paciente varón de 25 años presentó dolor, limitación de la apertura bucal, edema y maloclusión. La TC confirmó el diagnóstico. El procedimiento quirúrgico se realizó bajo anestesia general, con reducción y fijación interna de la fractura mediante dos placas y tornillos de titanio del sistema 2.0, asociados a fijación maxilomandibular intraoperatoria. El período postoperatorio transcurrió satisfactoriamente, sin complicaciones, con una mejoría progresiva de la función mandibular. Se concluye que el abordaje quirúrgico empleado demostró ser eficaz, promoviendo una estabilidad ósea adecuada y una recuperación funcional, lo que refuerza su indicación en fracturas mandibulares con desplazamiento.

Descriptores: Fracturas Mandibulares; Traumatismos Faciales; Fijación Interna de Fracturas.

INTRODUCTION

The mandible is one of the main bones of the facial skeleton, performing essential functions such as mastication, swallowing, speech, and

maintenance of dental occlusion[1]. As the only movable bone of the craniofacial complex, it is more susceptible to the transmission and dissipation of traumatic forces, making it particularly vulnerable to fractures[2,3]. Furthermore, its prominent position in the lower third of the face increases its exposure to direct impacts, contributing to the high incidence of injuries in this region[4-6]. In this context, mandibular fractures rank among the most frequent injuries in maxillofacial trauma and are commonly associated with high-energy mechanisms[4,7].

From an epidemiological perspective, a higher prevalence of these fractures is observed in young males, which may be related to greater exposure to risk factors, such as traffic accidents and interpersonal violence[8,9]. Interpersonal assaults and falls stand out as relevant etiological factors, although there are some variations depending on the socioeconomic and cultural context. However, the occurrence of these injuries results from the interaction between anatomical, biomechanical, and environmental factors; therefore, traffic accidents, especially motorcycle accidents, are characterized as the primary cause frequently associated with more severe trauma[4,7,10].

This type of fracture can affect different regions of the mandible and is most frequently observed on the condyle, angle, body, and symphysis. This distribution is directly related to the vector of traumatic forces, the structural characteristics of the bone, and the presence of areas of lower resistance, such as regions associated with impacted third molars[2,7,11]. Clinically, fractures manifest through signs and symptoms such as pain, edema, limited mouth opening, malocclusion, abnormal mobility, and paresthesia resulting from involvement of the inferior alveolar nerve; recognition of these manifestations is essential for early diagnosis and prevention of functional and aesthetic complications[4,5].

The diagnosis is based primarily on the combination of clinical and imaging examinations. Clinically, signs and symptoms of pain, swelling, limited mouth opening, malocclusion, abnormal mobility of bone segments, and paresthesia resulting from inferior alveolar nerve injury are common in cases of mandibular fractures[4]. Early identification of these manifestations is essential for diagnostic guidance and the prevention of functional and aesthetic complications[5].

The diagnosis of mandibular fractures is based on the combination of clinical and imaging findings. Imaging studies complement the clinical examination, with panoramic radiography often used as an initial method because it provides an overview of the mandible[10]. However, computed tomography (CT) is considered the gold standard in the evaluation of mandibular fractures, especially in complex cases, due to its high sensitivity and ability to provide detailed three-dimensional images, allowing for better visualization of fracture lines and more precise surgical planning[12,13].

Treatment varies according to the location, fracture pattern, and the patient's clinical condition, ranging from conservative approaches to more invasive and complex surgical interventions[13]. Conservative approaches, through closed reduction, are indicated in selected cases where there is non-displaced or minimally displaced fractures. However, due to the high prevalence of displaced mandibular fractures, open reduction with rigid internal fixation using plates and screws is widely employed. This technique provides adequate stability, promotes bone healing, and allows for early functional recovery[14-16].

Considering the above, the present study aims to report a clinical case of a right mandibular angle fracture following a motorcycle accident, focusing on surgical reduction and stabilization.

MATERIAL AND METHOD

This study is a descriptive qualitative clinical case report, developed in accordance with the methodological guidelines proposed by Pereira et al.[17]. The case was conducted at the Department of Oral and Maxillofacial Surgery and Traumatology of Santa Casa de Misericórdia de Araçatuba, São Paulo, Brazil, involving a 25-year-old male patient who sustained facial trauma resulting from a motorcycle accident and was diagnosed with a right mandibular angle fracture.

The study was carried out in accordance with the principles of the Declaration of Helsinki, ensuring the confidentiality, anonymity, and privacy of the patient's information. The patient was fully informed about the procedures and provided written informed consent, authorizing the use of his clinical data and images for scientific purposes.

