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The effect of mandibular advancement on signs and symptoms of the temporomandibular joint

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ABSTRACT

Statement of Problem: TMJ disorder is counted as one of the most problem in dentistry treatment with high prevalence. This disorder causes to pain. Since all of the structural defects do not lead to pain, therefore in differential diagnosis of TMD, the signs and symptoms should be considered.

Purpose: The purpose of this study is to inspect the effect of mandibular advancement on signs and symptoms of the temporomandibular joint disorders (TMDs). Because of various etiologies of TMJ disorder, the researchers have not reached to agreement yet about the effect of orthognathic surgery on TMJ.

Materials and Methods: A prospective descriptive trail of 81 patients with the range age between 19 and 31 years old with skeletal Cl II malocclusion that undergoes orthognathic surgery is carried out. For this purpose, the numbers of the male and female were considered to be 26 (32.1%) and 55 (67.9%). The most common features of TMDs are including pain, limitation of mandibular movement and joint sound which are assessed at three times pre surgery, three and six months post surgery.

Result: The incidence of TMDs at these three times is statistically analyzed by McNemar test. It is noteworthy that 11.1 % of the patients had TMJ pain pre surgery which changed to 2.5 % in duration of three months and 7.4 % after six months post surgery. The obtained results show that incidence of TMJ pain is greatly reduced at three months post surgery in comparison with pre surgery results (p=0.02). In addition, the average of maximum mouth opening is reported as 47.6, 32.4 and 40.1 (mm) before surgery, three and six months afterwards (significant difference). Click disorder is reported 34.6% before surgery and 12.3% three months and 23.5% six months after surgery which demonstrates the remarkable reduction at time of three months later (p=0.0001) and six months after (p=0.004) in comparison with pre surgery.

Conclusion: This study is also illustrated that although orthognathic surgery has no significantly effect on the limitation of maximum mouth opening, it causes to improve the TMJ pain and temporomandibular click of patients with skeletal Cl II malocclusion.

Keywords: Temporomandibular disorders; Mandibular advancement; Pain; Click.

Introduction

TMJ disorder is counted as one of the most problem in dentistry treatment which the prevalence of TMD in the general population is high between 40 to 60 percent [1,2]. TMD is composed of a set of disorder including deformity, disease and misalignment of TMJ.

Furthermore, this disorder causes to pain so that it is common symptom of structural defects. Since all of the structural defects do not lead to pain, therefore in differential diagnosis of TMD, the signs and symptoms should be considered. Because of various etiologies of TMJ disorder, the researchers have not reached to agreement yet about the effect of orthognathic surgery on TMJ. Emotional stress and pathologic occlusion are the most important factors in progress of the TMJ dysfunction. Stress causes occlusal dysfunction which can traumatize and threat the psychological equilibrium of the patient. Occlusal disturbance may lead to pressure and tension on masticatory muscles which cause TMJ dysfunction and painful spasm. Masticatory system disorder is subset of orofacial pain. Pain associated of TMJ disorder has frequently muscular origin. The sources of non-dental pains are TMJ structure, muscle, neuropathy, vascular inflammation, types of headache, sleep disorder, systemic disorder and psycho immune [3]. The literature clearly shows that there is no agreement about the effect of orthognathic surgery on TMJ. Herewith, this paper is presented on signs and symptoms of TMJ in patients under orthognathic surgery in three times including before, three and six months after surgery.

Materials and Methods

At the beginning of this section, it is essential to note that this research has been approved by Tehran Dentistry University institutional board review and ethical committee. In this prospective descriptive trail, 81 skeletal Cl II malocclusion patients with the range age of patients of 19-31 were operated between October 2013 and November 2017. Moreover, the considered numbers of the male and female were 26 (32.1%) and 55 (67.9%), respectively. These patients had no systemic problems. They were evaluated in three aspects including TMJ pain, click sound and maximum mouth opening. The criteria of patient selection were CI II malocclusion skeletal without anterior open bite, with natural dentition without trauma and excluded syndromic and cleft patients. The assessment techniques of click were the questionnaires and clinical history examination, palpation, stethoscopic auscultation. The normal mandibular range of motion is generally accepted as 40 to 55 (mm) [4]. The assessment of TMJ pain was based on VAS (Visual Analogue Scale), comprehensive history, clinical examination and screening questionnaire according to those described in [4].

