Review

Surgical approaches of condylar fracture management - A Mini Review

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Abstract

Mandibular condylar neck and subcondylar fractures are common in maxillofacial surgery. The justification for surgical treatment of these fractures has varied over time to avoid the most concerning side event, namely facial nerve injury. We offer a new approach that combines intraoral and cutaneous pre-auricular access, allowing for quick and safe access to the surgical site while avoiding facial nerve injury and surgical scars in high-impact aesthetic areas of the neck. Five patients with condylar neck or subcondylar fractures were treated at the same hospital using a combined intraoral and pre-auricular approach. Three months following surgery, the results were assessed in terms of mandibular mobility, complications, and patient satisfaction All five patients had a positive outcome, with complete fracture healing and no sequelae, including no facial nerve palsy. The safe reduction of the two mandibular pieces achieved by a combined intraoral and cutaneous pre-auricular surgical access is a major element of the approach. The periosteal plan of the ramus can be broadly and safely elevated using the intraoral approach and connected to the condylar bone plane with the pre-auricular cutaneous approach, avoiding facial nerve damage. The wide ramus periosteum elevation generates an "optical space" that allows fragment reduction and fixation in direct oblique view without the requirement for endoscopic intervention. Our findings strongly imply that with our technique, it is possible to treat sub-condyle and condylar neck fractures safely while avoiding facial nerve injury, which is an undesirable consequence due to its severe impact on quality of life.

Keywords: Condylar Fracture, Facial Nerve, Neck Fractures, Surgical Approach

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Introduction

In children and teenagers, the condyle is the mandible's growth and development center. According to Bertrand, fractures of the mandibular condyle account for 36 percent of all mandibular fractures. There is no consensus on the occurrence of mandibular condyle fractures because they are commonly ignored or misdiagnosed, resulting in negative consequences.

The goal of this article is to go through the anatomy of the mandibular condyle as well as the current surgical options(1). For fractures of the mandibular condylar process, there is no common classification system. Their treatment options include functional, orthopedic, and surgical options. In the absence of treatment, the prognosis is poor (risk of temporomandibular joint ankylosis and growth problems) (2).

Condyle fractures in youngsters provide a significant difficulty to the maxillofacial surgeon. Because there is no uniform consensus, the debate between conservative (risk of maintaining facial asymmetry, TMJ problems) and surgical (risk of osteonecrosis of the skull, facial paralysis, mandibular growth, scar) therapies continues(3). Mandibular condylar process fractures are among the most common mandibular fractures, accounting for 17.5 percent to 52 percent of all mandibular fractures. When open therapy is chosen, many surgical methods to expose, reduce, and stabilize the fracture site can be performed, each with its own set of benefits and drawbacks. Intraoral and extraoral techniques to the fractured mandibular condyle are the two basic categories of surgical procedures. Intraoral approaches can be conducted with or without the use of an endoscope(4). Submandibular, Risdon, preauricular, retroauricular, and retromandibular transparotid or trans masseteric techniques are the most common extraoral approaches.

Some authors advocate for intraoral access because it decreases the danger of facial nerve injury and eliminates the need for facial incision scars. An intraoral technique, on the other hand, may be time intensive and require special devices such as an endoscope as well as additional training. Furthermore, high fractures and/or medially displaced condylar fractures are technically challenging to treat with an intraoral technique(5). When compared to extraoral techniques, incorrect anatomical reduction, condylar head resorption, myofascial pain, and malocclusions have been documented to be more common problems following the intraoral approach. Access and sight may also be limited in displaced fractures due to the presence of the coronoid process. Angulated drills and screwdrivers, as well as endoscopic help, can be used to gain intraoral access(1).

Extraoral techniques, on the other hand, are often employed because they provide greater vision of the fracture site and so enable fracture reduction and fixation. Extraoral approaches, on the other hand, are hampered by the possibility of harm to the face, great auricular, and auriculotemporal nerves, as well as visible scars, sialoceles, Frey syndrome, and salivary fistulas. The incidence of facial nerve damage following surgical treatment of mandibular condylar process fractures ranges from 1% to 48%(6).

