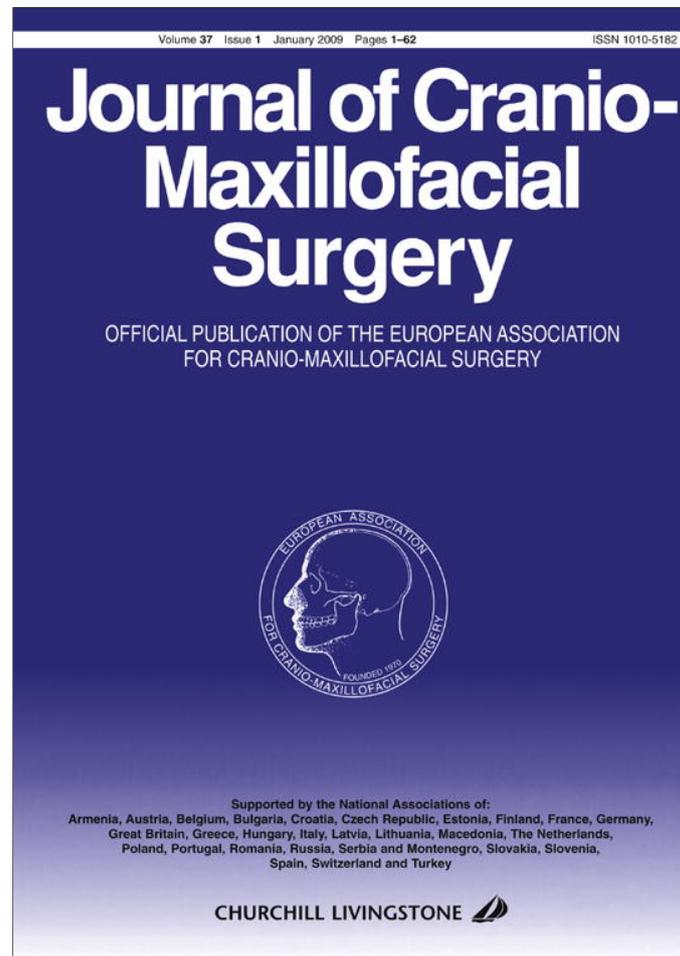


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Management of chronic recurrent temporomandibular joint dislocations: A retrospective study

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SUMMARY. Purpose: The purpose of this study is to evaluate the clinical results of patients who received surgical treatment for chronic recurrent dislocations (CRD). In our clinical practice CRD patients were classified into 5 types depending upon their aetiology. These patients were treated by two different surgical techniques, eminectomy or augmentation of the eminence by autograft depending on their classification. Materials and methods: Nineteen patients with CRD attended the clinic for surgical treatment. Patients were classified accordingly into 5 types of CRD. Eminoplasty was used in the treatment of twelve patients with type I and II disease. An oblique osteotomy of the eminence was carried out. Harvested chin graft was contoured to a wedge form and inserted tightly into the osteotomy site. The augmentation of the eminence was provided by an inlay cortical bone graft without using any of the conventional fixation materials. The remaining 7 patients with type III, IV and V disease were treated by eminectomy. The factors evaluated were pre- and post-operative maximal incisor opening, sex, age, number and type of previous operations, cause and type of the CRD, and the previous treatment of the patients. Results: The survey is based on nineteen patients who were treated in the same department. Patients age ranged from 22 to 80 years. Females are dominated in the study. The follow-up period ranged from 1 to 12 years. Free excursions of the condyles were achieved in the patients treated by two different techniques. On the other hand, maximum interincisal openings were higher in the patients treated by eminectomy when compared with the patients who had eminoplasty. Conclusion: So far as the quality of life for the patients with CRD is concerned, the most appropriate technique (whether it be to confine the condyle or allow its free movement) to be employed should be decided by following an comprehensive evaluation of the patients' history. © 2008 European Association for Cranio-Maxillofacial Surgery

