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Review

Management and Complications of Condylar Fractures

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Abstract

Mandibular condylar fractures are frequently encountered maxillofacial traumatic injuries, representing a significant proportion of all fractures of the lower jaw. They are more common in young males and are typically caused by trauma to the face or jaw. The diagnosis begins with a thorough medical and dental history, followed by a clinical examination and radiographic imaging. With both surgical and non-surgical methods available, there are differences in opinion regarding condylar fracture repair. Surgical options include open reduction and internal fixation (ORIF), closed reduction and internal fixation (CRIF), percutaneous reduction and internal fixation (PRIF), arthroscopy-assisted reduction and internal fixation (ARIF), and endoscopic-assisted reduction and internal fixation (ERIF). Non-surgical options include closed reduction, immobilization, and functional therapy. Complications can occur with both surgical and non-surgical approaches, and the timing of treatment should be based on the severity and complexity of the fracture, as well as the patient's overall health and individual circumstances. The long-term outcomes of mandibular condylar fracture management are generally favorable, but certain factors can influence the prognosis. Further research is needed to better understand how to optimally manage these injuries and improve clinical and surgical outcomes.

Keywords: *mandibular fracture, condylar fracture, maxillofacial trauma*

Introduction

Mandibular condylar fractures (MCF) are relatively common and represent a significant proportion of all mandibular fractures (MF). Their incidence varies between studies and populations, but they are generally reported to account for 25% to 35% of all MFs (1).

MCF occurs more frequently in males, with a male-to-female ratio varying between 2:1 and 5:1 in the literature (2-4). They typically occur in young adults, with a peak incidence in the third decade of life (5). The most common causes of MCFs are trauma to the face or jaw, including motor vehicle accidents, assaults, falls, and sports-related injuries. Other causes include iatrogenic injuries during dental or surgical procedures, as well as pathological conditions such as osteoporosis and metastatic cancer. Several risk factors have been identified for MCFs, including alcohol and drug use, male gender, and younger age (5). Patients with pre-existing temporomandibular joint (TMJ) dysfunction or arthritis may also be at increased risk for condylar fractures.

The diagnosis of MCFs typically begins with a thorough medical and dental history, followed by a clinical examination. Patients with suspected MCFs may present with pain, swelling, and limited or painful jaw movements. During the clinical examination, the clinician may observe facial asymmetry, malocclusion, and deviation of the mandible upon opening or closing the mouth (6).

Radiographic imaging is an essential diagnostic tool in the evaluation of MCFs. The most commonly used radiographic imaging modalities include panoramic radiographs, computed tomography (CT), and magnetic resonance imaging (MRI). Panoramic radiographs are useful for initial screening, but CT and MRI are preferred for a more detailed assessment of the fracture and surrounding soft tissues.

In some cases, additional diagnostic procedures may be necessary, such as dental casts, occlusal analysis, and electromyography (EMG). Dental casts can help identify occlusal discrepancies that may be associated with condylar fractures, while occlusal analysis can help identify functional disturbances of the jaw. EMG can help assess the function of the masticatory muscles and determine the presence of muscle spasms or dysfunction (6). The treatment strategies for MCFs and their optimal management are topics of debate. The purpose of this literature review is to summarize the current understanding of the treatment modalities and management of MCF.

Methodology

This study is based on a comprehensive literature search conducted on March 16, 2023, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed information about the management and complications of condylar fractures. There were no restrictions on a date, language, participant age, or type of publication.

Discussion

Surgical treatment

While non-surgical management options are available for some cases, surgical intervention is often necessary for more severe cases. Surgical interventions for condylar fractures can be classified into two categories, namely, open and closed reductions (7). Open reduction is typically reserved for more complex fractures or when closed reduction is unsuccessful. Different surgical techniques have been developed for the management of MCFs, each with its own set of advantages and drawbacks.

Open reduction and internal fixation (ORIF) is a commonly used surgical technique for the management of MCFs. ORIF involves making an incision in the skin to access the fractured condyle and then using screws, plates, or wires to fixate the bone in its correct position. One advantage of ORIF is that it allows for direct visualization of the

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fracture site, which can help to ensure accurate reduction and fixation of the fracture. ORIF is also associated with a low risk of malocclusion and joint dysfunction (8).