CASE REPORT

A 25-year-old male patient was admitted to the emergency department of Santa Casa de Misericórdia de Araçatuba, São Paulo, Brazil, following facial trauma sustained in a motorcycle accident. During medical history assessment, the patient denied systemic comorbidities, allergies, and regular use of medications. He also denied episodes of vomiting, loss of consciousness, or epistaxis, and reported a history of marijuana use and alcohol abuse.

On extraoral examination, limited mouth opening associated with pain was observed, along with mild edema in the region of the right mandibular angle. Intraoral examination revealed crepitus upon palpation of the right mandible, the presence of an anterior open bite (Figure 1A), and premature occlusal contact in the region of tooth 48.

Based on clinical findings, a CT scan of the face was requested. The examination revealed, in

sagittal, axial, and coronal sections, as well as in three-dimensional reconstruction, a fracture of the right mandibular angle (Figures 1B–1G).

The patient was admitted and underwent preoperative laboratory tests, all of which were within normal limits. He was then taken to the operating room, where general anesthesia was induced, followed by nasotracheal intubation. Intraoral antisepsis was performed using 1% aqueous chlorhexidine, and extraoral antisepsis with 2% chlorhexidine solution. Eye protection was provided with adhesive tape, sterile fenestrated drapes were placed, and an oropharyngeal throat pack was inserted.

Subsequently, local infiltration with 2% lidocaine containing epinephrine (1:200,000) was performed in the region of the right mandibular vestibule. A mucoperiosteal incision was made along the external oblique ridge, allowing flap elevation and adequate exposure of the mandibular angle fracture. Fracture reduction was achieved, and maxillomandibular fixation was established to provide occlusal stabilization and intraoperative guidance. A trocar was used to assist in the manipulation, reduction, and fixation of the bone segments.

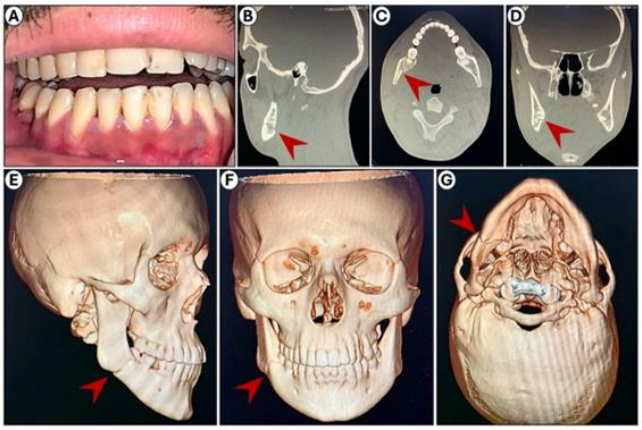

Figure 1. Preoperative clinical and tomographic evaluation. (A) Anterior open bite, demonstrating malocclusion associated with a right mandibular angle fracture. (B–D) Computed tomography (CT) images in sagittal, axial, and coronal planes, respectively. (E–G) Three-dimensional CT reconstruction. The red arrow indicates the right mandibular angle fracture (Source: Author).

Osteosynthesis of the mandibular angle fracture was performed using a 2.0 mm system plate with five holes and monocortical screws in the tension zone, and a 2.0 mm system plate with six holes and bicortical screws in the compression zone (Figure 2A). After fixation, the maxillomandibular fixation was removed, and stable occlusion was confirmed (Figure 2B). Layered closure was then performed using 4-0 resorbable sutures.

Postoperatively, the patient presented with edema in the right mandibular region compatible with the postoperative period, with intact sutures and no signs of bleeding or suppuration. Postoperative CT demonstrated adequate positioning of the fixation hardware and proper alignment of the bone segments (Figures 2C–2E).

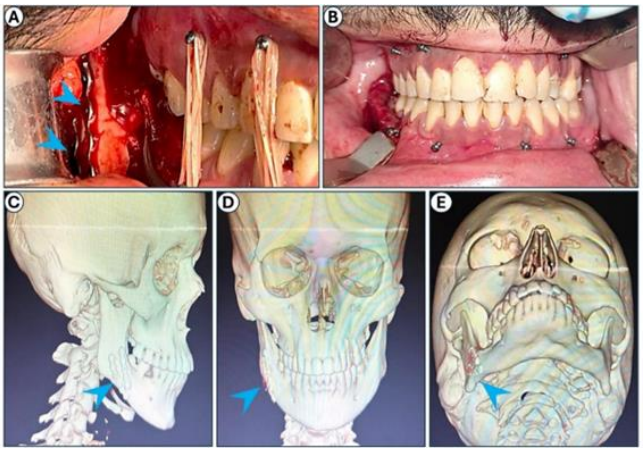

Figure 2. Surgical approach and postoperative imaging. (A) Osteosynthesis of the mandibular angle fracture using two 2.0 mm plates. (B) Stable occlusion after fixation. (C–E) Postoperative three-dimensional computed tomography (CT) reconstruction showing the fixation hardware in position. The blue arrow indicates the osteosynthesis material (Source: Author).

