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Serial Case Report

Surgical Management of Open Reduction Internal Fixation (ORIF) in the Treatment of Mandibular Condyle Fractures: Serial Case Report

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Abstract:

Background: *The mandibular condyle is part of the temporomandibular joint with regular movements of rotation and translation simultaneously on the right and left sides when opening or closing the mouth. Mandibular condyle fractures can cause long-term complications such as malocclusion, open bite, reduced posterior facial height, facial asymmetry and limited mouth opening. Management of mandibular condyle fractures is still debatable between closed reduction or open reduction depending on the case. In some cases, combination of closed reduction and open reduction was reported. Immediate and appropriate treatment can prevent complications. This serial case report describes the successful treatment of a condyle fracture with open reduction with internal fixation (ORIF).* ***Case report:*** *This case report discusses three cases of mandibular condyle fracture. Our three patients underwent surgical treatment procedures, which is open reduction and internal fixation (ORIF) with an extraoral approach. Postoperative follow-up showed the patient was in good condition, good occlusion and no significant complications.* ***Conclusion:*** *Mandibular condyle fracture is one of the facial bone fractures that often occurs and is difficult to treat. Immediate treatment with appropriate open reduction internal fixation in both cases resulted in good anatomical shape and function of the temporomandibular joint.*

Keywords: *Mandibular Condyle Fracture, Mandibular Fracture, Open Reduction Internal Fixation, ORIF*

Introduction

Mandibular fractures are the second most common facial fractures after nasal fractures, with condylar fractures being the most frequent type of mandibular fractures, accounting for 25%- 35% of cases. Bilateral condylar fractures have a high incidence, reaching 40%-50% of total condylar fractures. The high incidence of mandibular condyle fractures is due to the stiffness difference between the mandibular ramus and condyle, where the condyle is less rigid than the ramus. These fractures typically result from indirect force transmitted to the condylar head, with external causes such as

physical trauma, traffic accidents, violence, industrial accidents, falls, sports injuries, and gunshot wounds. Internal causes include osteomyelitis, benign or malignant tumors, and muscle spasms due to electrical shock therapy.[1,2]

Mandibular fractures can cause aesthetic and functional impairments, necessitating precise treatment for reconstructing form and function. Accurate diagnosis, proper reduction, rigid fixation, and complication prevention are crucial. Special attention is needed because mandibular condyle fractures can lead to long-term complications such as mandibular growth disturbances, functional impairment, and chronic TMJ disorders. Bilateral condylar fractures can cause anterior open bite, loss of ramal height, articular surface damage, and muscle adhesions, accompanied by reduced mouth opening, limited lateral mandibular movement, and decreased bite force. [1,2] This serial case report aims to evaluate whether bilateral condylar fractures necessitate surgical intervention on both condyles

CASE REPORTS

Case 1

A 41-year-old female patient came to the Emergency Department of Dr. Hasan Sadikin General Hospital, Oral and Maxillofacial Surgery Division, with complaints of difficulty opening and closing her mouth. The incident began four days before hospitalization when the patient was working and suddenly lost consciousness, causing her to lose balance and fall, hitting her chin on a table. There was bleeding from her face, but no bleeding from the mouth, nose, or ears, and no nausea or vomiting. The patient complained difficulty opening and closing her mouth and was taken to a community health center where wound cleaning was performed, and the wound was covered with a bandage. The following day, the patient visited a private dental and oral hospital where a panoramic X-ray was taken, and she was referred to the Emergency Department of Dr. Hasan Sadikin General Hospital for further treatment.

During the primary survey, no signs of emergency were observed, and the secondary survey results also indicated normal conditions. General examination revealed asymmetry in the patient's head and facial region. Local examination showed a lacerated wound on the chin, measuring 4 x 1 x 0.5 cm^3, with irregular edges and a muscular base (Figure 1). Intraoral examination revealed an anterior open bite (Figure 2)

Figure 1: Profile and extraoral photos of the patient

Figure 2: intra oral photo showing anterior open bite

The results of the panoramic X-ray showed discontinuity in the bilateral mandibular condyle. The patient then underwent a 3D CT scan of the head, which revealed bilateral mandibular condyle fractures with medial displacement (Figure 3). Based on the anamnesis, clinical examination (subjective and objective), and radiographic findings, the patient was diagnosed with bilateral condylar fractures accompanied by a lacerated wound (vulnus laceratum) in the mental region

