

TREATMENT GUIDELINES FOR CONDYLAR FRACTURES IN ADULTS

Mislaine de Oliveira Ribeiro

Undergraduate in Dentistry

Faculty of Dentistry, Universidade Paulista
(UNIP), Campus Sorocaba

SP, Brazil

Kelly Cristine Tarquinio Marinho

Professors of the Department of Surgery

Faculty of Dentistry, Universidade Paulista
(UNIP), Campus Sorocaba

SP, Brazil

<https://orcid.org/0000-0001-9194-4469>

<http://lattes.cnpq.br/7543483463022755/>

Levy Anderson Cesar Alves

Professors of the Department of Surgery

Faculty of Dentistry, Universidade Paulista
(UNIP), Campus Sorocaba

SP, Brazil

<http://lattes.cnpq.br/4583482989383583>

Hélio Kiyochi Junior

Professors of the Department of Surgery

Faculty of Dentistry, Universidade Paulista
(UNIP), Campus Sorocaba

SP, Brazil

<http://lattes.cnpq.br/3004796869708634>

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Abstract: Condylar fractures are related to mandibular fractures with high occurrence among maxillofacial fractures. In the literature there is greater controversy regarding the forms of treatment. For the evaluation of a condylar fracture, a thorough clinical examination is necessary, followed by imaging tests to complement the suggested diagnosis. After the aspects analyzed and pointed out, the surgeon must choose the type of therapeutic approach, either surgical or closed. The main objective of this study was to review the literature on the treatment of condylar fractures, also including the importance of anatomical knowledge of the noble structures close to the region, extra-oral accesses and complications. The methodology used was a literature review through bibliographic research, search for scientific articles in the electronic database PubMed, Scielo and Medline, as well as a search for well-referenced books in the area of oral and maxillofacial surgery. After the eligibility criteria, 21 references were selected that covered the principles of treatment of condylar fractures. It is known among surgeons that several factors must be taken into account when deciding on the best therapeutic approach. Closed treatment is associated with maxillomandibular block and open treatment is related to rigid internal fixation, both have good aesthetic and functional results when well indicated. Thus, it was concluded that both treatments have satisfactory results, with no significant differences between them.

Keywords: Mandibular condyle, mandibular fracture, mandibular injuries, rigid internal fixation, conservative treatment.

INTRODUCTION

The mandibular condyle is considered an anatomical area with less resistance, thus providing a higher incidence of fracture reaching 39.75% of fractures in the face region, this can occur by inducing the transmission

of forces by impact along the mandibular arch mainly in the symphysis region, and jointly because there is no power of muscular actions inserted in the³. It is commonly seen that condylar fractures are of a physical nature related to physical aggression and/or car accidents in adults, with a higher prevalence in the age group over 18 years, with a higher prevalence in males.³. It is well established in the literature that there is no uniformity of conduct for the treatment of condylar fractures, but that there is a conservative or surgical approach, so to direct the correct conduct of the oral and maxillofacial surgeon (CBMF), it will be necessary to evaluate several aspects such as: age of the patient, type of fracture, the concepts of location, presence of displacement with the classification of bone stumps, analyzing the occlusion, how long it has been fractured and whether it is associated with another type of fracture³. This research aims to discuss the possible treatments (bloody or closed) of mandibular condyle fractures.

LITERATURE REVIEW

The mandibular condyle is a bone component located in the supero-posterior region of the mandibular ramus. (ATM) and a lower part considered as condylar neck¹⁴. Its anatomy reveals a structural weak point of the mandibular skeleton, its neck shape ends up facilitating the fracture, which is not a negative point as it prevents more serious damage, such as skull base fractures.^{4,10,12} The muscles that are involved in TMJ mechanics are the muscles of mastication: temporal, masseter, medial pterygoid and lateral pterygoid, in addition to which the digastric muscle is also included.¹³ The position and action of the masticatory muscles are also related to the severity of the trauma, as well as the presence of dental elements and fracture location.^{4,12,16}