Given the patient's satisfactory clinical progress, he was discharged from the hospital on the first postoperative day. The following medications were prescribed: cephalexin 500 mg every 8 hours for 7 days, ibuprofen 600 mg every 12 hours for 3 days, and dipyrone 1 g every 6 hours as needed for pain.

The patient was instructed to follow a liquid-to-soft diet for 60 days and to apply cold compresses to control swelling.

Outpatient follow-up visits were performed at 15 and 30 days, demonstrating favorable clinical progress. Improvement in mouth opening was observed with the aid of physiotherapy. The patient remains follow-up by the Oral and Maxillofacial Surgery and Traumatology team.

DISCUSSION

Mandibular fractures are among the most treated injuries in oral and maxillofacial surgery and present a wide range of etiologies. Among the main contributing factors, motor vehicle accidents—particularly motorcycle-related accidents, as observed in the present case—and interpersonal violence stand out[18]. This pattern is consistent with the increasing rates of urban violence and traffic-related injuries in contemporary society. Other causes, although less frequent, include falls, bicycle accidents, and firearm-related injuries[18].

Mandibular fractures can be classified according to their anatomical location and morphological characteristics. Regarding location, the most affected regions include the condyle, angle, symphysis, alveolar process, ramus, coronoid process, and mandibular body, as described by Ramalho et al.[19]. In agreement with the literature, the patient in the present case exhibited a fracture in the mandibular angle, one of the most frequently involved sites[20].

From a morphological standpoint, fractures may be classified as greenstick (incomplete fracture), comminuted (multiple bone fragments), impacted (one fragment driven into another), pathological (associated with underlying bone disease), or multiple (presence of two or more fracture lines in the same bone). Additionally, based on their communication with the external environment, fractures may be categorized as open, when there is direct communication with the external environment, or closed, when such communication is absent[21].

The use of imaging studies is fundamental for the diagnosis, treatment planning, and postoperative follow-up of craniofacial fractures[22]. In the present case, the imaging modality of choice was CT, which is consistent with the current literature, as it is widely considered the gold standard due to its high accuracy in determining the location and extent of fractures[13,22,23].

CT imaging played a crucial role in the diagnosis and management of this case, allowing clear visualization of a right mandibular angle fracture extending from the inferior border of the mandible toward the superior aspect, involving both the mandibular body and ramus. Clinical intraoral examination revealed no communication with the external environment, characterizing a closed fracture. However, displacement of the bone fragments was evidenced by limited mouth opening, pain, edema in the mandibular angle region, and crepitus on palpation, findings that were consistent with the imaging results.

Among the therapeutic options for mandibular fractures, management ranges from conservative (non-surgical) approaches to complex surgical interventions. Conservative treatment is restricted to selected cases without displacement of bone fragments. In contrast, fractures with evident displacement require surgical management through reduction and fixation[24]. In this context, the gold-standard approach involves osteosynthesis using titanium plates and screws[25]. Consistent with this evidence, the present case employed fixation with 2.0 mm plates and screws, a choice supported by high success rates reported in the literature.

For intraoperative occlusal stabilization, maxillomandibular fixation was performed, providing proper occlusal alignment and additional stability to the bone segments, thereby ensuring greater precision during fixation1[8,26].

Regarding postoperative management, the literature recommends maintaining a liquid-to-soft diet for at least two weeks, along with the use of cold compresses to reduce edema[18,27]. In the present case, the patient was instructed to maintain this diet for 60 days and to apply cold compresses during the first four postoperative days. Follow-up evaluations at 15 and 30 days demonstrated favorable clinical progress, with improved mouth opening aided by physiotherapy. Fixation using the 2.0 mm system proved effective, as evidenced by the absence of postoperative complications such as infection or hardware failure. The patient remains under follow-up by the Oral and Maxillofacial Surgery and Traumatology team of Santa Casa de Misericórdia de Araçatuba, São Paulo, Brazil.

CONCLUSION

The use of open reduction and internal fixation with 2.0 mm plates and screws proved to be an effective approach for the treatment of a right mandibular angle fracture following a motorcycle accident, providing adequate bone stability and favorable functional recovery.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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