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Research Article

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Some Ear Symptoms and Malocclusion

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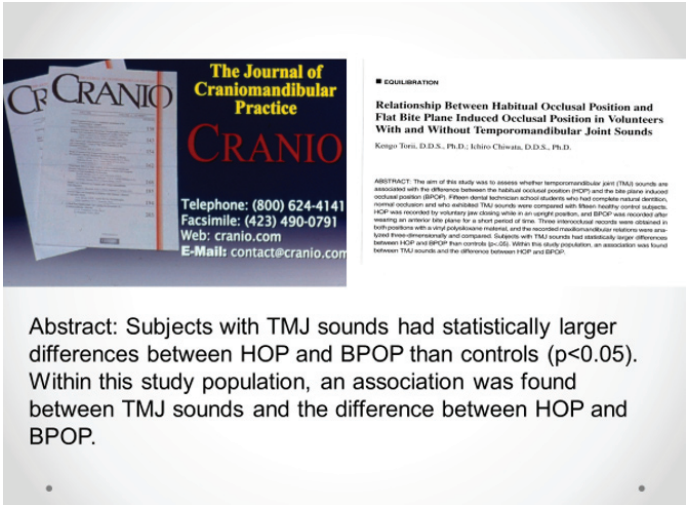
Abstract

Unilateral tinnitus, vertigo and sensory neural hearing loss attributed to malocclusion have been reported. The background of these reports was explained and a physiological occlusal analysis and occlusal equilibration were described. The occlusal discrepancy between the habitual occlusal position and the muscular position caused unilateral tinnitus, vertigo, sensory neural hearing loss and ear fullness. It is important to maintain the occlusal stability in the muscular position.

Key words: *Tinnitus; Vertigo; Sensory neural hearing loss; Ear fullness; Habitual occlusal position; Muscular position; Occlusal discrepancy*

In 1964, Dr. Myrhaug who was in otorhinolaryngology reported the relationship between some ear symptoms and malocclusion [1]. He described that approximately one in four patients with subjective disorders resulting from bite anomalies had disturbances of balance and hearing. A typical representative of this group is a woman who was incapacitated by vertigo for nine years. After restoration of the bite, she was never troubled. However, Dr. Myrhaug didn't describe the detail of bite anomalies, because he wasn't a dentist, but a medical. In 1959, Brill et al. postulated that the coincidence of the muscular and tooth position (intercuspal) constitutes a physiological condition, whereas the lack of a coincidence of these two positions may be indicative of a pathological condition [2].



We reported that there was a strong relation between the discrepancy of habitual occlusal position and the muscular position, and temporomandibular sounds [3].

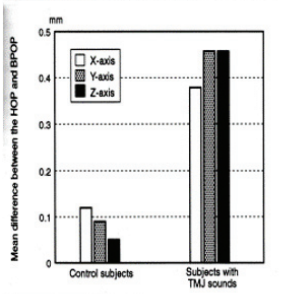


Table 1
Statistical Differences Between HOP-BPOP and TMJ Sounds

Statistical difference between HOP and BPOP	Subjects w/TMJ sounds	Control subjects
No difference	1	13
Difference	14	2

HOP: habitual occlusal position
BPOP: bite plane induced occlusal position
(The relationship between the statistical difference of HOP-BPOP and TMJ sounds was significant (p=0.000007, using Fisher's exact test.)

There was a strong relation between the discrepancy of HOP-BPOP and TMJ sounds.

The existence of occlusal discrepancy between HOP and BPOP means that the mandible shifts from its correct position (muscular position) to a deflected position (habitual occlusal position). This displacement seems to have the normal relationship between the disc and the condyle distorted in the TMJ, since the correct relationship between the disc and the condyle is thought to be fundamentally established during the function of the masticatory muscles before tooth eruption. TMJ clicking and TMJ arthralgia are thought to be caused with these distorted relationship between the disc and the condyle.