Fracture of the mandibular condyle is

understood as the appearance of continuity solutions in the bone tissue at the level of the condylar region, with diagnosis based on a thorough clinical examination in conjunction with specific imaging exams.²¹

Epidemiological surveys show that the etiological agents for FCM (mandibular condyle fractures) in most cases are of a physical nature, related to physical aggression, however, their prevalence varies depending on the region where the oral and maxillofacial service is located. Motorcycle, automobile and sports accidents are common. The most affected by these traumas are males aged between 18 and 29 years.^{3,18}

These FCM have a high relationship with the traumas that occurred in the symphysis region, this happens because the action generates a countercoup mechanism effect²¹, or indirect trauma, the symphysis region is considered an area of great resistance support due to the mental protuberance, but when it receives an intense impact, the forces are transferred from the most resistant area to the least, then traveling to the region of the body, branch and mandibular condyle. Studies also indicate that the position of the mandible being open or closed at the time of trauma, in relation to the direction and amplitude of the force, also influenced the type of fracture that occurred.¹⁴

CLASSIFICATIONS OF CONDYLAR FRACTURES

There are several classification systems to describe condylar and subcondylar fractures, but the simple classification is currently widely used, following the parameters as a reference: anatomical region of the fracture and relationship with the condylar head, direction and degree of displacement, pathological conditions such as dislocation of the condylar head and contact between the fragments^{8,14,21}. The most used classifications are Lindahl and

Spießl and Schroll¹⁴

It is important to note that the mandible undergoes deviation to the affected side when this fracture occurs, even at rest, due to the lack of structural support in the region. When mouth opening occurs, usually after 15 mm, the lateral pterygoid muscle pulls the ramus of the mandible forward, together with the suprahyoid musculature, which has the mouth opening action, promoting deviation towards the affected side. In the event of a subcondylar fracture, the lateral pterygoid muscle is not able to advance the branch on the affected side, thus, movement on the normal side causes deviation towards the affected side.¹⁵

In the classification by Spiessl and Schroll in 1972, mandibular condyle fractures of types I to VI were idealized, respectively considered in relation to severity, implying that the greater the severity, the greater the supply of damage or sequelae to the polytraumatized patient. Thus, type I is related to condylar fractures without displacement; type II are low fractures with displacement; type III are high fractures with displacement; type IV are low fractures with displacement of the condylar head out of the articular fossa and type VI are considered intracapsular fractures (figure 1).⁵

In 1977, Lindahl's classification was devised, fractures are based on the anatomical level of the condyle head, condylar and subcondylar neck (figure 2), defined with the fracture line below the level of the lowest part of the mandible notch.^{3,6,14}

SIGNS AND SYMPTOMS

In cases of condylar fractures there may be the following characteristic signs and symptoms: pain on palpation and during mouth opening, otorrhagia (in cases of medial displacement of the condylar head); preauricular pain; lip-chin hypoesthesia; ecchymosis; mouth opening limitation; anterior open bite (in cases of bilateral condyle