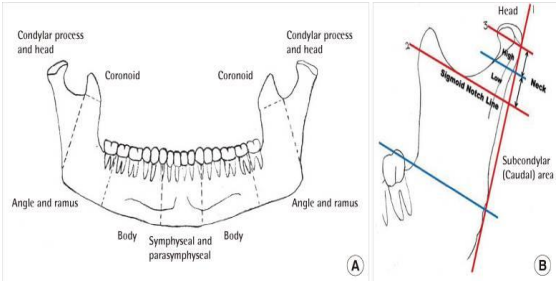
Mandible

The mandible is a U-shaped long bone that is the hardest monostotic bone among facial bones (Fig. 1). It is divided into sections with and without teeth and is attached to the bilateral temporal bones at the left and right TMJ. It develops laterally and merges at the midline 1 to 2 years after birth, forming a full structure similar to the maxilla. The names of each area vary based on the literature. The symphysis and parasymphysis, body, angle and ramus, condylar process, coronoid process, and alveolar process are the most therapeutically useful classifications of each area. The symphysis and parasymphysis are areas between both canines. The canine body is referred to as the body until the second molar Except for the coronoid and condylar processes, the angle and ramus relate to the area next to the third molar. The condylar process and the head of the jaw make up the mandibular condyle. A superior section of the extension line connecting the masseteric tuberosity from the deepest area of the sigmoid notch is referred to as the condylar process and head subunit(7).

The head, neck, and subcondylar area comprise the condylar process and head subunit. These are three height level lines that divide and define the component. The three height level

lines are an extension line parallel to the posterior border of the mandible, an extension line parallel to the perpendicular from the deepest area of the sigmoid notch, and an extension line inferior to the lateral pole of the condylar head(8). The condylar head is an area that is superior to the extension line and inferior to the lateral pole of the condylar head. The condylar neck is the area between the extension line inferior to the condylar head lateral pole and the extension line superior to the condylar head lateral pole that runs parallel to the perpendicular from the deepest part of the sigmoid notch The subcondylar area is the area beneath the extension line that runs parallel to the perpendicular from the deepest part of the sigmoid notch(9).

Meanwhile, the condylar neck is separated into high and low levels, and the reference line that separates them is an extension line located in the middle of the sigmoid notch line and the head's lateral pole line.

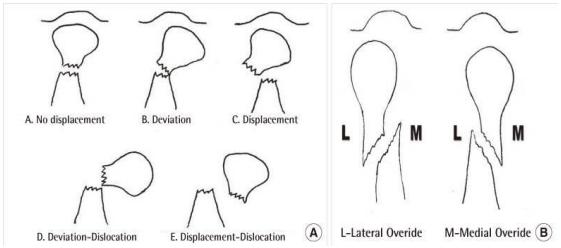


Types of Fractures

- Type I: Fractures without displacement
- Type II: Low fractures with displacement
- Type III: High fractures with displacement
- Type IV: Low fractures with dislocation
- Type V: High fractures with dislocation
- Type VI: Intracapsular fractures

Classification of Condylar Fractures

According to Lindahl's categorization, condyle fractures are classed as follows. According to the position of the fracture, it is characterized as a condyle head fracture, a condylar neck fracture, or a subcondylar fracture. Because the joint capsule extends till the condyle neck, a condyle head fracture is also known as an intracapsular fracture. A condylar neck fracture, which occurs at the inferior attach area of the joint capsule, refers to a narrowing of the area between the condyle head and the joint capsule(10). It is classified as an extracapsular fracture since it is not contained within the joint capsule and is located at the inferior attach area of the lateral pterygoid. Subcondyle fracture refers to an area between the mandibular sigmoid notch and the mandibular posterior aspect that exists inferiorly to the condyle neck. Condyle fracture is classified into four types according to the degree of fracture fragment displacement: non-displaced fracture, deviated fracture, displaced fracture, and dislocation. Condyle fracture causes fracture fragment displacement. The masseter, lateral pterygoid, and temporalis muscles are primarily responsible for traction(11). The most common kind is condyle head displacement to the anteromedial side, as seen in a fracture inferior to the lateral pterygoid muscle (fig 2).



