THE USAGE OF ELASTIC TRACTIONS AND CLOSED METHODS IN TREATMENT OF SUBCONDYLAR FRACTURES OF TEMPOROMANDIBULAR JOINT: A COMPARATIVE STUDY

Muntathar Muhsen Hassan Abusanna, Zina Ali Daily, Nawres Bahaa Mohammed

1 University of Al-Ameed, College of dentistry/Iraq

*Corresponding author: alizena046@gmail.com (Daily)

Background:

Fractures of the facial bones are very common. The mandible (lower jaw) and zygoma (cheek bone), by nature of their location and anatomy are the two bones most commonly fractured. In the developed world, interpersonal violence is the most common cause of facial fractures; this is often exacerbated by the use of alcohol or illicit drugs. Treatment of condylar fractures of TMJ today seems to be based mostly on three main forms of treatment for patient suffering from condylar process fractures; conservative, closed method, and open method. **Aim of the study:** The purpose of this study is to make comparison between splint with elastic tractions and closed method in treatment of subcondylar fractures of TMJ. **Patients and methods:** The study groups are divided into two groups, group A and group B, according to the method of treatment. Group A including 8 patients (all of them were male), (the mean of age 25.5 years), Treatment plane for those patients done by using splints with elastic traction. Group B including 15 patients (13 male & 2 female), (mean of age 23 years), Treatment plane for them was done by inter maxillary fixation only (IMF). Those patients were collected during the period from November 2017 to Jun 2019, from the specialized surgery clinic. At the end of follow up period, the clinical parameters including (occlusion mouth opening, deviation, and pain) with radiographic finding of condylar fractures (reduced, reduced with little deviation and still deviated (no results). **Results:** This study were, in group A, only one patient (12.5%) out of 8 with slight malocclusion, 2 patients (25%) showed reduce mouth opening, 1 patient (12.5%) with slight deviation to the fracture side during wide opening, and 1 patient (12.5%) was complain of pain in fracture site.

**Keyword:** Subcondylar fractures, temporomandibular joint, closed methods, splint, elastic tractions

**Introduciton**

The mandible is a unique horse-shoe shaped bone with an identical joint at both ends with the condyle articulating in the glenoid fossa of the middle cranial fossa of the skull. Inherently weak areas of the bone are commonly fractured namely the articular condyle, the angle and the parasympysis

TMJ condylar fractures has considered as common and accounting about (25-35%) of all mandibular fractures in many reported series, than any other in the field of maxillofacial trauma.

It was classified in to Lindahl classification system 1977, is excellent in identifying the various clinical and radiographic patterns. this system describe condylar fractures by considering the level of the fracture...
dislocation at the fracture level (relationship of condylar fragment to mandible) and position of the condylar head to articular fossa.

And Maclennan (1952) stressed that more simple and practical the classification the more useful it is likely to prove. In his opinion the relationship of the fractured fragment to the remainder of the mandible is the most important factor and he divides his classification into four main categories.

There are three main forms of treatment advocate for patient suffering from condylar process fracture; conservative, closed method, and open method.

**Conservative**, this method of treatment appropriate for:

- Intra capsular fracture (particularly need early mobilization to prevent ankylosis);
- Most fracture in children (often intra capsular);
- Un displaced fractures;
- Edentulous patients;
- Patients with significant co-morbidity.

And this achieved by: soft diet, and closed follow-up.

**Closed method**, this method appropriate for:

- Displaced fracture;
- Cases with malocclusion where open method contraindicated.

And this achieved by: arch bars and elastic tractions or wires for MMF, and suspension wires and MMF in mixed dentition.

**Open method**, the absolute and relative indications of open treatment method in sub condylar fracture of TMJ.

This prospective study was designed to evaluate the short term of the clinical results including (occlusion, mouth opening, deviation and pain) and radiographic results by using splint and elastic traction for treatment of subcondylar fractures of the TMJ, and to make comparison between splint with elastic tractions and closed method in treatment of subcondylar fractures of TMJ cases.

**Patients and methods**

In this study 23 patients who had suffered from subcondylar fracture of their TMJ were recruited to the specialized surgery clinic at Swak Dental Clinics in Babylon city during the period of November 2017 to Jun 2019.

The following inclusion criteria were judged as bases for this study:

1. Unilateral and bilateral subcondylar fracture of less than 48 hours onset as defined by Lindahil.
2. Sufficient bilateral dentition to allow arch bar for IMF and for assessment of occlusal relationship.
3. No previous history of TMJ dysfunction.
As a result of these specifications 13 patients who are treated by open reduction with direct skeletal fixation or conservative method were excluded from original total number of 36 patients leaving us with 23 patients only.

Those 23 patients were divided according to the type of treatment into two groups:

1. Group A: that consist of only 8 male patients and they were treated by splint and elastic tractions.

2. Group B: which consist of 15 patients (13 male & 2 female) were treated by closed method with Inter maxillary fixation only.