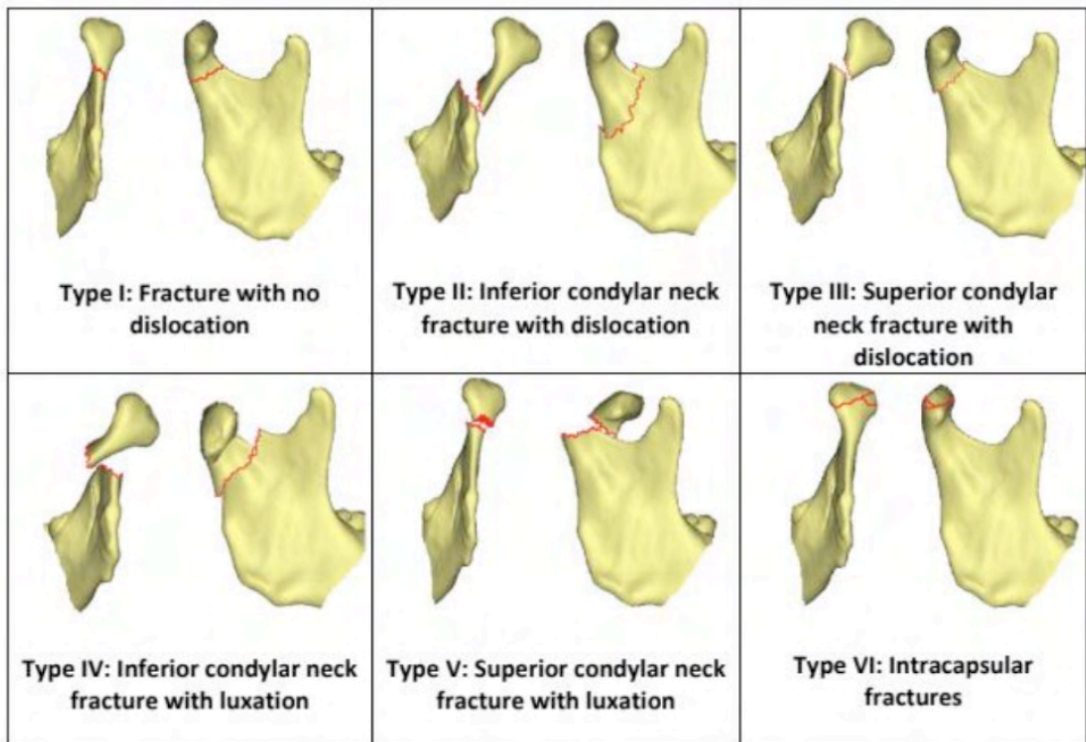


Figure 1- Classification of condylar fractures (Spiessl e Schroll), 1972.

Source: Chrcanovic BR; et al., 2014.

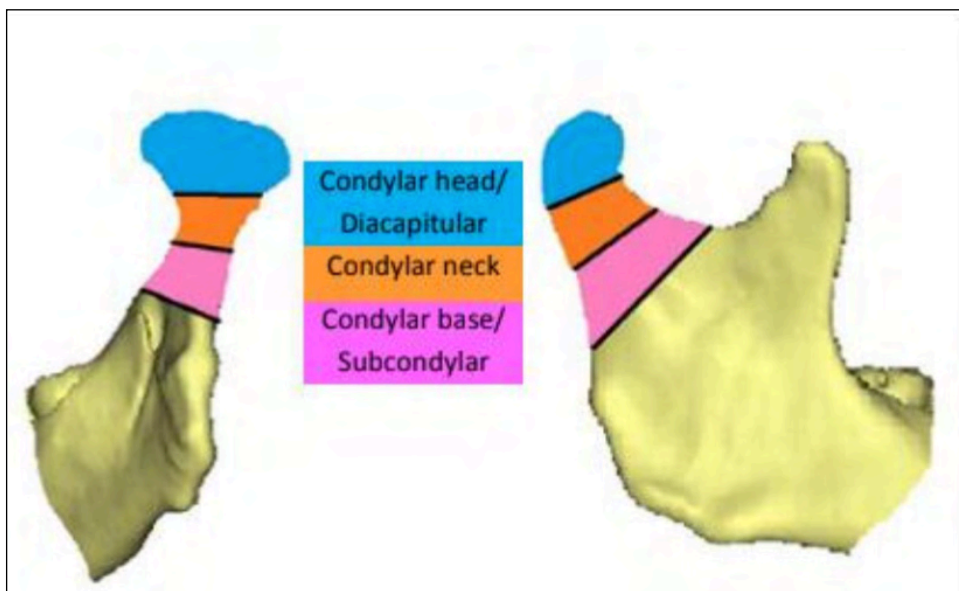


Figure 2 – Classification based on anatomical level (Lindahl)