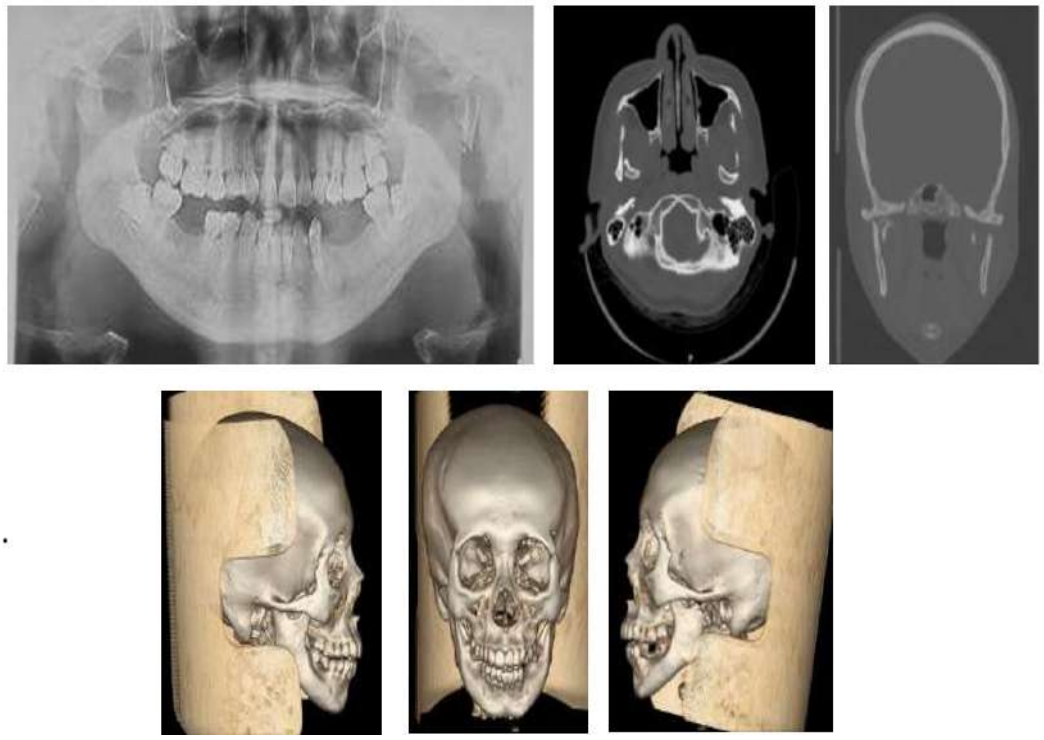

Figure 3. ***Panoramic radiograph and 3D CT scan of bilateral condylar fractures.***

Based on the series of examinations and the consent of the patient and their family, it was decided to perform an Open Reduction Internal Fixation (ORIF) procedure under general anesthesia. An extraoral approach was used to reduce the condylar bone fragments and reposition the condyle, utilizing bilateral preauricular and submandibular incision designs. Before making the incisions, the surgical area was marked in the preauricular region to identify the facial nerve (CN VII) (Figure 4)

Figure 4: ***Surgical site marking for facial nerve (CN VII) identification.***

After the incision design was completed, preauricular and submandibular incisions were made using a #15 blade. Following this, blunt dissection was performed in the preauricular and submandibular regions using an artery clamp, revealing the medially displaced condylar bone fragments. The bone fragments were then repositioned, and a submandibular approach was used to apply traction to the mandible using a wire to facilitate the retrieval of the fractured condylar fragments displaced medially. After the bone fragments were repositioned, fixation plates were installed using 2.0 mm straight plates, with two plates placed on each condyle and 8 mm screws used for fixation. Subsequently, occlusion locking was achieved using four quick fix devices and wires (Figure 5).