Treatment Procedures for Condylar Fracture

Functional therapy and closed reduction

Intermaxillary fixation with an arch bar and wire is used for closed reduction, followed by the fixation of the maxilla and mandible for 2 to 4 weeks. After the factored site has been stabilized, a wire for intermaxillary fixation is removed. Following fixation with rubber,

normal occlusion is produced, and a soft diet is maintained for two weeks. Functional treatment is performed, followed by clinical outcomes, which include passive mandibular movement exercise and mouth opening exercise(12).

Internal fixation and open reduction

Depending on the fracture site and degree of bone fragment displacement, there are several open reduction operation procedures for mandibular condyle fracture. They are, in general, the preauricular approach, the postauricular approach, the submandibular approach, the Risdon approach, the combination approach, and the retromandibular approach. Treatment should be chosen with the patient's age, preferences, fracture kind, fracture of other sites, and tooth status in mind(1).

Retromandibular Transparotid

The gold standard method for treating condylar neck fractures has been the retromandibular transparotid technique for many years. This strategy primarily focuses on the parotid gland is reached through a deep, blunt incision fracture axis Nevertheless, the significant number of neck fractures and the decrease was achieved by tissue transferred during dissection. Fixing is a difficult, hazardous surgery(13). The separation between the fracture line and the incision line is necessary extreme tissue reaching upward to reveal the fracture line and the area of the condyle closest to the fracture stretching of the anchoring screws could result in stretching of the face nerve's principal trunk. Moreover, this process involves a substantial risk of complications for tissues used in surgery field damage to the facial nerve branches, salivary fistulas, frey's syndrome and sialocoele are frequent complications.It could happen as a result of the sharp incision through the Parietal lobe. With a greater understanding of the facial nerve's path, adjustments to the surgical strategy seemed to both prevent the earlier issue and make access and exposure easier(14). The transmasseteric anteroparotid method differs from the traditional transparotid approach in that the dissection is performed in the masseter muscle down to the bone while remaining superficial to the platysma and the SMAS layer anterior to the parotid. Therefore, this method may serve as a substitute for the traditional transparotid technique for condylar neck fracture(13).

For many years, the transparotid technique was the method of choice for treating condylar neck fractures. Direct view into the fracture field, ease of use without specialized training or equipment, and good postoperative TMJ function are all benefits of this approach. This is because the articular disc and capsule might be correctly adjusted. To get rid of these two major problems, an alternate procedure called the transmasseterric retroparotid approach was introduced. The nerve-free region above the masseter muscle and anterior to the parotid gland benefits from this method. Dissection is performed through the masseter until it reaches the periosteum, then it is taken out superficially to the parotid capsule till anterior to the gland. Due to the preauricular extension's improved accessibility, the parotid structure was not dissected, the buccal nerve anastomosis rate was high (the only branch that may be found in the dissection area), and less traction force was applied to the retracted tissue as a result. These factors reduced the risk of facial nerve injury and prevented the development of any salivary fistulas or sialocele(15).

Complications of Mandibular Fracture

Traumatic temporo-mandibular joint arthritis

Traumatic arthritis is arthritis that develops secondary to joint deformity caused by direct injury to the articular cartilage or fracture caused by trauma. Traumatic arthritis is most commonly caused by a fracture penetrating the articular surface, although it can also be induced by repetitive minor trauma or joint injury caused by chronic stress. In particular,

articular surface injury occurs at the time of trauma initiation in mandibular condyle fractures, and traumatic arthritis is likely to arise as a result of chronic and recurrent joint activity. Early-stage clinical symptoms may include joint sound and pain during joint movement. As bone arthritis advances, clinical signs such as increased joint sound, lock feeling, pain, and swelling occur(7).