Source: Chrcanovic BR; et al., 2014.

fractures); posterior premature contact of the affected side; open bite on the unaffected side (in cases of unilateral fracture); posterior open bite on the affected side (due to hemartosis); cross bite; swelling and asymmetry on the affected side; difficulty in excursive jaw movements; tooth avulsion; midline shift to the compromised side when opening the mouth (when the fracture is unilateral); jaw bone mobility; changes in regional muscle activity; pre-auricular edema; sialorrhea; condyle is not palpable when opening and closing the mandible; subcondylar fractures that extend into the bone canal can generate temporary or permanent paresthesia of the lip, tooth and gum; signs and symptoms of TMD (temporomandibular joint dysfunction); crepitus and popping during function and pain on palpation of masticatory muscles^{3,12,14,21}.

REQUESTED IMAGINOLOGICAL EXAMS

Fractures in the condylar region require a computed tomography (CT) scan to assess possible displacement of the condyle to the middle cranial fossa or external auditory canal for diagnosis, planning, or treatment of condylar fractures.¹⁴ However, in the absence of CT, the most requested radiographic exams are orthopantomography (OPG) and Towne radiography (anteroposterior)¹¹.

TREATMENTS OF CONDYLAR FRACTURES

The treatment of condylar fractures for years has been a result of much controversy among authors regarding the closed or open reduction approach, but whatever the required approach, the essential condition for success is a well-targeted and persistent postoperative physiotherapy.²¹

The treatment modalities for mandibular condyle fractures are: closed treatment that does not expose the tissues to the

environment¹⁴. Indications for closed treatment are isolated intracapsular fractures without compromising occlusion; favorable fracture; incomplete fractures and systemic involvement^{11,15,20}. According to Zide and Kent, fractures have absolute and relative indications for surgical treatment. Absolute indications include the presence of a foreign body in the joint capsule, lateral extracapsular displacement of the condyle, displacement of the condyle into the middle cranial fossa, without solutions for correct occlusion with closed reduction techniques. In the case of relative indications, they include bilateral condyle fractures associated with comminuted fractures of the midface, bilateral fractures in edentulous patients with severe alveolar atrophy or unavailable gutters, fractures with displacements with alteration in occlusion in patients with seizure disorders, alcoholism or psychiatric disorders.¹

CLOSED TREATMENT

The non-surgical approach can also be called closed treatment, defined as treatment that does not involve surgical exposure of the fracture, therefore, they are less invasive methods to reduce smaller condylar and subcondylar fractures. The main methods of temporary immobilization involve strapping with steel wires, erich bars (figure 3), brackets (figure 4), maxillomandibular fixation screws (MMF) (figure 5), splints for edentulous patients (figure 6) for fracture stabilization^{3,8,14}.

This treatment is a procedure taken when a fracture is favorable, it means that it is not displaced by the action of the muscles of mastication, this way there will be no displacement of bone fragments.²⁰

The closed treatment consists of the use of maxillomandibular block (BMM) for 07 days, followed by a precise physiotherapy in the postoperative period to restore the masticatory function.¹⁰ together with



Figure 3 - Rigid Lock - Steel wire + Erich bar
Source: Manacés; et al., 2017



Figure 4- Semi-rigid lock - Brackets + heavy rubber bands
Source: TOral and Maxillofacial Traumatology - Rettore Surgery Clinic



Figure 5 - Rigid lock - FMM screws
Source: (britesbucofacial.blogspot.com)

