Clinical management of temporomandibular disorders: controlling bruxism and temporomandibular joint load

Penanganan klinis gangguan temporomandibula: pengendalian bruksisma dan beban sendi temporomandibula

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ABSTRAK

Langkah pertama penatalaksanaan klinis dari gangguan temporomandibula (GTM) adalah membedakan sumber masalah, mengklasifikasi menjadi masalah dari otot atau sendi, yang telah dipahami menjadi proses yang penting. Meskipun mekanisme yang tepat untuk gejala atau patologi kondisi tersebut sampai saat ini belum diklarifikasi, parafungsi atau hiperfungsi otot telah disadari memainkan peranan penting dalam etiologi GTM. Pembebanan mekanis yang berlebih ke sendi temporomandibula (STM) telah dilaporkan menjadi salah satu faktor yang mungkin menyebabkan perkembangan osteoarthritis. Gaya-gaya ini dapat dikenakan melalui parafungsi mandibula seperti bruksisma saat tidur atau kebiasaan mengkertakkan gigi. Untuk kontrol klinis dari bruksisma saat tidur, telah dikembangkan sebuah piranti palatal yang tebal yang menutupi palatum dan tidak menutupi permukaan oklusal. Dalam kajian pustaka ini juga telah dibahas mengenai implikasi klinis dari hubungan antara oklusi, mastikasi dan bruksisma.

Kata kunci: oklusi, balancing side, mediotrusif, TMJ, epidemiologi

ABSTRACT

The first step of clinical management of the temporomandibular disorders (TMD) is to distinguish the origin of problem, to classify into myogeneous and joint problems, which have been regarded to be an important process. Although the precise mechanisms for the symptoms or pathology of these conditions have not yet been clarified, muscular parafunction or hyperfunction has been regarded to play an important role in the etiology of TMD. Excess mechanical loading to the temporomandibular joint (TMJ) has been reported to be one of the possible causes for the development of osteoarthritis. These forces might be exerted through mandibular parafunctions like sleep bruxism or tooth contacting habit. For clinical control of sleep bruxism, a thick palatal appliance which fills the palate and does not cover the occlusal surface have been developed. In this review article, clinical implication of the relationship between occlusion, mastication and bruxism have also been discussed.

Key words: occlusion, balancing-side, mediotrusive, TMJ, epidemiology

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INTRODUCTION

The first step of clinical management of the temporomandibular disorders (TMD), is to distinguish the origin of the problem, classify into myogeneous and joint problems, which has been regarded to be an important process. Although precise mechanisms for the symptoms or pathology of these conditions have not yet been clarified, muscular parafunction or hyperfunction has been regarded to play an important role in the etiology of TMD.

On the other hand, occlusion has been a

controversial issue especially in relation to TMD. Many opinions have been presented in the literature during the past century especially regarding several points of view: i.e. 1) occlusion as an aggravating factor of mandibular parafunction, 2) occlusion as a controlling factor of mechanical stress distribution, and 3) others.

Excess mechanical loading to the temporomandibular joint (TMJ) has been reported to be one of the possible causes for the development of osteoarthritis.¹⁻² These forces might be exerted through mandibular

Fig.1. Thick palatal appliance.³ **A.** Occlusal view of a thick palatal appliance in position. The appliance does not cover occlusal surfaces. **B.** Median sagittal section of a thick palatal appliance. The appliance fills the palatal cavity.

parafunctions like sleep bruxism or tooth contacting habit. This review article focuses on the clinical management of TMD and its consequence is mainly from our research results.

LITERATURE REVIEW

Controlling sleep bruxism

For the clinical control of sleep bruxism, a thick palatal appliance was developed.³ The appliance fills the palate and does not cover the occlusal surface, thus would not alter the occlusal condition as shown in Fig.1. This has long been the first choice modality in TMD clinic at the Okayama University Hospital. A clinical study revealed significant effect of pain alleviation on myogenous TMD patient as shown in Fig.2.³ This clinical effect could be expected especially at the first phase of the treatment. Hasegawa et al.,⁴ made EMG study on the effect of different design

of palatal appliance, which were horseshoe type appliance (HS), thin appliance (TN), thick appliance (TK) and medium thick appliance (Med), on sleep bruxism and reported that TK was most effective in these designs as shown in Fig.3. Even when treatment target were TMJ and not masticatory muscles, it would be appropriate to use this appliance as a first choice modality, as the origin of the force exerted to TMJ would be generated by the masticatory muscle activities.

DISCUSSION

Classification of balancing-side occlusion and related epidemiological survey

When focused on the occlusion as a controlling factor of the mechanical stress exerted to masticatory system, balancing-side occlusion would be playing an important role. In historical studies of balancing-side occlusion, it has been

Fig.2. Pain alleviation rate at the end of treatment.³ Note that statistical differences were observed between the no treatment and the thick palatal appliance groups ($p < 0.05$) and between the thick palatal appliance group and the medication group ($p < 0.05$).