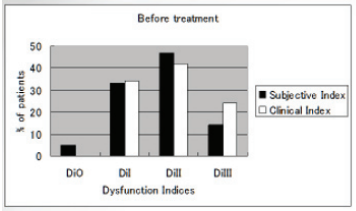
On the other hand, the existence of an occlusal discrepancy between the HOP and the BPOP means that as the mandible voluntarily closes, the elevator muscles require additional activity to adapt the mandible from the BPOP to the HOP as multiple teeth come in contact with a stable position. This condition may cause muscle tension, muscle fatigue and muscle spasm, resulting in muscle pain. Therefore, at present, the only evidence-based causal treatment of TMD is the occlusal equilibration, in which the habitual occlusal position (HOP) is aligned with the muscular position (BPOP).

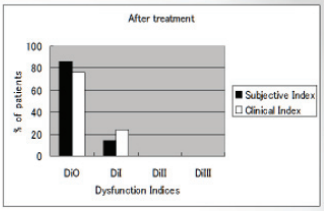
We also reported that the occlusal equilibration as a reference position using the bite plate-induced occlusal position was very effective on temporomandibular disorders (TMDs) [4].

Occlusal adjustment using the bite plate-induced occlusal position as a reference position for TMDs: a pilot study

The patient wears an anterior bite plate in 5 min. After that, the patient closes the jaw. This is the bite plate-induced occlusal position. The occlusal equilibration is performed in this position.

The following graphs show our results.





Dysfunction Index at first examination. evaluation.
Distribution of dysfunction indices before occlusal adjustment. DiO: no TMD; DiI: mild TMD; DiII: moderate TMD; DiIII: severe TMD.

Dysfunction Index at 1-year
Distribution of dysfunction indices occlusal adjustment. DiO: no TMD; DiI: mild TMD; DiII: moderate TMD; DiIII: severe TMD.

These graphs show the outcome of treatment using occlusal adjustment for 21 TMD patients (Torii & Chiwata, 2010).

We call this occlusal adjustment as "Occlusal position correcting therapy". Occlusal position correcting therapy entails making the habitual occlusal position (HOP) consistent with the muscular position (MP). However, since the MP is very unstable in the mouth,

occlusal analysis and equilibration in the MP should be performed on models mounted on an articulator with BPOP wax record, which represents the MP.

Occlusal equilibration is performed on the articulator and then in the mouth referring to the ground spots on the models.

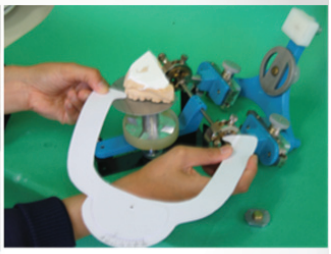
The patient wears an anterior bite plate for 5 min.

The bite plate induced occlusal position (BPOP) wax records are taken using a bite wafer with the anterior portion cut off (Kerr' s).

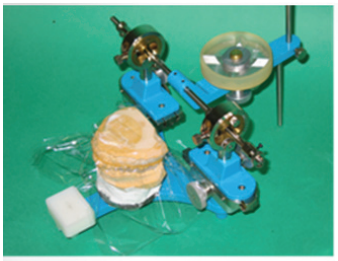
The intercondylar distance of the patient is measured using a caliper.

The intercondylar distance of an articulator is adjusted to the same value as that of the patient.

The distance between the condylar point and the lower incisal point is measured using a caliper.



The incisal point of the lower model is positioned in the same position as that of the patient. The lower model is then attached to the lower member with some plaster.

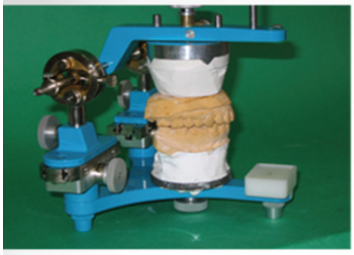


The upper model is positioned on the lower model with the BPOP (muscular position) wax record and the basal surface of the upper model is wrapped with a film. Some plaster is added in the plastering ring of the upper member.