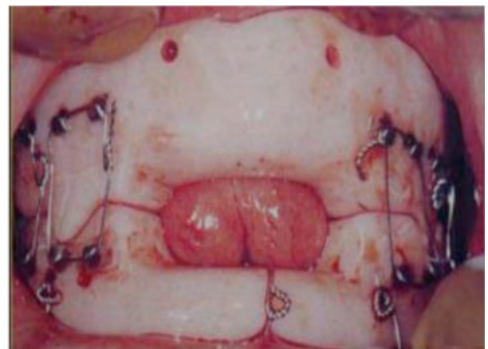


Figure 6 - Hard lock - Gutters + FMM screws + steel wire
Source: Barber et al., 1977 ; Osbon & Alling III, 1988

institution of liquid and pasty diet ^{7,21}. Studies suggest rigid BMM for 2 weeks, semi-rigid BMM with elastic bands are commonly used, desirable period of immobilization ranges from one to two weeks, or 3 weeks of rigid BMM followed by functional treatment ¹⁴ this treatment is indicated for patients with functional problems, pain, altered occlusion and displaced fractures. ⁸.

The physiotherapy guidelines are the performance of physiological movements of the mandible such as opening, laterality, protrusion, to help with forced opening, wooden spatulas are used, 3 to 4 times a day, with outpatient return for weekly control in the first two months, and in the following four

months the return becomes fortnightly¹².

In cases of intra-capsular condylar fractures, 10 days of BMM followed by a functional orthodontic activator is indicated. ¹⁴. With short-term BMM, it stimulates callus formation, which prevents mobility of the fracture segments¹⁷.

SURGICAL TREATMENT

Surgical approaches for condylar fractures expose the fracture and the following extraoral approaches are related to this: preauricular, submandibular, parotid anterior transmasseteric, retromandibular, retroauricular, transparotid and endoscope-assisted intraoral^{2,3,8}.

The most used are: preauricular access is indicated to address intracapsular or subcondylar high fractures¹⁵; submandibular access also known as Risdon access⁶, are indicated in the case of subcondylar fractures that are low. Osteosynthesis can be impaired in cases of patients who have very strong muscles or are obese.¹⁵; the retromandibular access indicated for the approach of subcondylar fractures⁹.

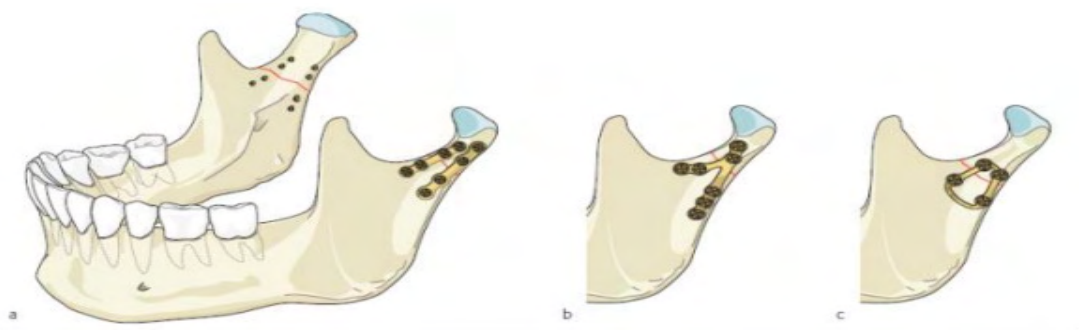
Nowadays, osteosynthesis is typically performed with plates and screws. Two miniplates are recommended. A stronger plate, such as a universal fracture plate, is inserted. In cases where the anatomy allows the use of only one miniplate, the strongest jaw miniplates must be chosen. A minimum of two screws must be anchored in the proximal condylar fragment to allow rotational stability⁸. Rigid internal fixation does not dispense with the provisional BMM during the surgical procedure, until the fractures are fixed, nor does the maintenance of devices attached to the teeth to guide the occlusion¹⁵. For fixation of the miniplate in the strong cortical bone, along the posterior edge of the mandibular ascending ramus, fixation with a

bicortical screw is indicated. The subcondylar area is a place that requires mechanical effort, and two miniplates allow greater safety and stability (figure 7)⁸.

