

Title	Evaluation of Disk and Condylar Movement with Soft Occlusal Appliance
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論文内容の要旨

Background and objectives

Soft occlusal appliances (SOAs) are widely used in dentistry not only for therapeutic means of temporomandibular joint (TMJ) dysfunction but also the protection against injuries in sports activities. Such SOAs have indeed reduced the incidence of injuries in the oral and maxillofacial region, so it is mandatory for athletes in some contact sports to wear SOAs.

It was reported that individual cushioning effects are directly correlated to the thickness, while the force distribution is determined by the rigidity of the SOA. However, there is no consensus about the appropriate thickness and material for the SOA. And it has been reported that prolonged mounting of the SOA may harm the TMJ disk. Moreover, especially in patients with the internal derangement of the TMJ, the SOA mounting could get worse the disk condition. But the significance of the position of the condyle in fossa is a controversial subject. And there is no report on the evaluation of the relationship between condylar position and disk displacement with SOA mounting.

MRI has been recently accepted as the first choice for diagnosis of the TMJ because of its many advantages, such as no ionizing radiation, optional tomographic plane and good soft tissue contrast. Spatial resolution has now been improved, and the digital subtraction method has been found very useful in comparing two different statuses.

The aim of this study is to use MRI and the digital subtraction method to evaluate whether TMJ are affected or not by SOA mounting, and to evaluate whether clenching with resilient SOAs affects TMJ or not, with the goal being to decide what is the appropriate SOA.

Subjects and methods

Eleven symptomless volunteers after giving informed consent participated in this study. Two types of SOAs were made of resilient thermoplastic material, one raised to a vertical height of 3 mm, within the freeway space at the incisor (SOA1), while the other was raised to 6 mm (SOA2). All participants underwent MRI

examinations of their TMJs with a 1.5-TMR scanner in the centric occlusion, the SOA mounting, and clenching with the SOA mounting. The imaging sequences were three-dimensional fast gradient echo T1 weighted and two-dimensional fast spin echo proton density weighted imaging. All data were transferred to a personal computer to analyze disk and condyle movement digitally. To detect minute changes in movement, the digital subtraction method was used on the SPM software. On the subtracted images, the disk and condylar movement was measured horizontally and vertically, and the condylar movement was classified into two groups, such as rotation and translatory movement.

Results

Although all condyle moved slightly downward, the disk did not move with SOA1 mounting. With SOA2 mounting, however, the condyle moved downward and disk also moved forward statistically.

Seven of the 22 condyles showed anterior disk displacement (ADD) in the centric occlusion. All condyles in the ADD group seemed to have moved downward and forward to a greater extent than those in the normal group, but without any statistically significant difference in the degree of movement. However, disks in the ADD group were pushed forward more than that in the normal group, a tendency that was stronger in the SOA2 mounting MRIs.

All joint showed rotational movement on SOA1 mounting. On the contrary on SOA2 mounting, 10 joints (67%) of all the normal joints showed rotational movement, and 4 joints (57%) of all the ADD joints showed rotational and translatory movement.

All condyles in the ADD group seemed to have moved upward and backward on clenching with SOAs more than those in the normal group, but without any statistically significant differences. Disks in the ADD group moved backward more than that in the normal group, a tendency that was strongest in the SOA2 clenching MRIs. The ADD cases group on clenching the SOA2 disk showed remarkable horizontal movement.

Conclusion

These results suggest that SOAs within the freeway space may not affect the normal condyle-disk relationship, while thickness may have an affect on the relationship in ADD cases. And it was found that clenching with SOAs within the freeway space did not affect the normal condyle-disk relationship, however, SOA thickness (as with SOA2) may have an affect on that relationship in ADD cases. Before mounting a thick SOA, we recommend that MRI be used to gain an understanding and diagnosis of the condyle-disk relationship. And in case the ADD is found, thick SOA mounting is not recommended.

論文審査の結果の要旨

本研究はマウスガード装着による咬合挙上顎関節に与える影響についてMRI像を用いて明らかにしたものである。その結果、挙上量が安静空隙内にとどまる場合にはその影響が少ないことが示された。本論文は同様な装置の設計を考慮する上で貴重な資料を与えるものであり、博士（歯学）の学位論文に十分に値するものと認める。