

RETAINING OF THE MEDIALY DISPLACED CONDYLE AND DISC IN THE SURGICAL TREATMENT OF TYPE III TEMPOROMANDIBULAR JOINT ANKYLOSIS

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ABSTRACT

Purpose: To evaluate the effectiveness of retaining of the medially displaced condyle and disc in the surgical treatment of type III temporomandibular joint ankylosis.

Patients and methods: Eight patients with type III temporomandibular joint ankylosis, according to *Sawhney*⁽⁶⁾ classification were included in this study. 5 males and 3 females, their ages in between 12 to 42 years with a mean of 33 years. All the patients were evaluated preoperatively both clinically (determination of maximal inter-incisal opening in mm, assessment of mandibular deviation, presence of pain on the affected joint, examination of occlusion and examination of function of the facial nerve) and radiographically (using axial, coronal and three dimensional computerized tomograms) to determine the presence of ankylosis on the lateral aspect of the TMJ and to determine the presence of medially displaced condyle. All the clinical and radiographic parameters were performed immediately, 3 months, 6 months and finally one year after surgery.

Results: Regarding to the maximal inter-incisal opening, there was improvement in mouth opening, as the mean of inter-incisal distance preoperatively was 6mm and increased after one year postoperatively to 35 mm. The visual analogue pain scale (VAS) revealed no pain after one year, from surgery in all patients. All patients showed presence of proper postoperative occlusion according with no occlusal disturbances nor presence of deviation in mouth opening toward the affected side, as the condyle was preserved and height of the ramus of the affected side was maintained during the follow up periods. No permanent damage to the facial nerve had been detected in any case. Radiographic evaluation revealed proper remodeling of the reconstructed joint, no evidence of bony overgrowth no recurrence of ankylosis in all operated joints and the medially displaced condyle articulates properly with the base of the skull, medial to the glenoid fossa.

Conclusion: Retaining of the medially displaced condyle and disc during surgical treatment of type III TMJ ankylosis seems to be safe and efficient method as:- 1) The bony resection was far easier than conventional methods, as all work was carried out on lateral side of the joint. 2) There was less chance of bleeding and so, the surgery was relatively safe. 3) Preservation of the disc makes no need to use any interpositional material. 4) Preservation of the condyle leads to maintaining the ramus height and also the retained condyle can fulfil its role in mandibular growth and function. 5) There is no need to reconstruct the joint with autogenous or alloplastic material.

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INTRODUCTION

Temporomandibular joint (TMJ) ankylosis is a Greek word denoting to presence of stiff joint. Temporomandibular joint ankylosis can be defined as occurrence of adhesion of surfaces of the joint by either fibrous tissue or bone which results in occurrence of limitation in mouth opening.⁽¹⁾

The cause of occurrence of TMJ ankylosis is considered to be multifactorial. However, Trauma especially the intracapsular fractures in the children is the most predisposing condition, that predispose to occurrence of TMJ ankylosis. Also infection, systemic disease such as ankylosing spondylitis and rheumatoid arthritis or inadequate surgical treatment of the region of the TMJ may predispose for occurrence of TMJ ankylosis.⁽²⁾

Occurrence of TMJ ankylosis leads to occurrence of impairments in the orofacial function such as occurrence of compromised oral hygiene and dental care, limited chewing ability, speech alteration, restricted airway and absence of space for eruption of the posterior dentition.⁽³⁾

Also ankylosis of TMJ may leads to other sequelae such as occurrence of problems in digestion and occurrence of alterations in the facial Skeleton which in role effects on the psychologic condition of the patient and put the patient's life in Jeopardy at any time due to the inability of the patient to open the mouth.⁽⁴⁾

