A Novel Treatment of Recurrent Temporomandibular Joint Dislocation with Intermaxillary Fixation Using Microimplant: A Case Report

In-Kyung Kee*, Jin-Seok Byun*, Jae-Kap Choi

Department of Oral Medicine, School of Dentistry, Kyungpook National University, Daegu, Korea

Received October 8, 2014
Revised October 16, 2014
Accepted October 31, 2014

INTRODUCTION

Temporomandibular joint (TMJ) dislocation is characterized when the mandibular condyle moves far anteriorly during opening and passes the articular eminence easily. Subsequently the ligaments around the joint are often stretched by an intra-articular effusion, which induces various physical and social problems such as pain, closing limitation, difficulty in speech and chewing. According to Diagnostic Criteria for Temporomandibular Disorders 2014 guideline, if dislocated condyle was voluntarily reduced, it is called “subluxation,” and if not, the term “luxation” was used. In general, dislocation of TMJ clinically designated “luxation” of TMJ.

Macrotraumatic event by extensive mouth opening is regarded main cause of TMJ dislocation. The ligaments of injured joint lose its function as passive restrictors and the masticatory muscles lose coordination during mouth opening and closing. In addition, specific anatomic characteristics of TMJ such as steepness of the articular eminence and joint laxity may predispose a patient to TMJ dislocation. A TMJ articular eminence which showed “short steep posterior slope” and “long flat anterior slope” was generally regarded vulnerable to dislocation.

In treating recurrent TMJ dislocation, behavioral modification is the primary treatment option. However, if the patient’s hazardous habit could not be managed, additional methods should be considered to restrict mouth opening precisely. Although many treatment modalities have been suggested in the literature, only surgical alteration of TMJ called eminectomy or eminoplasty has been regarded as definitive in treating TMJ dislocation. No satisfactory...
nonsurgical or conservative methods for recurrent TMJ dislocation has been available so far. In this study, we present a novel conservative trials for the management of recurrent dislocation of the TMJ.

**CASE REPORT**

A 21-year-old military man was referred from Korean Armed Forces Capital Hospital to the Department of Oral Medicine, Kyungpook National University Hospital. He is complaining about recurrent TMJ dislocation and pain on left preauricular area. The symptoms are began 2 weeks ago immediately after a military assistant instructor forcefully push his fist into the patient’s mouth. He said TMJ dislocation occurred mainly during sleeping and yawning, and he could not fully open the mouth on daytime due to fear of TMJ dislocation.

On clinical examination, he showed 23 mm of maximum pain free mouth opening with “soft-end feel.” He reported palpational tenderness on the left preauricular area and also on the temporalis and the masseter. Panoramic radiograph showed steep slope of articular eminence without entire translational movement (Figs. 1, 2). Cone beam computed tomography of TMJ showed steep posterior slope of articular eminence (Fig. 3). TMJ magnetic resonance imaging showed normal engagement of articular disc and condyle on both TMJ during opening and closing (Fig. 4). Collectively, it seems that the recurrent TMJ dislocation was caused by excessive displacement of the mandible after forced mouth opening as well as anatomic predisposition.

For the initial treatment, we first tried to modify the patient’s behaviors. The patient was instructed not to open wide and restrict the condylar movement within a rotational movement. The appropriate range of mouth opening was guided by placing two fingers in vertical into the patient’s mouth. In addition, nonsteroidal anti-inflammatory drugs and physical therapies on both masticatory muscles and left TMJ were prescribed to reduce the pain. Two weeks later, even though he did his best not to open widely, TMJ dislocation still happened by unconscious yawning and during sleeping. Therefore, we had to consider another method.
achieve limitation of mouth opening, two elastic power chains (Energy Chain J-120; Rocky Mountain Morita Corp., Tokyo, Japan) were installed between were tied between ipsilateral upper 1st premolar and lower 2nd premolar (Fig. 5). Although, the elastic power chains were frequently detached, the total numbers of TMJ dislocation were decreased during first 2 weeks. However, the patient was complaining which would be effective in unconscious condition like sleeping and yawning.