The patients underwent TMJ clinical examinations before the surgery, three and six months after the bilateral sagittal split osteotomy technique (BSSO as described by Epker) for mandibular advancement(mean advancement between 3 and 10 (mm) between October 2013 and November 2017. It is noteworthy that all of surgeries were performed by one surgeon and all mandibular osteotomies were stabilized by one microplate at each side. Cephalometric radiographs were completed and repeated a few weeks before surgery and three and six months post surgery. Involvement of the masticatory muscles, temporomandibular joint and their structures were considered as the presence of TMD. The incidence of TMD before and after surgery time intervals was statistically analyzed by McNemar test.

Results

As shown in Table 1, before the surgery, 11.1% patients experienced TMD pain which decreased to 2.5% at three months post surgery and 7.4% at six months, afterwards. However, incidence of TMJ pain significantly reduced at three months post surgery in comparison with pre surgery results ($p=0.02$). Furthermore, the results showed that the click exists in 34.6%, 12.3% and 23.5% of patients before and two times after surgery. Besides, a significant reduction was occurred at three months ($p=0.0001$), and six months post surgery ($p=0.004$) in comparison with pre surgery results. Moreover, the means maximum mouth opening were 47.6 (mm), 32.4 (mm) and 40.1 (mm) before the surgery and three and six months post surgery ($p=0.0001$). TMJ click, maximum mouth opening and pain were lower than pre surgery findings.

TMJ disorder and their positions		Before Surgery		After three Months		After six Months	
		Number	%	Number	%	Number	%
Pain side	Right	6	7.4	7	8.6	7	8.6
	Left	8	9.9	7	8.6	8	9.9
	Both	19	23.5	20	24.7	23	28.4
TMJ pain		9	11.1	2	2.5	6	7.4
Clicking	Yes	28	34.6	10	12.3	19	23.5
	No	53	65.4	71	87.7	62	76.5
Clicking side	Right	7	8.6	3	3.7	7	8.6
	Left	10	12.3	3	3.7	6	7.4
	Both	11	13.6	4	4.9	8	9.9
Mouth opening limitation	Yes	23	28.4	52	64.2	39	48.1
	No	58	71.6	29	35.8	42	51.9

Table 1. Frequency of TMD in patients before and after surgery.

Discussion

The objective of mandibular advancement is the correction of face disorder, dental malocclusion and return of orofacial normal function. Herewith, there is disagreement about whether mandibular advancement causes reduction of TMJ symptoms or it makes negative effect on TMJ. Dujoncquoy et al. [5] presented and evaluated changes of TMD before and after orthosurgery and the risk of creating new TMJ symptoms on asymptomatic patients. Furthermore, the achieved results illustrate high prevalence of TMD in dysgnathia cases and orthognathic surgery reduces pain and improves TMJ dysfunction in patients with preoperative TMD. Therefore, the difference between the present results and those offered by Dujoncquoy et al implies type of skeletal discrepancy. In fact, in recent study, the Cl II and Cl III malocclusion were evaluated. In another work presented by Fang et al. [6], the position changes of the condyle disc in sagittal split ramus osteotomy following mandible prognathism correction were discussed and no meaningful difference in view of maximum mouth opening after and before treatment was obtained which is in contrast with the present result. Abrahamasson et al. [7] compared the frequency of temporomandibular disorders in orthognathic patient with control group and presented more prevalence of TMJ pain.

In the following, in longitudinally assessment, the effects of the orthognathic surgery on TMD signs, symptoms and the pain threshold of the jaw muscles were offered by Farella et al. [8] which the same results were observed. Wolford et al. [9] inspected the effect of the orthognathic surgery treatment on patients with internal disorder of TMJ before treatment. They confirmed that pre surgery 36% of the patients had TMJ pain, and post surgery, 84% had pain. Meanwhile, the recent study present the prevalence of TMJ pain reduces three and six months post surgery. Then, some researchers including Dervis and Tuncer [10] compared the changes of the temporomandibular disorder symptoms in orthognathic patients with healthy ones. A statistically significant reduction was noted for the TMD symptoms and signs two years after surgery with respect to pre surgery. It is noteworthy that the similar outcomes were observed in frequency of click disorder and TMJ pain. Westmark et al. [11] evaluated the TMD results of the 1516 patients before and after orthognathic surgery treatment. They followed up patient in duration of two years. Preoperatively 43% and postoperatively 28% of the patients reported subjective symptoms of TMD. These results demonstrate overall positive effect of orthognathic surgery on TMD signs and symptoms. Orthognathic surgery was more effective in patients with mandibular prognathia than mandibular retrognathia. There were some differences in following up time.