There are many classifications for the TMJ ankylosis. Kazanjian classified the TMJ ankylosis into either true or false. True ankylosis (intraarticular) can be defined as the condition in which osseous or fibrous adhesion is present within the limits of the articular capsule. But false ankylosis (extra articular) can be defined as the condition which results from diseases not directly related to the joint. Also, the intraarticular ankylosis can be subclassified as complete or incomplete forms.⁽⁵⁾

Sawhney, classified the ankylosis of TMJ into four types, according to the severity of ankylosis

which is seen on the tomograms. In type (I) ankylosis (pseudo ankylosis) there is deformity or flattening of the condyle with little joint space can be seen on tomograms. And this condition occurs due to minimal bony fusion but there is an extensive fibrous adhesion around the TMJ. In type (II) ankylosis no bony fusion is present within the deep areas of the TMJ. But bony fusion is present only along the outer edges of the articular surfaces. In type (III) ankylosis, there is a bridge of bone between the zygomatic arch and the ramus. In this condition, the articular disc and upper articular surface remains intact after the bony bridge is excised. In type (IV) ankylosis, the architecture of the TMJ is lost and the joint is replaced by a bony mass.⁽⁶⁾

Although, there is no agreement on the standard protocol for management of TMJ ankylosis. However, there are three modalities used commonly, including a gap arthroplasty, interpositional arthroplasty and excision of the TMJ ankylotic mass with articular reconstruction.⁽⁷⁾

In type (III) ankylosis, the accepted surgical technique for treatment is total resection of the ankylotic bony mass, particularly the bone which is located at the medial aspect of the joint.⁽⁸⁾

Total resection of the ankylotic mass of bone is considered as the ideal method of treatment, with great care is considered for removal of the medial part of the bony remnants in type III and type IV ankylosis.⁽⁹⁾

However, total resection of the ankylotic bony mass may lead to occurrence of poor sequela on mandibular movement, mandibular ramus height, occlusal plane and finally effects on mandibular growth particularly in children. So, proper reconstruction must be done.⁽¹⁰⁾

In recent years many reconstruction techniques are established and gained popularity due to its satisfying long term results with low rate of recurrence. However, reconstruction of the

resected joint can be achieved by either autogenous costochondral graft or alloplastic materials are still controversial. ⁽¹¹⁾

The most common complications that had been reported during use of autogenous costochondral graft includes rib resorption, rib overgrowth, rib fracture, occurrence of osteomyelitis, donor site, morbidity (pneumothorax), in addition this technique needs special skill, causes donor site morbidity and provides less than optimal results in most of the treated cases. ⁽⁸⁾

The use of alloplastic materials for reconstruction of the resected temporomandibular joint may leads to occurrence of foreign body reaction and extrusion or displacement of the used material. ⁽¹²⁾

So, during dealing with type (III) ankylosis, if the position of the displaced condyle can be accurately determined by radiographic examination, it may be possible to preserve it instead of remove it with its attached meniscus. As retaining of the displaced condyle with it's disc may leads to great improvement in mandibular growth, mandibular function and decrease the incidence of occurrence of recurrence of ankylosis.

Aim of this study

The aim of this study was to accurately determine the role of retaining of the medially displaced condyle and disc in treatment of type III ankylosis by clinical and radiographic evaluation.

PATIENTS AND METHODS

This study was conducted on 8 patients with type III ankylosis according to *Sawhney*⁽⁶⁾ classification. Their ages ranges from 12 to 42 years with a mean of 33 years, comprised of 5 males and 3 females. The surgery was performed under general anaesthesia through nasoendo tracheal intubation in Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Tanta University.

All the included patients in this study wrote an informed consent.

Exclusion criteria:

Any medical contraindication for performing surgical interference, cases of recurrence or previously treated ankylotic cases and type I, II or IV ankylosis according to *Sawhney*⁽⁶⁾ classification.

All patients in this study were evaluated both clinically and radiographically pre operatively and post operatively at the following follow up periods, immediately after surgery, 3 months, 6 months and 1 year as follow:

A) Clinical evaluation:

The chief complaint of all patients was presence of difficulty in eating and speaking due to presence of severe limitation in mouth opening.