All of those patients were clinically examined. Also for each patient Reverse Townes projection radiography was taken before treatment and after completion of treatment or at the end of the follow-up period while CT scan was taken when mandatory. Patients were informed of the use of their medical records. Ethical approval for the study was obtained from the ethical committee.

In group A of the patients the treatment plane was through insertion of upper and lower arch bar with splint (pieces of woody tongue depressor that covered by plaster) between the posterior teeth at fracture side, then elastic traction used but with especial direction that counteract muscle action, after that the patient is admitted to the ward and routine daily x-ray is performed until a good reduction of fracture is obtained then we replace the elastics by 0.05 soft stainless steeled wire.

Regarding group B, the patient was treated by close reduction of TMJ with indirect skeletal fixation (arch bar with 0.05 soft stainless steeled tie wires).

At the end of one-month follow-up period after completion of the treatment, the patients were evaluated for occlusion, moth opening, deviation and pain according to Marker et al 2000 and radiological assessment.

**Results**

**Distribution of age & sex:**

The age distributions showed vary range between 3-65 years (mean 24 years). Regarding sex, of the 23 patients including in this study, there were 21 (91.3%) men and only 2 (8.6%) women.

In this study we found that civilian injuries were predominate over missile injuries. The most common cause of fractures for civilian injuries was RTA, in group A, 5 patients (62.5%) out of 8 was RTA, the others 2 (25%) alleged assaults and 1 (12.5%) was FFH, while in group B, 7 patients (46.6%) out of 15 RTA, 5 (33.3%) FFH and the rest cases were miscellaneous causes like blast or wave of bullet injures 3 (20%) patients.

**Clinical parameters:**

1. **Occlusion:** In group A, we found that out of 8 patients there was only one patient (12.5%) suffered from malocclusion, while the rest 7 patients (87.5%) show centric normal occlusion as stated by them and seen by examiner. Regarding group B, there were 5 (33.5%) patients out of 15 had malocclusion. When this result analyzed statistically, we found that there is significant differences between group A and group B, reflecting that splint with elastic method is more benefit from close method in reduction the incidence of malocclusion.

2. **Mouth deviation:** Out of 8 patients of group A, there was only one (12.5%) who suffered from deviation of his mouth of ≥ 5 mm towered fracture side during maximum mouth opening which is considered not
acceptable although it is not noticed by the patient while in group B there was 7 (46.6%) patients suffered from such deviation. Statistically there is significant differences between the two groups.

3 -Mouth opening: According to the result of this study we found that 2 (25%) out of 8 patients in group A, and 4 (26.6%) out of 15 patients in group B show reduction in their mouth opening of less than 32mm. so there is significant difference between group A and group B regarding mouth opening.

4- Pain: Out of 8 patients of group A, there was only one patient (12.5%) still complained from pain and discomfort at fracture site during mouth opening, excursion and hinge movement of the mandible. While in group B, there were 5 (33.3%) patients suffered from such pain during the same range of movement. So, statistically there is a significant difference between the two groups. Distribution of clinical parameters between group A & B, these are showed in Figure (1)

![Fig 1: Distribution of clinical parameters between group A & B](image)

**Radiological parameters:**

1-Reduction of TMJ: In this study we found that in group A, the number of cases that show reduction of TMJ to its normal position was 5 out of 8 cases (62.5%). While in group B, the number of cases was only one out of 15 cases (6.6%) there are highly significant differences between group A and group B.
2- **TMJ slightly deviated**: Out of 8 patients of group A, there was only 2 patients (25%) whom the joint is slightly deviated and not return back completely to its normal position (the condylar head not fitted on gliniod fossa), while in group B, the number of such cases elevated reaching to 6 (40%) out of 15 patients. When this data analyzed statistically we found that there is significant difference between the two groups.

3- **TMJ not reduced (still deviated)**: TMJ is still dislocated or displaced and not reduced to its normal position in 1 (12.5%) out of 8 patients who treated with elastic tractions with splint while in group B patients who treated by closed method there was 8 (53.3%) patients there TMJ is still dislocated and not respond to treatment by this method after completion of treatment. There is highly significant differences between group A and group B. Distribution of radiological parameters between group A & B, these are showed in Figure (2).

![Figure (2): Distribution of radiological parameters between group A & B.](image)

**Discussion:**

This prospective study investigated the clinical and radiographical outcomes of usage the elastic tractions with splint versus closed treatment (IMF) method in management of subcondylar fractures of the TMJ in 8 cases as group A and 15 as group B.

The follow-up period was vary from patient to other but usually 1 month after completion of treatment which is acceptable time can give impression about the effectiveness of treatment method.

Condylar fractures frequently associated with other types of fractures. The most common combination with other mandibular fractures notably symphysial and parasymphysial due to the pattern of kinetic energy transferred to the condyle, these findings look similar to those of Marker et al.\(^5\), Zacharides et al.\(^7\), and Villarreal et al.\(^8\).