The effects of the orthognathic surgery treatment on TMJ disorders were presented by Panula et al. [12]. It is concluded that functional status can be noticeably improved and pain levels reduced with orthognathic surgery. The risk for new TMD is extremely little. Finally, the same results were clarified with those of Panula's study. Gaggl et al. [13] reported the evaluation results of the TMJ before and after orthognathic surgery. To achieve this end, the MRI and the clinical re-

port of the TMD disorder before and six months after surgery was determined. Note that all of the patients had skeletal CI II malocclusion. Operation resulted in a mean reduction of maximal incisor distance of 12 (mm) which lead to similar result in two studies. Furthermore, another work of Egermark et al. [14] is presented in which frequency of the TMJ disorders in patients under simultaneous treatment including orthognathic surgery and orthodontic are checked. Yamada et al. [15] proposed in cross-sectional analysis, the condyle bone changes, disc displacement and TMJ disorder symptoms in orthognathic patients. Aoyama et al. [16] stated the TMD frequency before and after bilateral sagittal split ramous osteotomy treatment. In this work also the predicting factors related to TMD symptoms after treatment were clarified. Consequently, the radiographically and clinical criterion examination was considered by Lee et al. [17] to obtain the articular disk position and TMD signs and symptoms Cl III skeletal malocclusion after mandibular set back. Riyami et al. [18] assessed the percentage of the orthognathic patients with TMD. As another consequence, the effects of the orthognathic surgery on situation of temporomandibular joint were presented before and after surgery using Magnetic Resonance Imaging (MRI). Finally, it was cleared that the orthognathic surgery is not effective on TMJ position. Pain decreased after surgery and varied result for joint sounds. The percentage of patients with clicking had a tendency to decrease post surgery, but improvements in crepitus were questionable. In Kalha's study [19], the effects of the orthognathic surgery treatment in TMJ disorders were offered in systematic review. Most reported studies are shown a decrease in TMD signs and symptoms after orthognathic surgery in skeletal Class II patients.

Abrahamasson et al. [20] determined the rate changes of TMD after correction of dantofacial deformity by combined orthodontics-surgical treatment. In this work also the frequency of the TMD in patients with dantofacial deformity according to the same age and sex was compared. The obtained results demonstrated orthodontics treatment along with orthosurgery has a positive effect on TMD pains. Next, Scolozzi et al. [21] reported the diagnostic value of the various clinical parameters for TMD in patients undergoing combined orthodontic-surgical treatment. The parameters in patients under orthognathic surgery including TMJ clicking, TMJ pain on palpation, bimax surgery, maxillary set back, mandibular advancement and pain on palpation of mastication muscle were recognized for high predicting TMD. Recently, Han et al. [22] presented the changes of the condyle position after orthognathic surgery. In this work also the relation between these variations and TMJ signs and symptoms were determined. The inspection of the retrospective cohort shows that the patients who have mandible prognathism as a candidate for orthognathic surgery are selected in the first step. Consequently, the linear and angular Changes related to condyle position are measured beforeand six months after the surgery by super positioning the three dimensional (3D) tomography. Besides, the obtained results demonstrate that the best parameter for predicting the TMJ signs and symptoms after treatment is first position of condyle. Moreover, it is clear that the linear and angular displacements related to condyle do not have the effective influence on pain after treatment due to fewer of 4 degree angular displacement and fewer of 1 (mm) linear displacement of condyle.

Conclusion

Orthognathic surgery has limited effect to improve signs and symptoms of TMJ in skeletal Cl II malocclusion patients and in most cases; it caused TMD to be deteriorated. Therefore, if the main complaint of the patient with the jaw mal-alignment is the TMJ signs and symptoms, there is no guarantee that the orthognathic surgery improves these signs and symptoms and these disorders must be separately assessed and treated.

Conflict of interest

There is no conflict of interest to declare.

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