Fig.3. Effect of design of palatal splint.⁴ B: baseline; HS: horseshoe type appliance; TN: thin appliance; TK: thick appliance; Med: medium thick appliance. *Significant difference when compared to the baseline condition. ($p < 0.05$).

reported that classification of the balancing-side occlusion might have been incomplete thus resulting in the conflict of their effect.⁵⁻⁶ An investigation employing a classification of balancing-side occlusion was achieved.¹ The classification incorporated the concept of functional force exerted to masticatory system. Balancing-side occlusal contact patterns observed during mandibular lateral excursive movements were classified into the following four groups.

First, simultaneous balancing-side and working-side contact (without clenching). This was defined as the presence of balancing-side molar contact that occurred simultaneously with occlusal contact on the working (contralateral) side during a lateral excursive jaw movement. This movement was performed without any clenching force. Second, balancing-side protective contact (with clenching only). This was defined as the presence of balancing-side molar contact (mandibular first and/or second molar) in a lateral excursive position that existed only when moderate clenching force was exerted. During clenching, the mandible was in the canine edge-to-edge position. Then, no balancing-side contact (with or without clenching). This was defined as the absence of any balancing-side tooth contact during either a lateral excursive movement (without clenching) or in a canine edge-to edge position (with moderate clenching). The last, exclusive balancing-side contact (no working-side contact). This was defined as the presence of balancing-side molar contact without any occlusal contact on the working (contralateral) side during a lateral excursive jaw movement. This movement was performed without any clenching force.

Epidemiologic survey using 430 subjects was achieved according to the classification. The number and percent of balancing-side contact patterns per side and per age were analyzed and the prevalences of TMJ sounds (per side) in three of the balancing-side contact groups (except for exclusive balancing-side contact group, as the number of the subjects is not enough) are shown in Fig. 4. Temporomandibular joint with ipsilateral balancing-side protective contact showed low prevalence of TMJ noise and showed no positive relationship. On the contrary, linear correlation between TMJ noise and the age was observed in TMJ with no balancing-side contact ($p < 0.001$). TMJ with simultaneous balancing-side contact

showed higher noise prevalence especially in young age, showing slight negative correlation with age. From these results, the clenching-induced balancing side contact was suggested to play a protective role for ipsilateral TMJ components.

Fig.4. Prevalence of TMJ sounds in three balancing-side occlusal contact groups.¹

Following the above described results, magnetic resonance imaging (MRI) analysis on the relationship between anterior disc displacement (ADD) of TMJ and balancing-side occlusal contact was achieved.⁸⁻⁹ One hundred and four patients who visited Okayama University Dental School Hospital seeking treatment for TMJ problems were selected for this trial. The diagnosis for the patients included myofascial pain dysfunction syndrome (MPD), internal derangement of the TMJ and osteoarthritis of TMJ but did not include growth abnormalities, traumatic joint diseases or neuralgias. Of 208 joints 70 were excluded from further examination as the disc position could not be clearly identified by the MRI. Occlusal examination of 138 sides, 52 sides showed simultaneous balancing-side contact, 7 sides showed balancing-side contact with clenching only and 79 sides showed no balancing-side contact with or without clenching. Articular disc displacement could be observed for 101 sides of 138 joints, and articular disc position of 37 sides of the joints were regarded to be normal. As shown in Fig.5, high prevalence of simultaneous balancing-side contact was observed in disc displacement group. The prevalence pattern of the three occlusions was significantly different between the disc displacement group and non disc displacement group ($p < 0.05$). Moreover, the comparison of these data with our previous

Fig.5. Prevalence of balancing-side occlusion in articular disc displacement group and non-displacement group.⁹ Note the significant difference of the distribution pattern ($p<0.05$).

Fig.6. Prevalence of balancing-side occlusion in dental school student and TMD group.⁹ Note the significant difference of the distribution pattern ($p<0.0001$).

study^{1,12} using 860 subjects research on balancing-side occlusion revealed that the prevalence of simultaneous balancing-side occlusal contact was significantly higher and the prevalence of balancing-side protective contact was significantly lower in patient group ($p<0.0001$) (Fig. 6).

From the results of this study, it was suggested that the high prevalence of simultaneous balancing-side occlusal contact in patient group was mainly caused by the disc displacement of the TMJ side, where no balancing-side occlusal contact could have been observed until the disc displaced. The importance of the balancing-side in articular disc displacement might be indirectly supported by the mandibular movement utilized in the manipulation

Clinical implication of the relationship between occlusion mastication and bruxism

Our recent study¹¹ on the preference of chewing side (PCS) revealed that in asymptomatic subjects with ADD, a significant predominance of the PCS on the ipsilateral side of ADD was observed during the mastication of hard food, and no correlation was found between unilateral ADD and PCS for the soft food. This suggests that daily mandibular function might be regulated by unconscious pain or uncomfortableness of TMJ caused by ADD. As mentioned above, ADD itself would be related to some specific condition of occlusion.

CONCLUSION

Epidemiological and experimental data listed above suggest the importance of occlusion as a mechanical stress distributing factor. Considering clinical settings, the role of occlusion might be negligible only when the total force amount, which would be generated by masticatory muscles during functional and parafunctional activities, were small. However, when mandibular parafunctional activity is high, resulting in certain amount of mechanical loading to stomatognathic system, occlusion would play an important role especially in distributing the resultant force.

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