

## Mini Review

# A Systematic Review on Controversies Related to Management of Condylar Fractures

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## Abstract

In Maxillofacial Trauma, condylar fractures are the most common with a high incidence among the mandibular fractures. Management of the condylar fractures always remained a source of ongoing controversy in oral and maxillofacial trauma. Condylar fractures can be intracapsular or extracapsular, displaced, undisplaced, deviated or dislocated. There are various factors which have remained the deciding for the treatment indicated including presence of teeth, status of occlusion, unilateral or bilateral fracture, age of the patient, level and displacement of fracture, co-existence of other maxillary or mandibular fracture and other form of fractures which are difficult to recover functionally and aesthetically. Most of the researchers favor closed reduction with maxillomandibular fixation, but in the recent era, open reduction with internal fixation has become the most common. To overcome this problem, we are presenting this review to ascertain the main variables that determine the choice of treatment and to appraise the current evidence regarding the effectiveness of the treatment.

**Keywords:** Condylar fractures; Maxillofacial trauma

## Introduction

The incidence of mandibular fractures has a highest next to nasal fractures among facial bone fractures and approximately 30% involve the condyle [1]. The reason for high incidence of condylar fractures is attributable to binding of mandibular ramus with high stiffness and condylar head with low stiffness, due to the indirect force that is delivered to the condylar head [2]. There are several causative factors responsible for this; most common external factors being physical trauma, accident, fall, sports injury, gunshot wounds and industrial hazard while internal factors being, benign and malignant tumors, osteomyelitis and muscle spasms due to any reason. After the development of osteosynthesis materials, there has been an ongoing debate about the management of condylar fractures. There are two therapeutic approaches for management of condylar fractures: Functional (closed reduction) and Surgical (open reduction). In the past literature, closed reduction with concomitant active physical therapy after intermaxillary fixation during recovery period has been advisable. However, due to metastasis of fractured bone by muscle strength, inappropriate temporomandibular joint (TMJ) function, abnormal occlusion and disuse muscular atrophy, open reduction has overtaken attention. Many authors still recommend closed reduction because problems related to open reduction, nerve and blood vessel injury, scars, infections are over-ruled in the previously accepted method of treatment [3,4]. Decision in the management of condylar fractures is still controversial. So, we are presenting this systematic review to evaluate the main variables to determine the correct method for treatment of condylar fractures.

## Discussion

Klotch and Lundy [5] and Widmarket al [6] noted that closed reduction should be considered especially in situations such as elderly

or pediatric patients or where there is difficulty in open reduction and in case of secured stable occlusion while open reduction is indicated if fractured mandibular condyle is severely displaced. Haug and Assael [7] showed that there was no statistically significant difference in occlusion status and complications between open and closed reduction. Differences were noted between groups for time since operation, scar perception and perception of pain. Ellis et al [8] reported that closed reduction is more advantageous than open reduction due to complications like intraoperative bleeding and postoperative infections, condylar growth disturbances, injury to auriculotemporal nerve and facial nerve paralysis. During this period, Brown and Jones [9] reported in their study that rigid fixation using miniplates did not require intermaxillary fixation. Tu and Tenhulzen [10] mentioned that screws and miniplates shortened period required for intermaxillary fixation and prevented disuse atrophy of masticatory muscles, thereby achieving early opening, in addition to the fact that postoperative complications were significantly reduced in this line of treatment. Ellis and Throckmorton [11] reported that those fractures which were treated by closed reduction had significantly shorter posterior facial and ramus heights on the side of injury and more tilting of occlusal and bigonial planes towards ipsilateral side than those treated by open reduction. Marker et al [12] recorded the results to find out there were any variables that were predictive of complications and concluded that closed reduction for management of condylar fractures is non-traumatic, safe and reliable and in only few cases, they were supposed to cause disturbances of function and malocclusion. With the objective of analyzing the main variables that determine the choice of method of treatment and outcome in condylar fractures, Villarreal et al [13] conducted a retrospective study to analyze and determine the relationship between the principal clinical variables and postoperative results. They analyzed the influence of preoperative variables, level of

**Table 1:** Zide and Kent's Criteria for Open Reduction (1983).

Absolute Indication:	
a.	Lateral Extra-capsular Displacement
b.	Impossibility of obtaining adequate occlusion by closed reduction
c.	Displacement into middle cranial fossa
d.	Invasion by Foreign Body
Relative Indication:	
a.	Unilateral or Bilateral condylar fractures when splinting cannot be accomplished for medical reasons or because physiotherapy is impossible
b.	Bilateral condylar fractures with comminuted midfacial fractures, prognathism or retro-prognathism
c.	Bilateral condylar fractures in an edentulous patient without a splint
d.	Periodontal problems, Loss of teeth
e.	Unilateral condylar fracture with unstable base