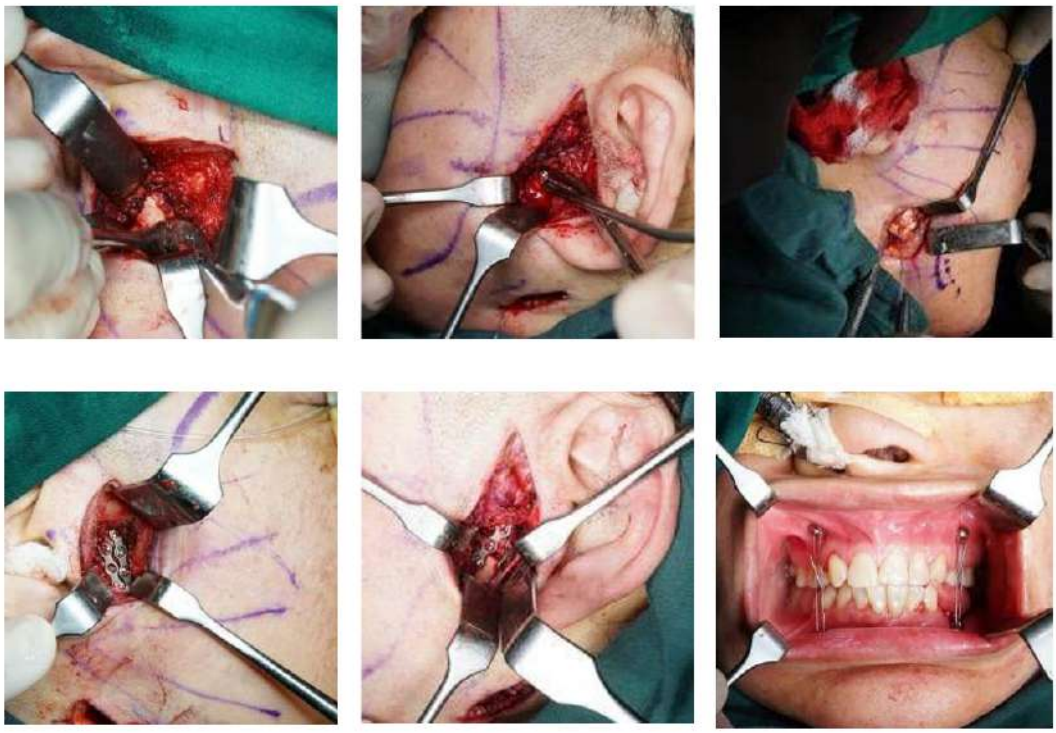

Figure 5: Intraoperative patient (plate placement and intermaxillary fixation with wire)

Next, thorough irrigation was performed using 0.9% NaCl, achieving hemostasis. The flap was then repositioned, and primary suturing was carried out on the incised areas using Vicryl® 4-0 sutures for the muscle layer and T-Nylon® 6-0 sutures for the cutaneous layer (Figure 6). During both the operation and the postoperative period, there was no significant bleeding. The patient underwent regular follow-up and achieved satisfactory postoperative recovery

Figure 6: Postoperative extraoral sutures

Seven days postoperatively, the patient returned for a follow-up. Clinical examination showed good healing at the suture site, and the patient's oral hygiene was satisfactory. Suture removal was performed, and the wound was found to be tightly closed with no signs of inflammation

Case 2

An 8-year-old girl came to the Oral and Maxillofacial Surgery department at Dr. Hasan

Sadikin general hospital with complaints of being unable to close her mouth. The incident occurred 10 days prior to admission when she slipped while playing on the stairs at home, causing her chin to hit the stair floor first. There was no bleeding from the face, mouth, nose, or ears, and no nausea or vomiting. The patient was taken to a private hospital in Karawang area, where a CT scan of the head was performed, and she was referred to the Oral and Maxillofacial Surgery department at Dr. Hasan Sadikin general hospital for further treatment. Primary and secondary surveys revealed no emergency signs, with general examination showing facial asymmetry towards the left. Intraoral examination confirmed an anterior open bite (Figure 7).

Figure 7: Preoperative profile and intraoral photos

A 3D CT scan of the head showed a left mandibular condyle fracture with medial displacement (Figure 8). Based on anamnesis, clinical examination (subjective and objective), and radiographic findings, the patient was diagnosed with a left condyle fracture

Figure 8: 3D Head CT-Scan

After a thorough examination and obtaining consent from the patient and family, it was decided to proceed with Open Reduction Internal Fixation (ORIF) under general anesthesia. An extraoral approach was used to reduce and reposition the fractured condyle using a preauricular incision design on the left side. Before making the incision, the surgical area was marked to identify the facial nerve (NC VII). A preauricular incision was made using a #15 blade, followed by blunt dissection with artery forceps, revealing the medially displaced condylar fragment. The fragment was repositioned, and fixation was performed using two straight 2.0 mm plates and 8 mm screws on the left condyle. Occlusion was secured with four quick-fix devices and wire. Thorough irrigation with 0.9% NaCl was performed, hemostasis was achieved, and the flap was repositioned and sutured using 4-0 Vicryl® for muscle layers and 6-0 T-Nylon® for the skin (Figure 9). No significant bleeding was observed during or after surgery. The patient was regularly monitored postoperatively, with satisfactory healing outcomes

Figure 9: Intraoperative patient (incision design, plate placement, and postoperative extraoral suturing)

Seven days postoperatively, the patient returned for follow-up. Clinical examination showed good healing at the suture site, and the patient maintained satisfactory oral hygiene. The sutures were removed, and the wound was completely closed without signs of inflammation.