After the plaster has set, the wrapping film is removed and some α-cyanoacrylate adhesive material is injected into the gap.

The BPOP (muscular position) wax record is removed and the upper model is then moved downward until tooth come in contact.

The premature occlusal contact in the BPOP (MP) can be detected using a occlusal foil (12μ).



When the occlusal adjustments are performed on the models, the incisal pin should be removed from the upper member of the articulator, since the mandible will move like a hinge with the compacted temporomandibular joint capsules.

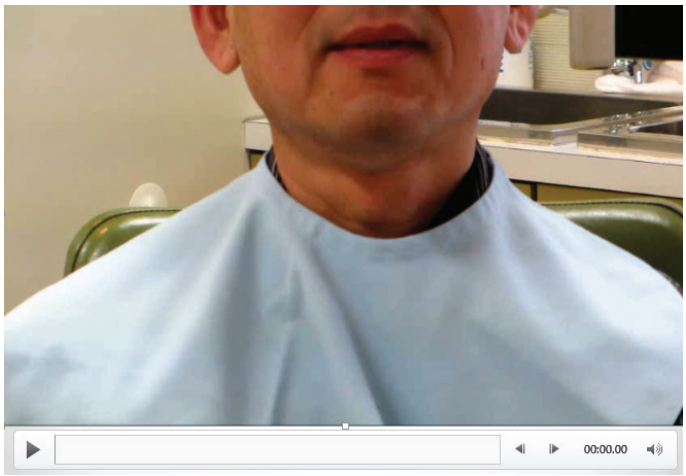
Since the MP is very unstable in the mouth, occlusal analysis and equilibration in the MP should be performed on models mounted on an articulator with BPOP wax record, which represents the MP.

Occlusal equilibration is performed on the articulator and then in the mouth referring to the ground spots on the models. This therapy is also effective on TMD related tinnitus, vertigo and sensorineural hearing loss.

Tinnitus

The occlusal discrepancy between the HOP and BPOP leads to tensions and contraction states in the masticatory muscles. The tensor tympani is influenced by the tension of the masticatory muscles through their common nerve supply (mandibular nerve of trigeminal nerve). According to Dr. Myrhaug, contraction of the tensor tympani muscle can be watched directly under the operating microscope when stimulated voluntarily by grinding and clenching movements of the jaw. Tinnitus related to TMDs were all unilateral symptoms. This means the mandible is unilaterally deviated. The masticatory muscles on the deviated side would be fatigue and cause spasm, then tensor tympani would cause spasmodic synkinesis, resulting in tinnitus.

This table is treatment outcome of TMD patients with aural symptoms in our practice.



Vertigo

This case of a patient with vertigo was reported [6].

No.	Age	Gender	Complaints	Diagnosis	Visits	Period	Outcome	Follow-up period
1.	16	M	Limited opening Tinnitus (R), headache	Disc disp.(R)	4	2 months	resolved No recurrence	5 years
2.	20	F	Limited opening Tinnitus(R)	Disc disp.(B) Myofascial	7	5 months	resolved No recurrence	3 years
3.	22	F	Limited opening Headache, tinnitus(L)	Myofascial Disc disp.(L)	16	5 months	resolved No recurrence	3 years
4.	28	F	Limited opening Tinnitus (L), fullness	Myofascial (L)	11	3 months	resolved No recurrence	5 years
5.	35	F	Facial pain Headache, tinnitus (L)	Myofascial (L)	4	2 months	resolved No recurrence	3 years
6.	37	F	Limited opening Tinnitus (L), headache	Disc disp.(L)	11	3 months	resolved No recurrence	10 years
7.	42	F	Facial pain Tinnitus (L), vertigo	Myofascial (L)	12	2 months	resolved No recurrence	5 years
8.	47	F	Limited opening Tinnitus(L)	Disc disp.(L)	10	5 months	resolved No recurrence	2 years
9.	73	F	TMJ pain Vertigo, Tinnitus (R)	Arthralgia (R)	20	5 months	resolved No recurrence	7 years

Treatment outcome of TMD patients with aural symptoms in our practice.
No.: Patient number; Visits: Number of visits; Period: Treatment period; Disc Disp: Disc displacement ; Myofascial: Myofascial Pain. M: Male; F: Female. (R), (L) and (B): Mainly affected side on the (R): Right; (L): Left; (B): Both sides.