We decided to perform the intermaxillary fixation which passively limits the condylar movement only to the rotation. Four metal buttons (lingual attachment, 601-05; Tomy Inc., Tokyo, Japan) were attached on buccal surface of both upper 1st premolars and lower 2nd premolars. To achieve limitation of mouth opening, two elastic power chains (Energy Chain J-120; Rocky Mountain Morita Corp., Tokyo, Japan) were installed between were tied between ipsilateral upper 1st premolar and lower 2nd premolar (Fig. 5). Although, the elastic power chains were frequently detached, the total numbers of TMJ dislocation were decreased during first 2 weeks. However, the patient was complaining
was installed for resilient intermaxillary fixation which is ranged 27 mm of maximum opening (Fig. 6). During the first week, the pain on left preauricular area was decreased and the patient did not experience dislocation of the jaw. Elastic power chain was changed daily and the patient was reassured behavioral modification and opening exercise to reinforce the TMJ ligaments and masticatory muscles. After 4 weeks of intermaxillary fixation, the patient reported TMJ dislocation twice a week and satisfied with the treatment outcome especially for the absence of previous tooth pain during the application of button-assisted intermaxillary fixation. The pain on left preauricular area was gradually decreased and maximum mouth opening without dislocation was increased at 33 mm. After 8 weeks of intermaxillary fixation, the patient reported the decreased occurrence of TMJ dislocation and comfortable maximum mouth opening was maintained at 33 mm. Although one of microimplant was detached during the treatment, there was no rebound of dislocation. Microimplant was finally removed after 8 weeks, and the patient was reassured to maintain behavioral modification and opening exercise. On 12 weeks

about dull pain on button-attached teeth and sensation of malocclusion. Accordingly, considering his anatomic characteristic of articular eminence, we recommended the eminectomy at this point. However, he refused eminectomy in fear of surgical treatment and possible complications of surgery.

Although the button-assisted intermaxillary fixation was effective in reducing TMJ dislocation, the patients was intolerated to the treatment due to tooth pain and discomfort of occlusion. Therefore we tried to change the method of anchorage from tooth itself to alveolar bone. We implanted two microimplants (AbsoAnchor BH1514-06; Dentos Inc., Daegu, Korea) on interdental gingiva between both upper 2nd premolars and 1st molars, and additional two microimplants (AbsoAnchor BH1413-06; Dentos) between both lower 2nd premolars and 1st molars. The patient was instructed about general precaution after implantation, and prescribed antibiotics, anti-inflammatory drugs. After 1 week, implantation site healed well and showed no signs of mobility or infection except mild gingival inflammation around microimplants. Elastic power chain (Energy Chain J-120)
joint laxity, ligaments act as passive restrainer which limit the excessive joint movement. Of the ligaments in TMJ, temporomandibular (TM) and stylomandibular ligaments are known to function as main restrictors against excessive opening of the condyle. TM ligament is consist of outer oblique and inner horizontal portion. Until the translation of the condyle is initiated, the outer oblique TM ligament keep the condyle not to open wide. Stylomandibular ligament is important in protrusive movement of mandible. Once the outer oblique TM ligament and stylomandibular ligament were excessively elongated by the accidental excessive mouth opening, mandibular condyle are more vulnerable to dislocate because ligamentous elongation was considered irreversible.

In general, cognitive-behavioral modification by patient education is considered to be the first and most important step in treating recurrent anterior dislocation of TMJ. The patient have to be educated the possible causes and pathophysiology of condylar dislocation with careful consideration of all habitual and anatomic factors based on anamnesis, clinical and radiographic examination. We explained that the previous accident and anatomic properties of the patient might be related with the onset and progress of TMJ dislocation. He was instructed to restrict mouth opening not to reach the critical point of dislocation, combined with physical therapies. However, the dislocation was mainly

**DISCUSSION**

Dislocation of TMJ is troublesome condition which was most commonly shown far anteriorly displaced mandibular condyle to the articular eminence, thereby make it impossible to close one’s mouth. It occurs in forms of “acute or chronic,” or “temporary or recurrent,” and is often referred to as “open lock” in clinically. Although the severity was different, most dentist would occasionally experience this condition with their patient during the practice, especially after prolonged mouth opening. Generally, any macrotraumas which induces extensive mouth opening such as yawning singing and singing are regarded as main cause of onset of TMJ dislocation. In addition, some researchers have proposed that certain anatomic features in the joint such as “steepness of the articular eminence” or “joint laxity” were closely linked with vulnerability of TMJ dislocation. In detail, articular eminence with “short and steep posterior slope” and “long and flat anterior slope” is tend to dislocate, and integrity of the ligaments, musculatures and bony structures are essential for the dynamic stability of TMJ.

According to diagnostic images, the patient in this case also showed typical trait of TMJ anatomy. In an aspect of joint laxity, ligaments act as passive restrainer which limit the excessive joint movement. Of the ligaments in TMJ, temporomandibular (TM) and stylomandibular ligaments are known to function as main restrictors against excessive opening of the condyle. TM ligament is consist of outer oblique and inner horizontal portion. Until the translation of the condyle is initiated, the outer oblique TM ligament keep the condyle not to open wide. Stylomandibular ligament is important in protrusive movement of mandible. Once the outer oblique TM ligament and stylomandibular ligament were excessively elongated by the accidental excessive mouth opening, mandibular condyle are more vulnerable to dislocate because ligamentous elongation was considered irreversible.