**Table 2:** Mathe's Treatment Protocol.

Open Reduction Indication:	
a.	Malocclusion with Centric Relation
b.	Bone Gap more than 4-5 mm
c.	Fragment Angulation more than 30°
d.	Lateral Override
e.	Lack of contact of the fractured fragment
Preferred for Open Reduction:	
a.	Low condylar fracture with displacement of condylar head out of the glenoid fossa
b.	Low condylar fracture with multiple fractured mandible or maxillary or Le Fort fracture
c.	Any low, dislocated sub-condylar fracture
d.	Ramus shortening – 5%
e.	Condylar fragment 14° – medial tilt
f.	Bilateral fracture with open bite
g.	Gross fracture end mal-alignment
h.	Fracture – Dislocation
i.	Abnormal function, malocclusion

fracture, treatment, postoperative physical therapy, displacement and dislocation, comminution, loss of ramus height, age, gender, etiology, occlusion, dentition status, and presence of facial and mandibular fractures. The principal factors that determined the treatment decision were the level of fracture and degree of displacement. The functional improvement obtained by open methods was greater than that obtained by closed treatment. In the study conducted by Ellis et al [14] to compare the occlusal relationships after open and closed reductions for unilateral condylar fractures, the authors concluded that patients treated by closed reduction had a significantly greater percentage of malocclusion compared with those treated by open reduction, in spite of initial displacement of fractures greater in open reduction.

Mandibular condylar fractures are the most common facial fractures and there is enormous controversy in the management of it as mentioned in literature. Since Zide and Kent [15] (Table 1) reported the relative and absolute indications for condylar fractures in 1983, management became controversial and new approaches of surgical reduction and fixation were introduced and developed. In the same year, Mathes [16] (1983) (Table 2) mentioned that angulation between the fractured fragments, lateral override and lack of contact of fracture segments should be considered before open reduction and this was also suggested by Klotch and Lundy [5].

Mitchell [17], Haug and Assael [7], Brandt and Haug [18] (Table 3) presented their views regarding the management of condylar fractures mentioning the absolute indications and contraindications for the choice of treatment after Zide and Kent's criteria. In 2003, American Association of Oral and Maxillofacial Surgeons [19] suggested an international guideline on treatment of condylar fractures according to which open reduction was recommended to

prevent complications of growth and functional disorders (Table 4). Table 5 highlights advantages and disadvantages of both open and closed reduction procedures used for treatment in different situations as per the discretion of the surgeon and the clinical situation.

Condylar fractures may be intracapsular or extracapsular and in children, whatever might be the case, the most accepted line of treatment in the existing literature is closed reduction. Nowadays, some researchers challenged this plan of management and tried open reduction in children, using minimally invasive endoscopic surgery. Nevertheless, there is no consensus as regards in the management of condylar fractures in adults. In adults, the condylar fractures can be treated on the basis of case and personal experience of the researcher. There are three main treatment options advocated for adult condylar fractures which include period of intermaxillary fixation followed by functional therapy; functional therapy without a period of intermaxillary fixations; and open reduction with or without internal fixations. Most important thing is the decision of which treatment is best so taking this into consideration some of the factors should be kept in mind including unilateral or bilateral fractures, total or partial loss of teeth, height and quantity of the fracture traces, degree and direction of condylar dislocation, general health of the patient, effect on temporomandibular joint on mandibular movements and neuromuscular adaptations in addition to difficulty of surgical access, risk of lesion being in critical anatomic structures, hypertrophic scars and presence of other compounding maxillofacial fractures. Treatment of condylar fractures with closed reduction in adults is indicated in minimum and high dislocations, fractures of the head of condyles, and systemic risks to surgery [20]. The complications related to it are chronic pain, shortening of the face leading to asymmetry, alteration of the occlusal and bigonial planes and high percentage of malocclusions [11]. There were several complications reported