All patients were evaluated according to the following parameters:

Maximal interincisal mouth opening in (mm), *Fig (1)* assessment of the mandibular deviation towards the affected side, presence of pain or not during palpation of the affected joint, examination of occlusion according to *Ulgesic et al (1993)* ⁽¹³⁾ and finally examination of the function of the facial nerve using the *House Brockmann* grading system.



Fig. (1): Preoperative photograph show limited mouth opening (case no. 6)

B) Radiographic evaluation:

Imaging including CT scan of the TMJ were performed to all patients both preoperative and during the postoperative periods (immediately after surgery, 3 months, 6 months and 1 year)

The preoperative coronal and the 3-dimensional CT showed properly the presence of medially displaced condyle and presence of ankylosis on the lateral aspect of the temporomandibular joint.

Fig. (2)

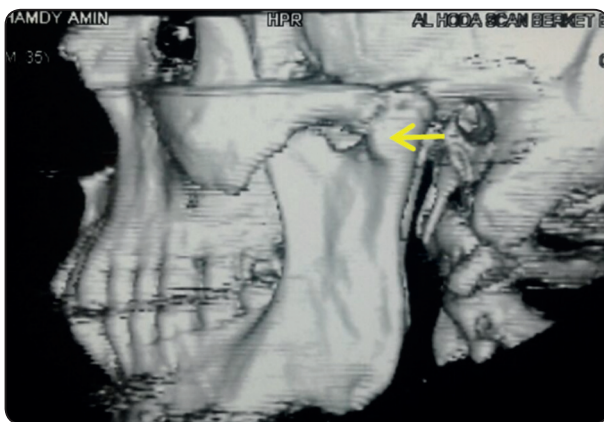


Fig. (2): Preoperative 3-D Ct scan showing left TMJ lateral ankylotic bony mass (case no. 6).

Surgical technique:

The surgical field was scrubbed using concentrated Povidine Iodine 1% and draped with surgical towels. Mepivacaine HCL 2% was injected at the incision lines to facilitate separation of the tissue planes and for performing haemostasis.

The ankylotic joint was approached through preauricular approach with temporal extension. The dissection was proceeded to the zygomatic arch and extended anteriorly and posteriorly to expose properly the ankylotic temporomandibular joint.

The periosteum covering the zygomatic arch and the ramus were incised and elevated. Then by using surgical burs and osteotomes, the lateral ankylotic mass was removed guided by CT images, continuing

to the condyle stump notchwith great care to avoid causing damage to the condyle and disc which are located in the medial aspect of the joint. **Fig (3)**

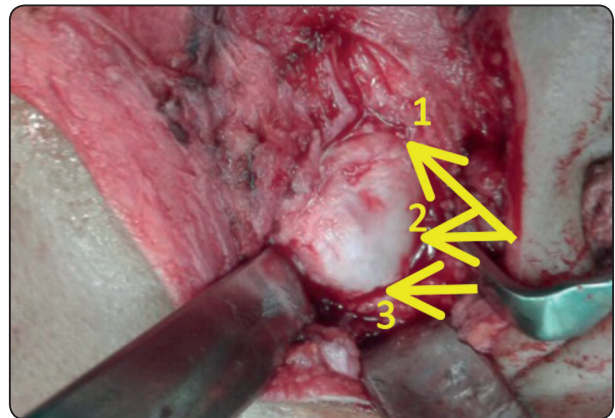


Fig. (3) Intra operative photograph showing the1) TMJ disc 2) lateral ankylotic bony mass 3) condylar neck osteotomy. (Case no. 6)

At this time, the medially displaced condyle and disc were seen and both can be released from the surrounding tissues. The remaining part of the stump was contoured, leading to the creation of a large gap between the stump and the glenoid fossa. Then the meniscus sutured lateral to the joint to cover the resected stump and avoid occurrence of ankylosis recurrence. No interpositional material was inserted between the condyle and the fossa. At this stage, the mandibular movement and mouth opening were checked.