Case 3

A 13-year-old girl presented to the Oral and Maxillofacial Surgery department at Dr. Hasan Sadikin general hospital with complaints of a fractured lower jaw and difficulty opening and closing her mouth. The incident occurred six days prior to admission when she was engaged in physical activity at school. She suddenly felt dizzy, lost her balance, and fell, striking her chin against a floor first. There was bleeding from the chin and mouth, but no bleeding from the nose or ears, and no nausea or vomiting. The patient was taken to a private clinic at Purwakarta area, where suturing was performed on her chin. She was then referred to the emergency department of a private hospital at Purwakarta area, where a panoramic X-ray and head imaging were conducted before she was transferred to the emergency department at Dr. Hasan Sadikin general hospital for further treatment. Primary and secondary surveys showed no signs of emergency, and the patient's overall condition was within normal limits. General examination revealed facial asymmetry. Localized examination showed extraoral sutures on the chin measuring 3x1 cm^2. Intraoral examination revealed a laceration on the lower lip measuring 5x3x1 cm^3 with an irregular edge and muscle exposure, as well as avulsion of teeth 11 and 21 (Figure 10)

Figure 10: Preoperative profile and intraoral photos of the patient

The patient underwent wound cleansing, alveolectomy at the 11 and 21 tooth regions, suturing of the lower lip and gingiva in the same region, and placement of interdental wiring with an arch bar on both the upper and lower jaws. The patient was then admitted for inpatient care in preparation for surgery (Figure 11)

Figure 11. Extraoral and intraoral suturing, along with interdental wiring placement using an arch bar

Panoramic X-ray and 3D CT scan of the head revealed bilateral mandibular condyle fractures with medial displacement and a fracture of the mandibular symphysis. Based on anamnesis, clinical examination (subjective and objective), and radiographic findings, the patient was diagnosed with bilateral condylar fractures and a mandibular symphysis fracture (Figure 12).