Keywords: TMJ, dislocations, TMJ dislocations, recurrent dislocations, TMJ disorders, TMJ eminoplasty, arthroplasty, eminectomy

INTRODUCTION

In some individuals excessive anterior movement of the mandibular condyle by passing the articular eminence during maximal opening creates discomfort. The terms “subluxation”, “luxation” and “dislocation” were used to describe this phenomenon. In cases where repeated dislocations occur, the term “chronic”, “chronic recurrent” or “habitual” could be used. (Norman and Bramley, 1990). Surgical treatment is required where the excessive anterior excursion of the condyle becomes recurrent.

Chronic recurrent dislocation (CRD) of temporomandibular joint (TMJ) is an uncommon condition. It is found more frequently in people with general ligamentous and capsular laxity, eminential erosion and flattening. Trauma is well recognized in the genesis of CRD. CRD is characterized by a condyle that slides over the articular eminence, catches briefly beyond the eminence and then returns to the fossa. Predisposing factors are, yawning, vomiting, extremes of masticatory effort or laughing. Dental and otorhinolaryngological treatment, trauma, the use of anti-emetics, and phenothiazines which produce extra pyramidal side effects. Systemic

disease, psychogenic and neurological disorders are also aetiological factors for CRD (Adekeye et al., 1976; Kummoona, 2001; Ugboko et al., 2005).

CRD may be unilateral or bilateral. The mouth is partly open and the affected condyle is impalpable. In bilateral CRD, the chin is central and the mouth wide open with only limited mandibular movement.

Many techniques have been advocated for the treatment of CRD. Non-surgical approaches have been proposed to prevent the excessive abnormal excursions of the condyle including bandages and splints and extra-articular sclerosing agent injections (McKelvey, 1950; Schade, 1977). As the effects of these injections appear to be short lived the procedure cannot, in all conscience, be recommended. Botulinum toxin injections have been proposed as an alternative non-invasive technique in the treatment of CRD (Moore and Wood, 1997; von Lindern, 2001; Ziegler et al., 2003; Martinez-Perez and Ruiz-Espiga, 2004). A review of the scientific literature over the period 1884 to date shows great and increasing ingenuity in the surgical management (Norman and Bramley, 1990). However, many of the studies failed to reveal how aetiological factors and the patients history can direct the decision and selection of the type of surgical treatment.

OBJECTIVES

The purpose of this study is to clinically evaluate two different types of treatment for chronic recurrent TMJ dislocations, in dependently of different aetiologies.

MATERIALS AND METHODS

Nineteen patients (37 joints) underwent reconstructive surgery to treat CRD and were evaluated in this study. The factors evaluated were sex, age, cause, and the type of the CRD, and previous operations.

The diagnosis of the TMJ CRD was based on history and clinical and radiographic findings. In our clinical practice, CRD patients were classified into five different types regarding the episodes and the treatments they had previously undergone. (Table 1) patients were divided into 2 groups according to the surgical technique used to treat the CRD. In group 1, patients with type I and type II CRD were treated with modified eminoplasty technique. In group 2, patients with type III, IV and V were treated with eminectomy.

SURGICAL TECHNIQUE

Two operations were employed in treatment of CRD in this study:

1. Eminoplasty: The TMJ was approached through an endaural incision with extension towards the temporal area to permit anterior mobilization of the tissue and exposure of the articular eminence without damaging the facial nerve. An oblique osteotomy of the eminence was carried out. A chin graft, including mostly cortical bone was harvested by Dowel cutter. The cylindrical Dowel graft was trimmed and contoured in wedge form. Wedge shaped bone graft was inserted and tapped tightly into the osteotomy site. A green-stick fracture was created avoiding a possible complete fracture of the lower segment of the eminence (Figs. 1 and 2). The augmentation of the eminence was completed by an inlay bone graft and none of the fixation material such as wire, screws or plates were needed. The surgical proce-

dure was performed without opening the capsule and intra-articular structures.