Postoperative care:

All patients were hospitalized for two days, during which, the patients were maintained on a standard regimen of antibiotics (Ceftriaxone 1gm twice daily), non-steroidal antiinflammatories and analgesics (pyroxicam 20mg ampule twice daily), freeze-dried proteolytic enzymatic antiedematous (5mg crystalized and lyophilized chymotrypsin). After discharge from the hospital, all patients were maintained on the same scheme of treatment for 5 days. The skin sutures were removed for all patients 7 days postoperatively. All patients were evaluated

postoperatively through the following follow-up periods (immediate, 3 months, 6 months and 1 year) both clinically and radiographically.

A) *Clinical evaluation*

All the operated patients were evaluated postoperatively to determine the following: -

Interincisal mouth opening (in mm), presence of the pain during palpation of the affected joint with the visual analogue scale (VAS)⁽¹⁴⁾, occlusion according to (*Ulgesic et al., 1993*) as follow:-

(-5) points: occlusion altered bilaterally

(-3) points: occlusion altered on one side

(1) point: occlusion altered on one side. Only occlusal adjustment is needed.

(3) points: occlusion is adequate on both sides, but not the same as before surgery.

(5) points: good occlusion is obtained.

Finally examining the facial nerve function, the postoperative function of the facial nerve was evaluated using the *House Brackmann* facial nerve grading system.⁽¹⁵⁾

The score is determined by measuring the superior movement of the mid portion of the top of the eyebrow and the outward (lateral) movement of the angle of the mouth. Each reference point corresponds to 1 point for each 0.25cm movement up to a maximum of 1cm. The scores are then added to obtain the maximum score out of 8.

B) *Radiographic evaluation*

Imaging including axial, coronal and three dimensional computerized tomograms of the TMJ were performed to all patients through the follow up periods (immediately, 3 months, 6 months and 1 year) to:

- i) Determine the presence of any bony overgrowth or ankylosis recurrence in TMJ.
- ii) Assess the remodeling of the reconstructed joint.

RESULTS

This study was applied on 8 patients 5 males and 3 females with type III ankylosis, according to Sawhney classification. Their age ranges from 12 to 42 years with a mean of 33 years regarding to the involved side, 5 patients had right TMJ ankylosis and 3 patients had left TMJ ankylosis. According to the history of the patients, the duration of presence of limitation in mouth opening ranged from 2 years to 4 years, with a mean duration of 2.75 years. Also, the etiology of TMJ ankylosis was trauma in 6 cases (75%) and unknown in 2 cases (25%). Most probably a trauma had been unnoticed in these two cases. The duration of following up for all cases was one year.

I) *Clinical results:*

1. **Mandibular movement and maximal interincisal opening in (mm):**

A) *Preoperatively:*

All patients suffered from severe limitation in mouth opening ranging from 4mm to 12mm, with a mean of 6 mm.

B) *Immediately postoperative:*

Considerable improvement in mandibular movement and maximum mouth opening was noted in all patients, as the mean of interincisal mouth opening was 30 mm, (range from 24 to 42mm) **Fig (4)**



Fig. (4): Immediate postoperative photograph showing improved mouth opening (case no. 6)

C) Three months postoperative:

Marked improvement in mandibular movement and maximum mouth opening was noted in all patients, as the mean of interincisal mouth opening was 34 mm, (range from 26 to 44mm).

D) six months postoperative:

All the patients showed proper improvement in mandibular movement and maximal mouth opening, as the mean of interincisal mouth opening was 34mm, with a range from 28 to 42 mm.

E) One year postoperative:

Marked improvement had been detected in all patients at the end of the follow up, as the mean of interincisal mouth opening was 35mm (range from 28 to 44 mm).