However, ORIF does have some disadvantages. One of the main disadvantages is that it requires an incision to be made, which can result in scarring and potential damage to surrounding tissues. Additionally, ORIF requires the use of hardware such as screws, plates, or wires, which can potentially cause irritation or infection (8).

Another surgical technique for the management of MCFs is closed reduction and internal fixation (CRIF). CRIF involves reducing the fracture without making an incision in the skin and then using hardware to fixate the bone in its correct position (9). One advantage of CRIF is that it is less invasive than ORIF, which can result in less scarring and a quicker recovery time. Further, CRIF does not need the operator to directly visualize the fracture site, which can decrease the risk of damage to adjacent tissues.

However, CRIF also has some disadvantages. One of the main disadvantages is that it can be more difficult to achieve accurate reduction and fixation of the fracture without direct visualization. Additionally, CRIF is associated with a higher risk of malocclusion and joint dysfunction compared to ORIF (9).

A variation of CRIF is the percutaneous reduction and internal fixation (PRIF). PRIF involves making a small incision in the skin and then using specialized instruments to reduce and fix the fracture without the need for a larger incision (10). PRIF offers the advantages of both ORIF and CRIF, including direct visualization of the fracture site and less invasive surgery.

Finally, endoscopic-assisted reduction and internal fixation (ERIF) is another surgical technique that has been developed for the management of MCFs. ERIF involves making small incisions in the skin and then using an endoscope to visualize the fracture site and guide reduction and fixation (11). ERIF offers the advantage of less invasive surgery compared to ORIF, as well as direct visualization of the fracture site.

However, ERIF also has some disadvantages. One of the main disadvantages is that it requires specialized equipment and training, which may not be available in all settings. Additionally, ERIF may not be appropriate for all types of MCFs, particularly those that are more complex.

Non-surgical treatment

Non-surgical management of MCFs can be considered in certain cases, such as in children with deciduous or mixed dentition, patients with medical comorbidities that increase the risks of surgery, or in cases where there is minimal or no displacement of the fracture fragments. Conservative management options for MCFs include closed reduction, immobilization, and functional therapy (12).

Closed reduction involves the manipulation of the fractured fragments to achieve proper alignment and occlusion without making any incisions through the skin or mucosa (13). Several techniques are in use today and involve the utilization of arch bars, most commonly, the Erich arch bars; Ivy loops; intermaxillary fixation (IMF) screws; and, particularly in edentulous patients, Gunning splints and dentures (14).

Most common approaches involve the use of wired arch bars or elastics, known as rigid intermaxillary fixation and intermaxillary elastic traction, respectively (15). Several studies have reported successful outcomes with closed reduction for MCFs, with most patients achieving satisfactory occlusion and function.

Immobilization using external appliances such as occlusal splints, intermaxillary fixation, or screws allows for the stabilization of the fractured fragments and healing. Occlusal splints are commonly used in the management of MCFs, as they allow for the early mobilization of the mandibular segments while preventing unwanted movements that may disrupt the healing process. Intermaxillary fixation involves wiring the maxillary and mandibular teeth together to

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immobilize the jaw, but this technique has fallen out of favor due to its potential complications, such as malocclusion and periodontal damage (14).

Functional therapy involves the use of exercises and physiotherapy to promote healing and restore function to the mandible (16). This approach is often used in conjunction with other non-surgical management techniques and may involve exercises such as mouth opening and closing, lateral movements, and stretching of the jaw muscles. Several studies have reported successful outcomes with functional therapy for MCFs, with most patients achieving satisfactory occlusion and function (17).

Non-surgical management of MCFs has several advantages, including reduced risks of complications associated with surgery, shorter hospital stays, and lower costs (12). However, it also has several limitations, such as the inability to achieve an anatomical reduction of the fracture fragments, longer healing times, and the potential for malocclusion and other functional problems (13).