Post-operatively, inter-maxillary fixation (IMF) was applied for one week to prevent any damage to the inlay graft and a soft diet and limited mouth opening were advised for five weeks.

2. Eminectomy: A standard endaural incision was used to approach the articular eminence. The superior joint space was opened. The articular eminence and tubercle were removed including the medial portion of the eminence. Post-operatively, a soft diet was advised for two weeks, and for ten days after surgery, patients were encouraged to do opening exercises. Although physiotherapy was painful during the first week, most of the patients eventually tolerated the therapy.

The decision in which surgical technique to be used was made depending on the CRD episodes, the previous treatments and the aetiology of the CRD. Two different types of surgical treatment were applied in this study (Table 2 and 3). One patient with unilateral CRD who was young and had few episodes previously (Patient No: 1) treated by unilateral approach. The Other eighteen patients were treated by bilateral approach.

The Students' *t*-test was used to compare the pre to post-operative changes within the groups. Mann Whitney *U* test was used to compare the pre- and post-operative MID

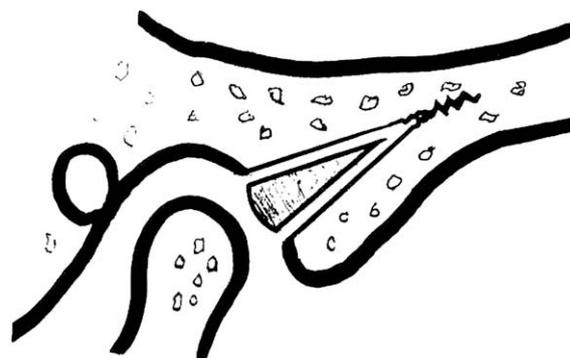


Fig. 1 – Line diagram illustrating direction of the oblique osteotomy and placement of the wedge shaped bone graft.

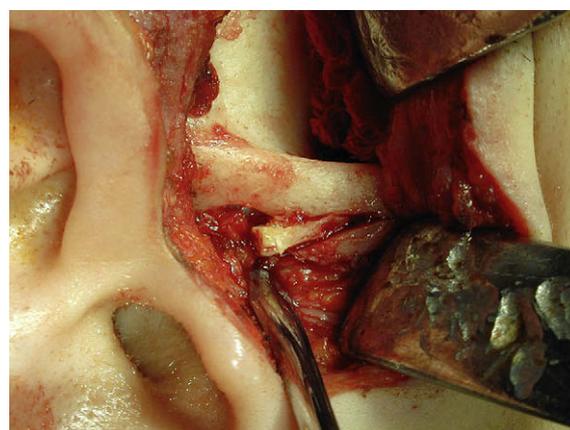


Fig. 2 – Oblique osteotomy of the eminence was carried out and wedge formed bone graft was tapped and inserted tightly into the osteotomy site.

Table 1 – Types of the chronic recurrent TMJ dislocations

Type of CRD		Number of patients
Type I	Patients had few previous episodes and their condyles were repositioned by physician without anaesthesia.	3
Type II	Patients had more than few episodes previously and condyles were repositioned by physician or maxillofacial surgeon with local or general anaesthesia.	9
Type III	Patients had more than few episodes due to a systemic disorder and they need surgical reconstruction.	2
Type IV	Patients had previous and failed surgical treatments and they need further surgical reconstruction.	3
Type V	Patients who cannot receive Inter-maxillary fixation due to local and systemic problems.	2