Malocclusion

Malocclusion is linked to the patient's teeth status, fracture type, bone segment displacement, insufficient reduction of bone fragments, incorrect fixation and fixation time, delayed therapy, and patient compliance. Occlusal adjustment, or even re-operation and orthodontic surgery, is required for malocclusions that emerge after bone union is complete. To prevent malocclusion after mandibular condylar trauma, open reduction should be performed as soon as possible after the injury. Furthermore, precise reduction and fixation during surgery, as well as continuous postoperative follow-up, are necessary to prevent postoperative malocclusion(16).

Non-union and Malunions

Fracture fragment stability, repetitive trauma, infection, incorrect reduction, numerous fractures, mandibular atrophy, and patient compliance are all related with non-union. Infection of the fracture site promotes fibroblast development more than osteoblast or osteoclast activity. This causes fibrous tissues to predominate in the bone healing area, resulting in fibrous binding and non-union. Delay in fracture treatment is demonstrated in the situation of extensive periosteum exposure, notably in comminuted fracture and edentulous fracture. If broken fragments are assigned incorrectly and dental alignment is positioned incorrectly. Non-union may develop in severe cases. Facial asymmetry causes malocclusion. If this occurs, orthognathic surgery and bone transplantation should be used to remedy the problem(17).

Temporomandibular joint disorder

Temporomandibular joint dysfunction

Temporomandibular joint derangement occurs when functional problems of the condyle-disc complex occur in conjunction with alterations in the form of the disc as a result of trauma. Disc displacement is caused by functional abnormalities of the condyle-disc complex. This displacement is one of the most fundamental features of temporo-mandibular joint derangement, which is characterized by major symptoms such as joint sound, aberrant movement of the condyle head, condyle head impingement, mandibular movement limitation, and joint discomfort. Changes in disc form and functional abnormalities of the condyle-disc complex are minimized and prevented in temporo-mandibular joint derangement by early reduction and firm fixation of the displaced bone fragments close to the joint(8).

Condylar resorption

Condylar resorption, or condylar dissolution, is a non-functional alteration of the TMJ. It is defined as a condition in which condyle shape and size gradually alter. Despite successful reduction of the condyle fracture, extensive dissection and injury to the nearby blood vessels during the surgery may result in long-term condyle head resorption. As a result, patients may experience occlusion and skeletal instability, TMJ dysfunction and pain, as well as facial asymmetry, anterior open bite, and mandibular setback. Nam's procedure, for example, in which osteotomy is performed on a condyle fracture at the subcondylar level to draw out the fragment and then return it to its original position after reduction, was previously employed as a condyle fracture surgery method(18).

Infection

Infection should be avoided by precisely reducing the displaced bone pieces during the early stages of mandibular fracture. Following surgery, the pulp vitality test of the fracture line or adjacent teeth, as well as the periodontal

state, should be closely monitored. Furthermore, early treatment is necessary to

avoid infection-related consequences. According to much research, infection occurred in 7% of patients with mandibular fracture. Furthermore, several studies have found preoperative infection, the majority of which are connected with delayed early treatment and teeth located on the fracture line. Postoperative infection can be caused by a variety of reasons. In particular, bone segment instability, the patient's systemic health, the degree of fracture, foreign objects, an open window, and preoperative and postoperative oral hygiene with a risk of contamination are all factors to consider(19).

Conclusion

The biologic nature and adaptive potential of the masticatory system influence the management of mandibular condyle fractures. These will vary greatly amongst patients, and a lack of sound biology and adaptation can lead to an undesirable outcome. As a result, we must comprehend the mandible's functional mechanism. When treating mandible fractures, the ultimate goal is to restore the patient's pre-injury occlusion and function. Accurate diagnosis, proper reduction and firm fixation, and complication prevention are essential to achieve this ultimate goal. Furthermore, when appropriate surgical concepts relating to diagnosis, stable fixation, and patient rehabilitation are followed, a number of procedures can be used to successfully treat mandibular fractures.

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