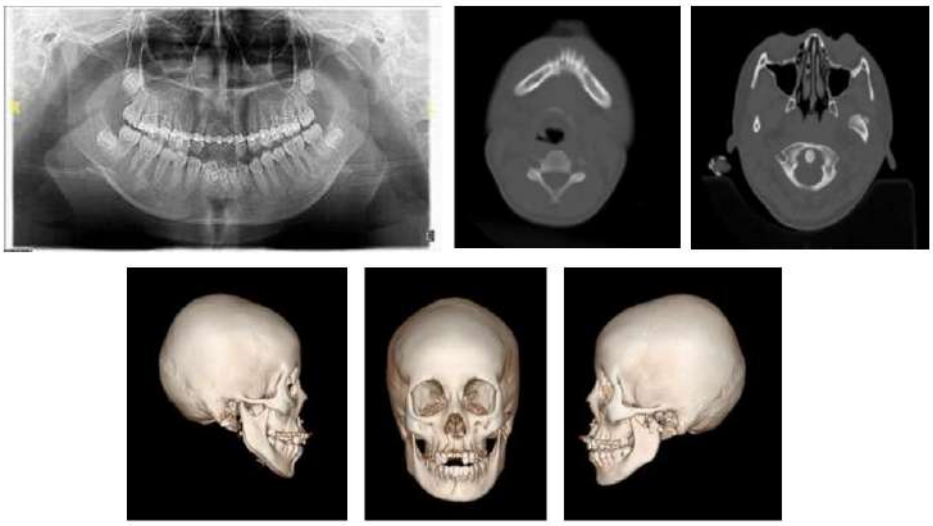

Figure 12: Panoramic X-ray and 3D CT scan of the head

Following comprehensive evaluation and consent from the patient and family, Open Reduction Internal Fixation (ORIF) was planned under general anesthesia. An extraoral approach was used to reduce and reposition the condylar and symphyseal fractures, utilizing preauricular and intraoral incisions. Preoperatively, the surgical site was marked to identify the facial nerve (NC VII). A preauricular and intraoral incision was made using a #15 blade. Blunt dissection with artery forceps was performed in the preauricular region, revealing the medially displaced condylar fragment, which was then repositioned. An intraoral incision was used to reduce the symphyseal fracture.After repositioning the bony fragments, fixation was achieved using two straight 2.0 mm plates on each condyle and two plates on the symphysis, secured with 8 mm screws. Occlusion was stabilized using intermaxillary fixation with an arch bar and wire. Thorough irrigation with 0.9% NaCl was performed, hemostasis was ensured, and the surgical flaps were repositioned and sutured using 4-0 Vicryl® for muscle and intraoral layers and 6-0 T-Nylon® for the skin (Figure 13). There was no significant intraoperative or postoperative bleeding. The patient was regularly monitored postoperatively and exhibited satisfactory healing

Figure 13: Intraoperative patient (plate placement and intermaxillary fixation with arch bar)

Seven days postoperatively, the patient returned for a follow-up visit. Clinical examination showed good healing at the suture sites, and the patient maintained satisfactory oral hygiene. The sutures were removed, and the wound was completely closed without signs of inflammation

Discussion

Mandibular condyle fractures are the most common type of mandibular fractures, accounting for approximately 25%-35% of cases. Bilateral condylar fractures make up 40%-50% of all condylar fractures. This high incidence is due to the structural weakness of the condyle within the mandibular framework, particularly because of its narrow neck. The biomechanics of condylar fractures follow the "Hunting Bow Concept," which describes the mandible as resembling a hunting bow, where the ends are weak, and the center is strong. Any impact or force directed at the midline of the mandible (symphysis) can result in bilateral condylar fractures, while forces at the parasymphysis can lead to contralateral fractures (Figure 14). The most common external causes of condylar fractures include physical trauma, motor vehicle accidents, industrial accidents, sports injuries, falls, violence, and gunshot wounds. Internal factors contributing to fractures include osteomyelitis, benign or malignant tumors, and muscle spasms induced by electrical shock therapy.[1–4] In all three cases presented, the "Hunting Bow Concept" is evident, as each patient experienced trauma originating at the mandibular midline (symphysis). In the third case, a simultaneous symphysis fracture was also present. The cause of these fractures was external trauma, with all three patients experiencing a similar mechanism of injury—falling and striking the chin first.

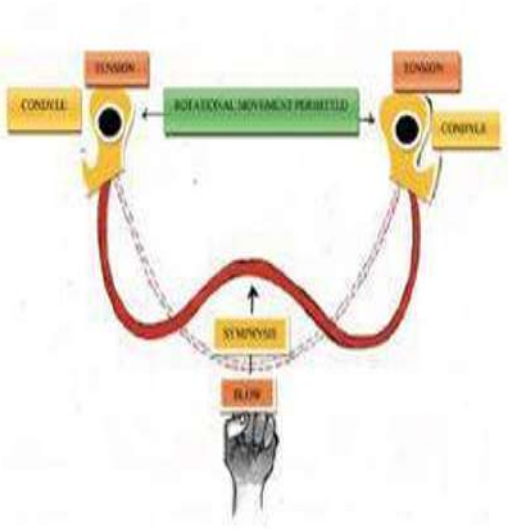

Figure 14: ***Hunting Bow Concept***

Based on the location of the fracture, deviation, and/or displacement, as well as the position of the condylar head within the articular fossa, Lindahl classifies condylar fractures into three types: condylar head fractures, condylar neck fractures, and subcondylar fractures (Figure 15). Condylar head fractures, also known as intracapsular fractures, occur within the joint capsule and extend to the condylar neck. Condylar neck fractures occur at the inferior attachment of the joint capsule, involving the narrow region of the condylar head. These are considered extracapsular fractures as they do not involve the joint capsule and occur at the inferior attachment of the lateral pterygoid muscle. Subcondylar fractures occur inferior to the condylar neck, in the region between the mandibular sigmoid notch and the posterior aspect of the mandible. [2,4,5] According to Lindahl's classification, the first case presented in this study can be categorized as a condylar neck fracture. Meanwhile, the second and third cases are classified as subcondylar fractures.