Table 2 – Group 1 patients, treated by eminoplasty

No	Age	Sex	Etiology	Previous treatments	Joint involved	Type of approach	First episode (Years)	Episodes (In per month)	Follow-up period (Year)
1	25	F	?	PLA	Unilateral	UEP	1	3	4
2	30	F	Tooth removal	PLA+PWLA+PGA	Bilateral	BEP	6	6–8	3
3	29	F	?	PLA+PWLA	Bilateral	BEP	3	4	5
4	28	F	Fall	PLA	Bilateral	BEP	2	2	4
5	27	F	Tooth removal	PLA+PWLA+IMF	Bilateral	BEP	3	4–6	5
6	24	F	?	PLA+PWLA+IMF	Bilateral	BEP	4	4	6
7	27	F	Traffic acc.	PLA	Bilateral	BEP	2	3–4	2
8	34	F	Traffic acc.	PLA+PWLA	Bilateral	BEP	3	3–4	5
9	22	F	Fall	PLA+PWLA	Bilateral	BEP	2	4–6	4
10	24	F	Tooth removal	PLA+PWLA+PGA+IMF	Bilateral	BEP	7	15–20	3
11	31	F	Traffic acc.	PLA+PWLA	Bilateral	BEP	2	4–6	6
12	22	F	Tooth removal	PLA+PWLA	Bilateral	BEP	2	3–4	4

PLA-Positioned without local anaesthetics, **PWLA**-Positioned with local anaesthetics, **PGA**-Positioned under general anaesthesia, **UEP**-Unilateral Eminoplasty, **BEP** Bilateral Eminoplasty.

Table 3 – Group 2 patients treated by eminectomy

No	Age	Sex	Aetiology	Previous treatments	Joint involved	Type of approach	First episode (Years)	Episodes (In per month)	Follow-up period (Year)
1	65	F	?	PWLA+SF	Bilateral	BEC	5	2	12
2	37	F	?	PWLA+SF	Unilateral	BEC	4	2–3	10
3	67	F	?	PWLA+SF+PW	Unilateral	BEC	4	4	11
4	55	F	ALS	PLA+PWLA+IMF	Bilateral	BEC	3	4–6	2
5	57	M	Epilepsy	PLA+PWLA+IMF	Bilateral	BEC	2	3–5	2
6	80	M	?	PLA+PWLA	Bilateral	BEC	6	3–4	3
7	78	F	?	PLA+PWLA	Unilateral	BEC	7	3–4	1

PLA-Positioned without local anaesthetics, **PWLA**-Positioned with local anaesthetics, **PGA**-Positioned under general anaesthesia, **SF**-Screw fixation on eminence under general anaesthesia, **PW**-Placement of wire under general anaesthesia, **ALS**-Amyotrophic lateral sclerosis, **BEC**-Bilateral Eminectomy.

(Maximum Interincisal Distance) changes in between two groups of patients treated by different techniques. Data were presented as mean \pm standard deviations (SD). *P* values less than 0.05 were considered to be significant.

RESULTS

The clinical review was based on 19 patients with a mean age of 44.1 years (range 22–80 years) who were treated in the same department. Among the 19 patients, aetiological factors predisposing to CRD were, 4 cases with a history of tooth removal, 3 with a history of traffic accident, 2 with a history of a fall, and 2 with neurological disorders (amyotrophic lateral sclerosis and grand mal epilepsy). 8 patients were not able to provide details regarding the cause of the disorder.

Patients were classified according to the aetiology of CRD, the type of the previous treatments, and systemic and local predisposing factors (Table 1). Three patients had Type I CRD. These patients had few episodes previously, and were managed by physicians and handled without anaesthesia. Nine patients had Type II CRD, (the most common presentation), they showed several episodes in their history, and had been treated by manual reduction (by physician) employing local or general anaesthesia and they had IMF for a while. The group 1 patients who had type I and type II disease, were treated by eminoplasty. (Table 2) Symptoms had disappeared in the post-operative period and patients were able to open their mouths without

any fear of dislocation. Satisfactory excursions of the condylar head were recovered (Fig. 3 and 4).

In group 2, eminectomy was performed (Table 3). Two patients had type III CRD, the aetiology comprised neurological disorders. One of the patients was suffering from grand mal epilepsy, the other one was suffering from amyotrophic lateral sclerosis. It was difficult to protect the augmented eminentia in the post-operative healing period in these patients. Position of the interpositional graft was at risk therefore eminoplasty was contra indicated.