The intraoral access was first described in 1925, indicated for low subcondylar fractures, presents a low risk of facial nerve injury and does not leave visible scars, this access is not commonly accessible for the treatment of condylar and subcondylar fractures because in cases of For displaced fractures, management will be hampered by the limited visibility of the fracture site, due to the location of the coronoid process. However, in cases where endoscopic techniques with angled scopes are used, this treatment can be facilitated.^{3,11}

The extraoral access is used in submandibular and preauricular approaches preferably, it has a higher risk of facial nerve injury and visible scar when compared to intraoral access.³

To decide on treatment, it is necessary to: respect the anatomical and functional characteristics that govern joint function; anatomical location; fracture comminution; degree of displacement; the patient's systemic condition; fracture position; fracture-



A- Two miniplates (2.0 and 1.5) must be securely anchored with two screws on each side of the fracture. As the subcondylar area is a place that requires mechanical effort, they allow for greater stability and safety.
B-C – Fixation with specific implants for the subcondylar region.

Figure 7 – Demonstration of the fastening system

Source: Ehrenfeld; et al., 2012

associated injuries; functional impairment; surgeon experience and surgeon preference^{8,14}.

Thus, the restoration of the anatomical reduction promotes a postoperative function, achieved after osteosynthesis. Some surgeons choose to use a BMM with a rubber band for a short period (up to 7 days) to allow the soft tissue and joint to rest. After that, it is recommended to use orientation elastics, usually with night use.⁸ Physiotherapy remains the same as in non-surgical treatment. Malocclusion and compromised TMJ function can arise even after surgical treatment, for this reason it is necessary to evaluate the result of the treatment and correct any undesired result, follow-up is mandatory, until they return to almost complete function.^{8,15} Follow-up with outpatient return for weekly control in the first 2 months, and in the following 4 months the return becomes fortnightly¹².

The most common complications seen in the literature are: deviation in mouth opening; infection; bone malunion; salivary fistula; facial nerve injury and temporomandibular ankylosis¹⁵.

The goal of functional exercise rehabilitation is a maximum incisal opening > 40 mm; lateral excursive movements > 10 mm; protrusive excursive movements > 12 mm; full use of the ATM throughout the day; the diet indication will be influenced depending on the coexisting pain and injuries and regular follow-up by the surgeon to supervise the occlusion, and adjust as necessary¹¹.

DISCUSSION

Belli et al. (2015) report that condylar fractures are currently much discussed, especially with regard to the standardization of treatment, the wide variety of forms it can take and the numerous treatment methods available. As in the report of a conference to discuss condylar fractures of the mandible, which emphasized the uncertainty that still

exists about the treatment results. (Editorial, Br. J. Oral Maxillofac. Surg., 1999)

According to Chcanovic et al. (2014) and Ministry of Oral Health Program in Malaysia (2019) comparing closed reduction with rigid internal fixation in the treatment of condylar fractures, FIR provided greater maximum mouth opening, decreased occurrence of malocclusion, reduced pain, bulge, lateroexcursive movements, medio-lateral angulation of the fractured condyle, better results in restoring ramus height and occlusal status, protrusive movements and prevention of chin deviation at opening. In contrast, there was no significant difference in postoperative TMJ pain or noise.

According to Marcantonio et al. (2000), Nam et al. (2019) and Barbosa et al. (2020) concluded that the indications for extraoral open treatment are debatable due to the hypertrophic scar or postoperative keloid, the high incidence of injury to the facial nerve and attached parotid gland, occurrence of Frey syndrome, salivary fistula, sensory disturbances of the auricular nerve, bone fixation failures, sialoceles, auriculotemporal nerve dysfunction, facial paralysis and infection, presenting a higher risk of post-surgical complications, therefore, there may be a higher cost and hospitalization time for the patient.