**Table 3:** Indications and Contraindications for Open Reduction: [7,17,18].

Absolute Indications:	
a.	Patient Preference (when no absolute or relative contraindications co-exist)
b.	When stability of the occlusion is limited (e.g. Less than 3 teeth per quadrant, gross periodontal disease, skeletal abnormality)
c.	Displacement into the middle cranial fossa
d.	When manipulation and closed treatment cannot re-establish the pre-traumatic occlusion
e.	When rigid internal fixation is being used to address another facial fracture affecting the occlusion
f.	Lateral extra-capsular deviation
g.	Open fracture with potential for fibrosis
h.	Invasion by foreign body.
i.	When closed treatment does not re-establish occlusion
Relative Indications:	
a.	Edentulous Jaws, Periodontal Problems, Noncompliance
b.	Bilateral condylar fractures in an edentulous patient without a splint
c.	Unilateral or bilateral condylar fractures where splinting cannot be accomplished for medical reasons or because physiotherapy is impossible
d.	Bilateral condylar fractures with comminuted midfacial fractures, prognathia or retrognathia
e.	Unilateral condylar fracture with unstable base
f.	Displaced condyle with edentulous or partially edentulous mandible with posterior bite collapse
g.	Uncontrolled seizure disorders, Status Asthmaticus, Substance abuse
h.	Obtunded neurologic status with documentation of predicted improvement
i.	Psychologic compromise (e.g. Mental retardation, organic mental syndrome, psychosis)
Absolute Contraindications:	
a.	Condylar head fractures (at or above the ligament us attachment – Single fragment, comminuted, or medial pole)
b.	When medical illness or systemic injury add undue risk to an extended general anesthetic
c.	Good Occlusion, Minimal pain, Acceptable mandibular movement
Relative Contraindications:	
a.	When a simpler method is as effective
b.	Condylar neck fractures (thin, constricted region inferior to condylar head)
c.	Obtunded neurologic status when there is no documented hope for improvement

**Table 4:** AAOMS Special committee on parameters of care, Indications for Open Reduction (2003).

a.	Physical evidence of fracture
b.	Imaging evidence of fracture
c.	Malocclusion
d.	Mandibular dysfunction
e.	Abnormal relationship of jaw
f.	Presence of foreign bodies
g.	Lacerations and/or hemorrhage in external auditory canal
h.	Hemo-tympanum
i.	Cerebrospinal fluid otorrhea
j.	Effusion
k.	Haemarthrosis

in literature regarding open reduction of the condylar fracture also including difficulty of surgical access, extra-oral scars, lesions of the facial nerve, plate fracture, and aseptic necrosis of condylar segment secondary to loss of periosteal blood supply during dissection. The blood supply has been discussed a great deal in open reductions because researchers argue that surgical access to condylar process to perform open reduction and internal fixation requires exposure and dissection of some of the soft tissues of the condylar process to allow manipulation and attachment of fixation devices. Therefore, surgery

**Table 5:** Advantages and Disadvantages of Open and Closed Reduction.

<b>A. Open Reduction</b>	
Advantages	Disadvantages
a.	Reduction of displaced fragment to most ideal anatomic site by direct approach
b.	Prevents nutritional imbalance, difficulty in speaking, respiration
c.	Prevents facial asymmetry
Closed Reduction	
Advantages	Disadvantages
a.	Relatively Safe treatment
b.	No injury to nerves and blood vessels
c.	No postoperative complications like infections, scars
d.	Loss, or delay in developing teeth avoided
e.	No tooth buds injury
a.	Injury to nerves and blood vessels
b.	Postoperative complication like infection
c.	Permanent scar through surgery compromising aesthetics
a.	Injury to periodontal tissues, buccal mucosa
b.	Poor oral hygiene, difficulty in speaking
c.	Imbalanced nutrition, mouth opening and respiration difficulty
d.	Facial asymmetry due to growth and functional disorder

further diminishes the blood supply to a segment of bone that has already been severely compromised. One should choose an approach that can minimize the soft tissue stripping from fractured condylar process and retain the attachment of capsule and lateral pterygoid muscle to maintain the blood supply to the condyle [21]. The temporomandibular joint, a ginglymoarthrodial joint, is necessary for the masticatory system to function efficiently and maximally, but it is also unclear whether open reduction would provide a more effective temporomandibular articulation than closed reduction [22].

Nussbaum et al [23] provided a critical analysis of the past studies that have directly compared open and closed reduction for condylar fractures and which produces best results. The results though were largely inconclusive and because of the relatively poor quality of the data available and a lack of exacting information, the question of the preferred treatment in case of condylar fractures still remains unanswered mandating need for further research.

### Conclusion

Nevertheless, after reviewing the various articles published over

last few years, it is believed that with exception of absolute indication of closed treatment used in children, there are still no rules or norms defined for treating condylar fractures. The decision about the choice of the treatment must always take some factors into consideration such as general condition of the patient, diagnostic precision, type of the fracture and mainly the experience, skill and the capability of the surgeons in that fracture.

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