Three patients had type IV CRD. All of the cases in this group had been treated previously by other surgeons by fixing screws on the articular eminences in an attempt to limit the excursion of the condyle. They were suffering from pain during function. Under general anaesthesia, screws were removed and eminectomy was carried out. After long-term medical therapy, symptoms disappeared (Güven, 2005). In cases who had surgery previously, especially with placement of an alloplastic (reconstruction) material, it was difficult to repeat reaugmentation of the articular eminence. In addition, as the source of pain was the injured eminence, therefore eminectomy was the preferred treatment.

Two patients had type V CRD, both of them were edentulous and also had resorbed alveolar ridges. In addition both patients have systemic problems. It was difficult for these patients to tolerate the IMF which was necessary for the stabilization of mandibular position during the healing period. Therefore eminoplasty was contraindicated in these patients.

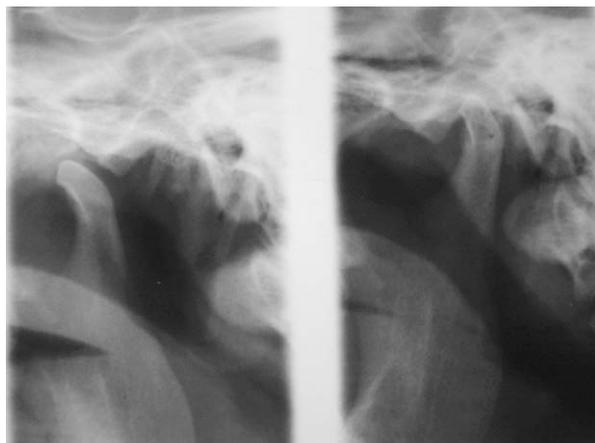


Fig. 3 – Pre-operative x-ray reveal anterior dislocation of the condyle when mouth was open (Patient No: 1).



Fig. 4 – Post-operative 3 years CT image reveals complete healing of the augmented eminencia and satisfactory anterior excursion of the condyle (Patient No: 1).

Group 1 and 2 was compared within it self and with each other for the pre- and post-operative MID change. (Table 4) In group 1, average calculated MID value was reduced from 47.67 ± 2.02 mm (Mean \pm SD) pre-operatively to 36.00 ± 1.71 post-operatively in the patients treated by eminoplasty. On the other hand, In group 2 patients who were treated by eminectomy, the average calculated MID value was reduced from 46.57 ± 2.82 mm pre-operatively to, 39.57 ± 2.30 mm post-operatively. Reduction in the MID was statistically significant for both groups ($p < 0.01$) (Table 4). When compared with each other reduction was significantly higher in the eminoplasty patients (11.67 ± 2.50) rather than the eminectomy patients (7.00 ± 2.83) ($p < 0.01$) (Table 4).

DISCUSSION

Non-surgical and surgical techniques have been proposed for the treatments of CRD. In non-surgical treatment of CRD, bandages, splints, and sclerosing agents were used previously (McKelvey, 1950; Schade, 1977).

Since its discovery in 1897 to its introduction as a therapeutic agent in 1977 to present day, botulinum toxin has evolved from a poison to a versatile clinical tool with an expanding list of uses including the treatment of CRD (Moore and Wood, 1997; von Lindern, 2001; Ziegler et al., 2003; Martinez-Perez and Ruiz-Espiga, 2004).

The vast number of surgical techniques tried over the years illustrates the difficulty that has been experienced in producing a satisfactory method for the treatment of CRD. Surgical techniques used were partial or complete myotomy (Xu, 1992), capsular plication (Mayer, 1933) scarification of the temporalis tendon (Maw and McKean, 1973), open condylotomy (James, 1971), insertion of implants into the articular eminence (Findlay, 1964; Cardoso et al., 2005), down-fracturing of the zygomatic arches (Leclerc and Girard, 1943), augmentation of the eminence by allografts (Keith, 1988; Whear et al., 1991) and eminectomy (Myrhaug, 1951; Undt et al., 1997). Of the myriad procedures currently employed by maxillofacial surgeons, eminectomy and augmentation of the articular eminence by bone grafts are, in all probability, the most popular.