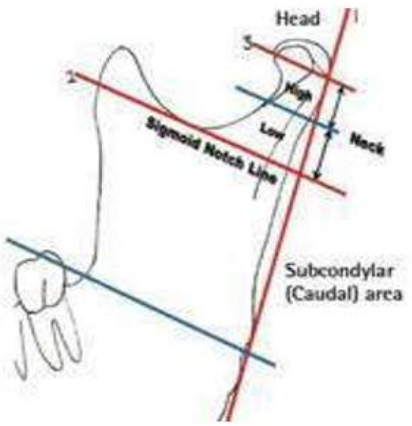

Figure 15: Classification of condylar fractures according to Lindahl

Diagnosis of condylar fractures relies on clinical and radiological evaluation. These fractures often go undetected in clinical assessments. The most common symptoms include pain and trismus in the temporomandibular joint (TMJ) area, which worsen with jaw movement. Patients typically limit their mandibular motion due to pain. Other symptoms include localized swelling, crepitus in the TMJ, and occasionally, ear bleeding. Malocclusion is a common complaint and must be thoroughly assessed. In unilateral condylar fractures, the midline of the chin and lower teeth deviate toward the fractured side, with posterior open bite on the contralateral side, preventing full mouth closure. In bilateral condylar fractures, often caused by symmetrical impact, the midline deviation is absent, but the mandible appears protruded, resulting in an anterior open bite. Patients may experience restricted jaw movement and difficulty speaking or swallowing. Palpation typically reveals tenderness and swelling, and assessment includes placing a finger over the TMJ in front of the tragus or carefully inserting a fingertip into the external acoustic canal.[4,5] The three cases above share similar clinical findings, including pain in the TMJ region, difficulty opening and closing the mouth, malocclusion, open bite, and facial asymmetry

Radiographic examinations such as Reverse Towne's X-ray, oblique lateral X-ray, panoramic X-ray, TMJ tomography, Water's X-ray, transcranial TMJ view, nasal projection, 3D CT scan, and MRI may be necessary to assess both soft and hard tissue involvement of the condylar head.[4–6] In this case series, 3D CT scans were used to confirm condylar fractures in all cases, with panoramic X-rays performed in the first and third cases.

Treatment of mandibular condyle fractures remains controversial despite extensive research in the scientific literature. Some studies favor conservative management due to its safety, while others advocate surgical treatment for faster and better functional recovery. The primary goal of treatment is to restore both anatomical structure and function. This is achieved through proper reduction and immobilization of the fractured fragments. Conservative treatment typically involves closed reduction and intermaxillary fixation using arch bars and wires, maintained for 2 to 4 weeks. Once stable union is achieved, the wires are removed, occlusion is restored with elastics, and a soft diet is recommended for an additional two weeks. Functional therapy, including passive mandibular exercises and mouth-opening training, is introduced, with clinical outcomes closely monitored. Various surgical approaches for open reduction of mandibular condyle fractures depend on the fracture location and the degree of displacement. The standard principles include reduction, repositioning, fixation, and immobilization. Surgical techniques involve preauricular, postauricular, submandibular, Risdon, retromandibular, and combined approaches. The choice of treatment should consider patient age, preferences, fracture type, additional fractures, and dental status.[1,2,4,7] In the three cases reported here, open reduction and internal fixation (ORIF) were performed to achieve optimal treatment outcomes.

Complications in the management of mandibular condyle fractures depend on the

severity of trauma, fracture type, displacement degree, affected structures, treatment approach (open or closed), and timing of intervention. Common complications include TMJ dysfunction, occlusal discrepancies, facial asymmetry, and ankylosis. Rare complications include avascular necrosis of the condylar head associated with surgical intervention. Surgical complications may include temporary or permanent facial nerve palsy, marginal mandibular nerve paralysis, hypoesthesia of the ear, postoperative scarring, ear stenosis, sialocele and salivary fistula formation, auriculotemporal nerve syndrome (Frey's syndrome), masseter myotonia, mini-plate fractures, and condylar head resorption. Surgical complications are generally temporary and may persist for up to 12 months postoperatively. Additional pharmacotherapy, such as vitamin B and B12 supplementation, may be prescribed during this period.[2,4,5] In this case series, no significant intraoperative or postoperative complications were observed

Discussion

The management of mandibular condyle fractures must be carefully considered whether through conservative treatment or open reduction with internal fixation, by weighing the benefits and risks of each approach. Treatment decisions should be based on various factors, including patient age, systemic condition, and fracture type. Based on the cases presented, we conclude that open reduction with internal fixation provides favorable outcomes in restoring mandibular condyle structure and function, achieving proper occlusion, and improving facial aesthetics. However, potential complications associated with open reduction should be carefully evaluated before selecting the treatment approach

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