Nam et al. (2019) suggested in the treatment of subcondylar fractures of the mandible with open reduction, the intraoral approach with an angled screwdriver being considered better than the retromandibular approach, based on the interincisal distance achieved. However, the time is longer in the operation of the intraoral approach, being disadvantageous compared to the retromandibular approach. According to Barbosa et al. (2020) in cases of subcondylar fractures with medial or lateral displacement, the intraoral surgical approach is indicated as a treatment option,

as it presents less damage, satisfactory results, mouth opening, bone and muscle movement, devolution of dental occlusion, reducing temporomandibular dysfunction and no visible scar.

Study by Ellis et al. (2000) and Al-Moraissi et al. (2015) add that conservative treatment may present greater long-term complications, most commonly facial asymmetries and changes in mandibular movements, such as a higher percentage of malocclusion, when compared to surgically treated patients. According to Ellis and Throckmorton (2000), De Riu et al. (2001) and Smets et al. (2003), emphasize that patients treated by conservative treatment may have as a complication a reduction in the height of the mandibular ramus and posterior facial height, but aesthetically, this reduction in posterior facial height is negligible in most cases, being only diagnosed in exams. imaging. The author Filho et al. (2005) reported that patients who presented shortening of the mandibular ramus with functional or aesthetic impairment must be treated by the surgical method.

Barbosa et al. (2020) concluded that in relation to low condylar fractures and without displacement, the indicated treatment is conservative (closed) functional. In cases of high fractures with displacement, low and intracapsular, surgical treatment (open) is indicated. On the other hand, authors such as Manganello and Silva (2002) and Chrcanovic et al. (2014) defend closed treatment as the first choice, specifying that surgical treatment must be used only in specific cases because it presents greater morbidity and risks of postoperative infection. In comparison to closed reduction according to Schneider et al. (2008), Eckelt et al. (2006) and Kokemueller et al. (2012) these patients had less pain, less discomfort, less occlusal alteration and greater range of motion in all parameters.

According to Vajgel et al. (2015) and Nam

et al. (2019), intraoral surgical treatment is the treatment option in cases of subcondylar fractures with medial or lateral displacement, this approach presents less damage, satisfactory results, mouth opening, bone and muscle movement, return of dental occlusion, without apparent scar and minimizing the risk of facial nerve injury. Studies by Nam et al. (2019) find that patients with fractures above the condylar neck are excluded for the intraoral approach, due to not providing enough space to allow plate fixation.

However, Ellis and Throckmorton (2000) conclude that surgical treatment of lower neck and subcondylar fractures may be better than closed treatment with respect to postoperative mouth opening.

The authors Ellis et al. (2000) conclude that few permanent postoperative complications were encountered by the open treatment approach to condylar fractures using postoperative rigid internal fixation. Retromandibular access was chosen in all cases.

In conclusion, the results presented in the meta-analysis by the author Chrcanovic et al. (2014) suggest that surgical treatment of condylar fractures provides a better clinical outcome regarding malocclusion, protrusion, laterotrusion, and lateral deviation compared to non-surgical treatment. On the other hand, the patients most affected by postoperative infection are those who underwent the surgical approach. There was no statistically significant difference in postoperative TMJ pain and joint noise when the two techniques were compared.

CONCLUSION

Condylar fractures must be very well discussed and the appropriate treatment planned for the case, if not treated properly, they can compromise mobility, facial bone and muscle asymmetry with different degrees

of involvement. There is agreement that clinical management must be performed according to the classification level of the mandibular condyle fracture, patient age and general health status. The objective of the treatment is to restore the mouth opening approximately 40 mm, perform the excursive movements of the mandible, free of pain, facial symmetry and reestablished occlusion.

There are several types of complications that can arise from both closed and open treatment. Thus, it is necessary to advise the patient of the need to perform postoperative physiotherapy properly for 6 months for the complete rehabilitation of the case to reduce the chances of postoperative complications such as the facial nerve neuropraxia, occlusal changes and bone malunion.

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