In contrast with the reports of Adekeye et al., 1976; Chin et al., 1988; Ugboko et al., 2005 which stated a higher incidence in males, this study revealed higher female prevalence.

Majority of the patients (12 patients) in this study were treated by augmentation of the articular eminence by autogenous bone grafts. Some of them (3 patients) had had few episodes previously and they were handled by manual reduction by physician without anesthesia, 9 patients had more than few episodes in their history and during the manual reduction they had needed local or general anesthesia. They were all young, under the age of 35, had no systemic disorder and surgical treatment in their history. The modified eminoplasty technique used in this study provided satisfactory augmentation, thus excessive movements of the mandibular condyles by passing the articular eminence anteriorly were limited successfully. According to Whear et al., 1991, when autogenous bone obtained from the hip was used to augment the eminence, subsequent resorption and remodeling of the graft may be considerable, leading to loss of much of the initial height gained. Quality and the type of the bone graft is another matter to be discussed. In contrast with the previously reported studies (Keith, 1988; Norman and Bramely, 1990; Kummoona, 2001) a chin graft was preferred in this study. To provide a chin graft is easy and after all, it creates less post-operative discomfort to the patient when compared with ilium donor site. Chin graft consisting sufficient compact bone provided a satisfactory augmentation and prevented an undesirable resorption of articular eminence during remodeling under functional forces in long-term.

A variety of techniques and materials have been suggested for the augmentation of the eminence. Schade, 1977 recommended osteotomy with insertion of a silastic wedge. The technique of re-building the articular eminence with polymethyl-methacrylate after carrying out an osteotomy was described as an alternative for the treatment of CRD (Norman and Bramley, 1990). Their loosening or displacement with function often

Table 4 – Pre-operative and post-operative MID in mm. (DMID: Difference between the pre-operative and post-operative MID values)

Technique	n	Pre-operative-MID	Post-operative-MID	DMID
		Mean \pm SD	Mean \pm SD	Mean \pm SD
Eminoplasty	12	47.67 \pm 2.02	36.00 \pm 1.71*	11.67 \pm 2.50
Eminectomy	7	46.57 \pm 2.82	39.57 \pm 2.30*f	7.00 \pm 2.83f

f: Mann Whitney U test showed statically significant difference between group 1 and 2, $p < 0.01$

*Students t-test showed significant decrease in MID post-operatively, $p < 0.01$.

complicates the use of alloplastic materials in augmentation of articular eminence. Compared with the allografts, autogenous bone grafts have been considered as better for many disorders in maxillofacial surgery. *Norman and Bramley, 1990* reported successful results with eminoplasty made by autogenous bone grafts. After an oblique osteotomy of the eminence, a bone block is down-fractured and iliac graft inserted between the two segments and firmly anchored by a compression wire osteosynthesis. Just in case the anterior limb of osteotomy site fractures, dual wire osteosynthesis is required. Failure to achieve adequate width of the graft may allow medial escape of condyle and further episodes of dislocation. In the technique described in this paper, after an oblique osteotomy of the eminence, a wedge shaped cortical bone graft was gently tapped tightly into the osteotomy site (Figs. 1 and 2). A green-stick fracture was created avoiding a possible total fracture of the lower segment of the eminence. None of the fixation materials such as wire, screw or miniplate was used to keep the bone graft in place. IMF was applied for one week to prevent any possible damage of the augmented eminentia. IMF for a short period and soft diet in the following days were enough to enable satisfactory rehabilitation of the articular eminence. The patients had no further dislocations. It is possible to create a bigger barrier by placing a big bony block and using wires or screws to secure it. However, in the treatment of CRD with arthroplasty, the purpose is not to completely confine the condyle which will restrict jaw movements, but rather to prevent recurrent dislocation and to provide free excursions of the mandible without fear of a dislocation. Even though there was a statistically significant reduction in MID post-operatively, this technique provided satisfactory mouth opening and a better standard of life for the patients with CRD, since the goal of treatment is not to increase the range of mandibular motion but provide satisfactory opening without the fear of further CRD. In addition, placing the bone graft between the green stick type fractured segments without using any fixation materials, provided a shorter operation and the same post-operative result as the technique described by *Norman and Bramley, 1990*.