In general, cognitive-behavioral modification by patient education is considered to be the first and most important step in treating recurrent anterior dislocation of TMJ. The patient have to be educated the possible causes and pathophysiology of condylar dislocation with careful consideration of all habitual and anatomic factors based on anamnesis, clinical and radiographic examination. We explained that the previous accident and anatomic properties of the patient might be related with the onset and progress of TMJ dislocation. He was instructed to restrict mouth opening not to reach the critical point of dislocation, combined with physical therapies. However, the dislocation was mainly
occurred during sleeping and yawning which was not under his voluntary control. Moreover, he was getting nervous and afraid about aggravation of the symptoms, thereby we tried to consider more active treatment modalities.

If it is clear that recurrent or chronic TMJ dislocation is mainly due to an anatomical feature of articular eminence, the treatment strategies should be focused on therapeutic alteration of anatomic structure using eminectomy or eminoplasty. Many studies reported that eminectomy of TMJ might be a satisfactory and effective treatment for managing the recurrent dislocation in patient with the apparent anatomic causes. In our patient, the morphology of articular eminence which showed “short steep posterior slope” and “long flat anterior slope,” is probably indicating disadvantage to dislocation. Therefore, we considered TMJ eminectomy as one of applicable treatment modalities. However, our patient refused the surgery in fear of surgery and associated complications.

We next tried to restrict the opening within an appropriate range which could prevent the jaw from dislocation. Intermaxillary fixation may be used alone or in combination of other treatments in order to immobilize the TMJ. Resilient intermaxillary fixation with the maximum rotational movement of 27 mm was performed using metal buttons and elastic power chains. The method was immediately effective in reducing the frequency of dislocation during sleeping and yawning. However as the patient uses the device longer, he began to complain with the pain on button-attached teeth and malocclusion. That is because extrusive forces during the opening were directly transferred to the supporting teeth through elastic chain. Consequentially, the patient was intolerant of button-assisted intermaxillary fixation method.

Microimplant (mini implant) has been widely used in orthodontic treatment for tooth movement. Microimplant is implanted on interdental periodontium and removed after the proper tooth movement was accomplished. Microimplant has many advantages in oral cavity: 1) easy to implant and remove, 2) no effects on tooth itself, and 3) less irritation to movable soft tissue. In the present case, it was already confirmed that intermaxillary fixation itself was effective in reducing the patient symptoms. Therefore we just modified the technic to get anchorage of the elastics. We change the structure of getting anchorage of intermaxillary fixation from teeth itself to alveolar bone. Compare with previous button-assisted method, novel microimplant-assisted method have several advantages as follows. First, microimplant inserted in periodontium was free of tooth-related symptoms. Second, because microimplant was placed near the root apex in vertical dimension, it induces less irritation to the movable soft tissue. Third, because microimplant could be placed more posteriorly than the button, it has advantage of aesthetic aspect. Last, microimplant could be used in edentulous patient. Only one problem using microimplant in the present case was spontaneous detachment of microimplant before the end of treatment.

The mechanism of intermaxillary fixation on recurrent TMJ dislocation was generally understood by myostatic contracture of elevator muscle at the point of dislocation. We maintained microimplant-assisted intermaxillary fixation for 8 weeks with the range of mouth opening at 33 mm because it was enough to get myostatic contracture to prevent dislocation. In fact, after the removal of microimplant, the patient showed similar frequency of TMJ dislocation in our case (Fig. 7). The unloading time after implantation is also considered. Actually, because microimplant might not be integrated to the bone, there is no need to be waiting in orthodontics. However, in this case, we allowed

Fig. 7. Change of comfortable mouth opening range after microimplant-assisted intermaxillary fixation. (A) One week after microimplant. (B) Four weeks after microimplant. (C) Eight weeks after microimplant. (D) Four weeks after removal of microimplant.
1 week of loading free due to difference of forces.

Though recurrent TMJ dislocation is remaining troublesome problem to the dentist, there has been no definitive treatment except extensive surgical interventions including eminectomy or eminoplasty when conservative treatments failed to manage the recurrence of TMJ dislocation. However, considering that most patient would not easily accepted the surgery, less invasive treatment modalities was required in many cases. Our case report showed that a 21-year-old male patient with recurrent TMJ anterior dislocation which developed after accidental excessive mouth opening was successfully treated with intermaxillary fixation using microimplant. Through this case report, we suggest that microimplant-assisted intermaxillary fixation could be a novel treatment option for recurrent TMJ anterior dislocation.

**CONFLICT OF INTEREST**

No potential conflict of interest relevant to this article was reported.

**REFERENCES**