Regarding radiographs, we can see the pattern or type of subcondylar fractures was approximately 9 cases (39.1%) had lateral override and 7 cases (30.4%) had medial override, 6 patients (26%) had angulation.
without override and only one patient (4.3%) with no displacement. These fractures types were due to the differences in the force transmitted to the condyle at the moment of impact.

Regarding treatment plan group A, treated by arch bars and elastic tractions in oblique directions to overcome muscular tractions, and insertion of splint between posterior teeth to create space for easily reduction of condyle and restore of TMJ. Then the elastics replaced by tie wires to complete time for IMF.

But group B, treated only by arch bars and tie wires for IMF in a period of times depend on type of fracture, conditions and age of the patients.

Every patient in group A&B followed clinically and radio graphically to see the fate of condyle. The patients with displaced mandibular fractures were been operated under GA and fixed by Simi rigid internal fixations to prevent displacement during healing phase, the condyle fracture then treated as if there was no associated fracture.

The clinical parameters were recorded short term follow-up after completion of treatment; occlusion, mouth opening, deviation and pain. Other parameters used by some authors for evaluation of treatment method used for this type of fractures but the parameters we used look more repeatable and complained from the patients.

Occlusion:

The comparison between groups A&B we found that was only one patient (12.5%) suffered from malocclusion in group A and the rest cases (87.5%) show normal centric occlusion. While in group B, there were 5 patients (33.5%) out of 15 had malocclusion.

This results seems to be agreed with that of Marker et al 6 (2%), Villarial et al 8 (4%), and Smets et al 12 (8%). While may be disagree with that of Rutges et al 10, and Ellis et al 13, that found more than this percentage, this difference may be due to the method of assessment and treatment plan and degree of displacement or dislocated of condylar head, which is necessary for restore articulation and maintain normal occlusion.

Mouth opening:

According to the result of this study we found that 2 patients (25%) out of 8 patients in group A, and 4 patients (26.6%) out of 15 patients in group B showed reduction in their mouth opening of less than 32mm, but it reverse the finding of Marker et al 14, and Al-mudaffer 15 that considard that IMF did not cause much effect upon the degree of mouth opening.

Deviation:

Many people already have some deviation but deviation more than 5mm during maximum mouth opening is considered unacceptable 15, in group A, there was only one patient (12.5%) who suffered from deviation of his mouth of ≥ 5mm towered fracture side, this is more accepted than group B where the deviation more than 5mm in 7 patients (46.6%) suffered from such deviation. This is due to the TMJ completely return to the normal functions after treatment completion in group A.

Pain:

In group A, there was only one patient (12.5%) complained from pain and discomfort at fracture site during mouth opening, in excursion and hinge movement of the mandible. While in group B, there was 5 patients (33.3%) suffered from such pain during the same range of movement. There is a significant difference.
between group A, and group B, this condition may be due to un reduced TMJ with slight degree effect of surrounding structures by muscular spasm that induce pain or discomfort upon this type of movement of the mandible.

**The radio graphical results:**

The radio graphical results were divided into three patterns, the head of condyle is completely reduced, slightly deviated or still deviated (no result).

The radio graphical results affected strongly by treatment plan choice, we and many authors found that open surgical reduction of condylar fractures lead to excellent radio graphical results, Santler et al.9, Hauge et al.11, and Ellis et al.13. but this group of cases excluded from this study due to limited sample collected also there are a lot of complications by surgical technique like damage to the facial nerve and maxillary artery, salivary fistula, facial scar, Frey's syndrome, mal-union(inadequate reduction), and failure of fixation failure(inadequate fixation). Bradly et al16, and Cyrus et al17.

In this study we tried to obtain good clinical and radio graphical results by non-surgical intervention for maximum benefit to the patients with less complication.

In group A, that treated by elastic tractions with splint 5 out of 8 cases( 62.5%) showed good reduction of TMJ to its normal position and 2 patients(25%) with slightly joint deviation and does not return back completely to its normal position(the condylar head does not fitted on gleniod fossa), and only 1 patient(12.5%) out of 8 patients were showed deviation due to sever medially displacement of the head of the condyle, by follow-up of this group we found the angulation type with lateral displacement were more achieve more benefit from this treatment method because of the space created by splint was quite enough for reduction of condylar head by tractions, while in group B, that were treated only by closed method with IMF ,we found that only one case out of 15 (6.6%)were the TMJ reduced, 6 cases(40%) showed slight deviation and in 8 patients (53.3%) the TMJ was still dislocated and not responding to treatment by this method after completion of treatment. This founding agreed with, Santler et al,9, Al-mudaffer15, Hauge et al.11, and Ellis et al.13.

**Conclusions:**

Young male patients are most likely involved by trauma inducing sub condylar fractures. Civilian injuries like road traffic accident seems to be the main cause of this types of fractures. The usage of elastic tractions with splint is a simple method but gives excellent functional and good radio graphical results than closed method by MMF only.

**ETHICAL CLEARANCE**

The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

**CONFLICT OF INTEREST**

The authors declare that they have no conflict of interest.

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