The use of conservative management options such as diet modification and physiotherapy has also been evaluated in the management of MCFs. A retrospective study by Lu et al. evaluated the outcomes of conservative management in 47 patients with unilateral MCFs (18). The study found that conservative management resulted in good functional outcomes and minimal complications in most cases, particularly in patients with undisplaced fractures.

Timing of treatment

The optimal timing of treatment for MCFs is still a topic of debate. Some studies have suggested that early intervention (within two weeks of injury) can lead to better outcomes, while others have found no significant difference in outcomes between early and delayed treatment (7, 19). One consideration is the potential for post-traumatic inflammation, which can complicate fracture reduction and healing. In general, the timing of treatment should be based on the severity and complexity of the fracture, as well as the patient's overall health and individual circumstances.

Complications

Complications in the management of MCFs can occur with both surgical and non-surgical techniques. Some of the common complications associated with surgical management include nerve injury, malocclusion, and infection, while non-surgical management can lead to limitations in mouth opening and joint function (20). Nerve injury is a frequent complication associated with surgical approaches. The inferior alveolar nerve (IAN) and lingual nerve are at risk during surgical approaches to the condyle. A study by Hu et al. reported a nerve injury rate of 5.7% in patients who underwent ORIF for MCF (21). The study also found that patients with nerve injuries had a significantly longer hospital stay and a higher incidence of malocclusion. Malocclusion is another common complication associated with the surgical management of MCFs. The fracture may not be properly reduced, or the hardware used for fixation may become dislodged or malpositioned, resulting in occlusal discrepancies. A study by Woon et al. reported an incidence of malocclusion in 10.4% of patients who underwent ORIF for MCFs. The researchers also noted that the use of two mini plates for fixation was linked with a lower incidence of malocclusion as opposed to the use of only one. Infection is also a potential complication associated with the surgical management of MCFs. A study by Boffano et al. reported an incidence of postoperative infections in 2.6% of patients who underwent ORIF for MCFs (22). The study found that factors such as comminution of the fracture, the presence of teeth adjacent to the fracture, and prolonged intubation were associated with an increased risk of postoperative infection.

Non-surgical management of MCFs can also lead to complications, particularly in terms of joint function. One of the main complications associated with non-surgical management is limitations in mouth opening. Patients treated non-surgically for MCFs showed a greater predisposition to reduction and shifts in mouth opening upon completion of treatment (23). There are also reports indicating that

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non-surgical management is associated with a higher incidence of temporomandibular joint (TMJ) dysfunction (24). Another complication associated with the non-surgical management of MCFs is joint ankylosis. Ankylosis occurs when the TMJ becomes fused, leading to a lack of joint mobility and function. A study by Lee et al. reported an incidence of TMJ ankylosis of 5.8% in patients who underwent non-surgical management for MCFs (25). One study also found that factors such as older age, delay in treatment, and comminution of the fracture were associated with an increased risk of TMJ ankylosis (26).

In terms of prognosis, the long-term outcomes of MCF management have been shown to be generally favorable, with good functional recovery and restoration of pre-injury occlusion (17). A prospective study by van den Bergh et al. evaluated the long-term outcomes of MCFs treated with ORIF or non-surgical management in 97 patients (27). The study found that the majority of patients achieved good functional outcomes and restoration of pre-injury occlusion, with no significant differences between the two treatment modalities. However, certain factors can influence the prognosis of MCFs. A retrospective study by Subhashraj et al. evaluated the factors affecting the functional recovery of patients with MCFs treated with ORIF (28). The study found that age, displacement of the fracture, and duration between injury and treatment were significant factors affecting the functional recovery of patients.

Conclusion

Mandibular condylar fractures are common injuries in maxillofacial trauma, and the optimal treatment is still a topic of debate. Treatment options include surgical and non-surgical approaches, and the timing of treatment should be based on the severity and complexity of the fracture, as well as the patient's overall health and individual circumstances. Complications in MCF management can include malocclusion, infection, and facial nerve injury. Further research is needed to better understand the optimal management of MCFs and to enhance clinical and surgical outcomes.

Disclosure

Conflict of interest

There is no conflict of interest

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Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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