2) Presence of pain (according to VAS) on palpation:**A) Preoperatively:**

No pain had been detected in the affected joints nor the masticatory muscles.

B) Immediately postoperative:

Moderate pain had been detected in all patients in the affected joints, with a score of VAS ranging from (2) to (4).

C) Three months postoperative:

No pain had been detected in the affected joints nor the masticatory muscle and movement was noticed properly in the affected joint.

D) Six months postoperative:

All patients reported absence of the pain in the affected joints and the masticatory muscles and also, proper movement of the affected joint had been recorded.

E) One year postoperatively:

No pain was elicited in the affected joints nor the masticatory muscles and movement of the affected joint was noticed properly.

3) Postoperative occlusion:

Proper postoperative occlusion had been recorded according to *Ulgesic et al.* ⁽¹³⁾, in all patients, and no open bite had been recorded in any patient during the follow-up periods i.e. (immediate, 3 months, 6 months and 1 year). No deviation in mouth opening had been detected in all patients through the follow up periods, as the height of the ramus was maintained through condylar preservation in the operated joints.

4) Facial nerve testing results (using the house Brackmann grading system):**A) Preoperatively:**

All patients didn't suffer from any disability in the facial nerve function of the operated side.

B) Immediate postoperative:

Five cases, (Case 1, 3, 4, 5, 6) showed temporary facial nerve paralysis occurred due to excessive retraction of the flap.

C) Three months postoperative:

Only 2 cases (cases 1, 6) showed temporary facial nerve paralysis. But the other (3) cases were improved properly.

D) Six months postoperative

No cases showed facial nerve paralysis.

E) One Year post operative:

All the cases had recovered properly with no case showed permanent facial nerve paralysis.

II) Radiographic Results:

A) Preoperatively:

Axial, coronal and 3-D (CT) scan showed presence of bony ankylosis on the lateral aspect of the medially displaced condyle on the affected joints.

B) Immediate postoperative:

Axial, coronal and 3-D (CT) scan showed presence of gap between the mandibular stump and the glenoid fossa. Also, the condyle was seen to be located medial to the glenoid fossa, articulating with the skull base. **Fig (5)**

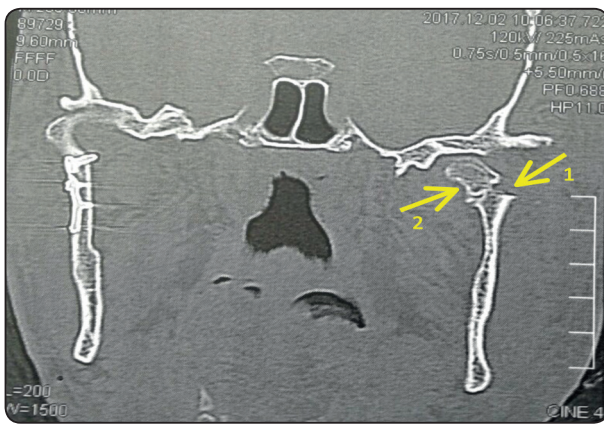


Fig. (5): Immediate postoperative coronal CT scan showing 1)removal of the left lateral ankylotic bony mass 2) preservation of medial condyle(case no. 6)

C) Three months postoperatively:

Axial, coronal and 3-D (CT) scan showed proper remolding of the reconstructed joint and showed that, the medially displaced condyle articulates properly with the base of the skull medial to the glenoid fossa.

D) Six months postoperatively:

Axial, coronal and 3D (CT) scan showed proper recontouring of the reconstructed joint and also showed that, the medially displaced condyle articulates properly with the base at the skull, medial to the glenoid fossa.

E) One year postoperatively:

Axial, coronal and 3-D (CT) scan showed no evidence of any bony overgrowth nor recurrence of ankylosis in the operated joints.