Augmentation of the articular eminence involving zygomatic arch down-fracture and confining the condylar head by autogenous bone, was reported by *Deutrey, 1975*. The technique of down-fracturing of the zygomatic arch is now well known and widely used. Although this technique avoids the need for a separate procedure to harvest bone, it may be complicated by uncontrolled fracture of zygomatic arch with a resulting mobile fragment (*Whear et al., 1991*). Since the arch is lateral to the

main mass of the condyle, it is advisable to check by submento-vertical radiograph pre-operatively that the condylar head will be adequately controlled by this procedure (*Revington, 1986*). *Norman and Bramley, 1990* reported four failed cases (medial escape) in which a zygomatic down-fracture was carried out.

Eminectomy was recommended for the patients of advanced age and these with neurological disorders (*Goode et al., 1973; Courtemanche and Son-Hing, 1979; Helman et al., 1984; Gay-Escoda, 1987; Undt et al., 1997*). This technique was described first by Hilmar Myhraug in 1951. Most authors agree that the medial parts of the eminence have to be reduced in height. However, the degree of bone reduction is still a matter of controversy. While some authors *Goode et al., 1973; Courtemanche and Son-Hing, 1979; Gay-Escoda, 1987* recommend aggressive (total) removal of articular eminence and tubercle, the others, (*Hale, 1972; Cherry and Frew, 1977; Van Der Kwast, 1978*) recommend conservative in eminectomy. In the present study, eminectomy was preferred in the treatment of seven patients. Two of them had neurological disorders, two were old with severely resorbed alveolar crests and another three patients were suffering from pain and had received alloplastic eminoplasty previously.

Only one patient had unilateral treatment, which can provide benefit in limited number of cases. As in the patients presented, limited augmentation of the eminence will offer suffice to prevent undesirable movements of the condyle during mouth opening. Bilateral approach have been preferred in the treatment of the majority of the patients who have CRD. In young patients with several dislocations, eminoplasty provided satisfactory results in this study. Another reason for us to prefer eminoplasty for type I and II cases is that it is a reversible procedure. After all, the prognosis of eminectomy in young adults has not been studied in long-term. We believe that removing the top cortical layer of the articular eminence in this group of patients has a risk of further resorption. However, the opportunity of a second operation (eminectomy) for a potential recurrence was an advantage of the eminoplasty. Eminectomy was the right choice in the patients with systemic diseases, previous surgical interventions, and in old patients. This technique required less effort and had a shorter operation time when compared with the eminoplasty. After all, MID values were higher than these treated by eminoplasty. The reason for the difference was, the technical difference and the aim of the two methods; Incarceration or unlimited excursion of the condyle. Both techniques provided reasonable mouth opening and prevented CRD. None of the patients in group 1 or 2 needed additional treatment.

CONCLUSIONS

The studies conducted so far, in the treatment of chronic dislocation of the TMJ have reflected a variety of experiences with different techniques. Whether to confine or to provide free movements of the condylar head is still a debatable matter. Radiographs, detailed information about the cause, duration and type of dislocation, number of episodes, underlying illness, drug history, and treatments for previous episodes were all helpful to choose the best and the most appropriate technique for the treatment. One should keep in mind that thorough evaluation of each case and an appropriate surgical approach will provide the best results with individual cases.

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