DISCUSSION

Ankylosis of temporomandibular joint causes physical and psychological disability to the patient, practically if it occurs early in the childhood age. As the ankylosis of TMJ leads to severe sequelae on the patients as it leads to occurrence of facial deformity, speech impairment, poor oral hygiene, difficult mastication, dental caries, malocclusion and occlusal canting in unilateral TMJ ankylosis and affects on airway leading to occurrence of sleep apnea. So, the objective of treatment of ankylosis of TMJ was to restore both function of the TMJ and aesthetic of the patient and to relieve the obstruction of the upper airway with minimal complications.

There are various surgical methods can be used for treatment of type III ankylosis, but this study aimed to relieve the ankylosis type III with preservation of the medially displaced condyle as preservation of the displaced condyle with its disc led to occurrence of many advantages such as, preserved on the ramus height, no need for use of interpositional material. The results of this study agreed with *Harvold*⁽¹⁶⁾ who reported that, even the deformed condyle can improve both function and growth when the lateral ankylosis is released. So, the condyle and disc should be used rather than removed.⁽¹⁶⁾

In this study, the etiology of occurrence of TMJ ankylosis was trauma in 75% of cases. This result agrees with *Khan et al*,⁽¹⁷⁾ who found that, trauma was the most common cause for occurrence of TMJ ankylosis.⁽¹⁷⁾

The results of this study showed proper improvement in the mouth opening and the maximum interincisal opening. As the mean of interincisal opening at the end of follow up (i.e. after 1 year) was 35 mm.This coincides with the results

of *Jakhar et al.*,⁽¹⁸⁾ who reported that, a mean of mouth opening of more than 30 mm was occurred at the end of follow up. So this marked improvement in mouth opening during the minimum follow up period indicted the effectiveness of this procedure.⁽¹⁸⁾

In this study all the patients reported absence of pain in either the operated joints or in the related masticatory muscles by using the visual analogue scale. This result agreed with *Balaj*⁽¹⁹⁾, who reported presence of less amount of postoperative pain.⁽¹⁹⁾

The current study showed proper postoperative occlusion and no open bite case had been recorded in any patient at the end of follow up period i.e. (after 1 year). Also, no deviation in mouth opening had been detected in all patients through the follow up periods, as the height of the ramus was maintained through condylar preservation in the operated joints. These results matched with the results of *Jakhar et al*⁽¹⁸⁾, who reported that after removal of the bony ankylotic mass and preservation of the joint with retaining of the condyle and disc, none of the operated patients had open bite.⁽¹⁸⁾

In the present study, none of the operated patients suffered from occurrence of affection in the function of facial nerve and all the cases recovered properly at the end of follow up period (i.e. after 1 year). The results of this study agreed with *Jakhar et al*⁽¹⁸⁾ who reported presence of temporary facial nerve paralysis caused by excessive retraction of the flap in 5 cases but all of these cases recovered properly after three months.⁽¹⁸⁾

In this study Axial, coronal and three dimensional computerized tomograms showed no evidence of occurrence of bony overgrowth nor recurrence of ankylosis in the operated joints through the follow up periods and also showed proper reconturing of the reconstructed joints. This result contradict with *Jakhar et al*,⁽¹⁸⁾ who reported three patients had recurrence of ankylosis, due to a lack of postoperative physiotherapy.⁽¹⁸⁾

CONCLUSION

Retaining of the medially displaced condyle and disc during surgical treatment of type III TMJ ankylosis seems to be safe and efficient method as:

- 1) The bony resection was far easier than conventional methods, as all work was carried out on lateral side of the joint.
- 2) There was less chance of bleeding and so, the surgery was relatively safe.
- 3) Preservation of the disc makes no need to use any interpositional material.
- 4) Preservation of the condyle leads to maintaining the ramus height and also the retained condyle can fulfil its role in mandibular growth and function.
- 5) There is no need to reconstruct the joint with autogenous or alloplastic material.

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