A 75-year-old man presented with a chief complaint of looseness of his upper denture. He reported suffering a strong impact injury to his left ear that required a hospital emergency department visit 2 years prior to the first examination, after which he developed severe rotatory vertigo. No brain abnormalities were detected.

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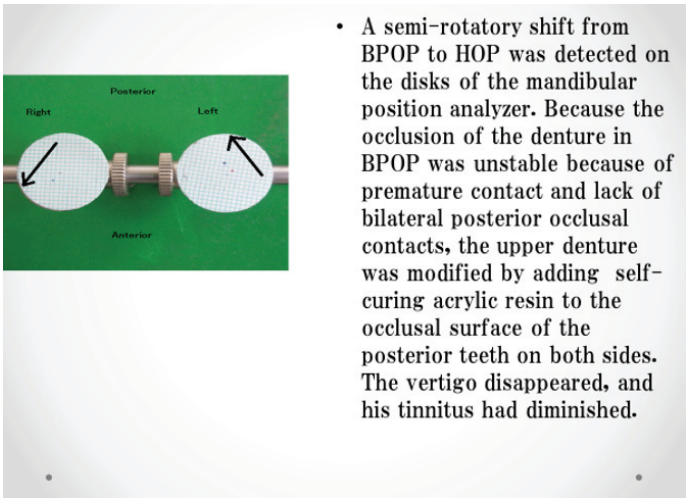
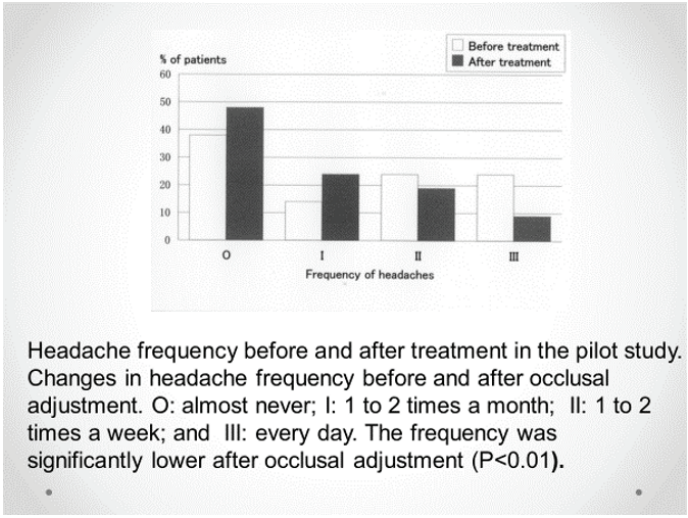


The headaches, spasms of the right side of the face, the left tinnitus, pain behind the right eye, and spasm of the right leg all disappeared, with no recurrence after 1.5 years.

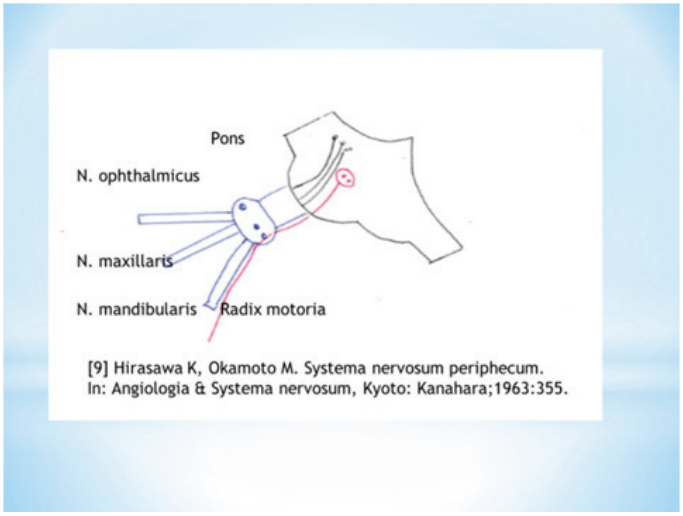
Headache

The relationship between temporomandibular disorders and headaches have been reported [5]. The following results is in our practice [4]:



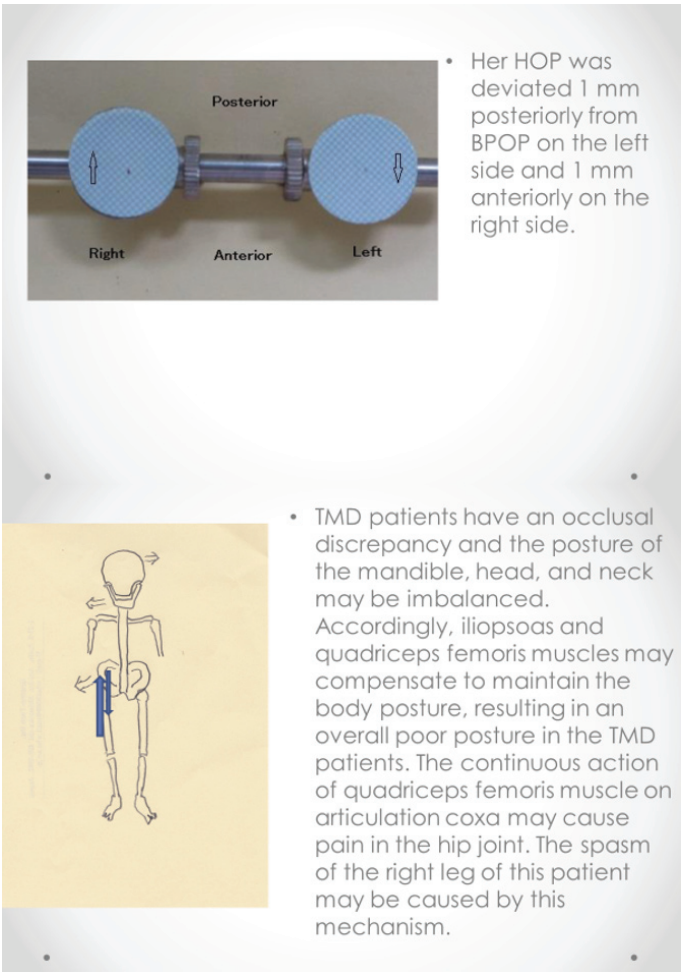
Pain behind eye

This symptom is thought to be caused with the excitement of ophthalmic nerve provoked with the mandibular motor nerve due to the overwork of the mandible due to the occlusal discrepancy between the habitual occlusal position and the muscular position.



Spasm of leg

This symptom is thought to be caused with the occlusal discrepancy of opposite directions in following figure [7].



Vertigo

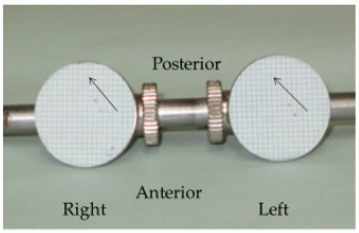
The semi-rotatory shift, which is frequent, short, and cyclically repeated in mastication and other oral functions, would be recognized as the rotatory movement and causing nystagmus, which gives the patient an illusion of rotation that results in vertigo.

Low-frequency hearing loss and Ear fullness

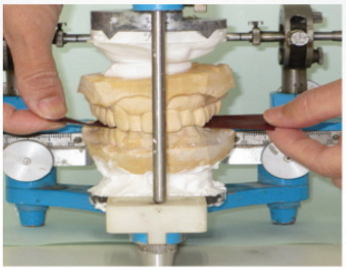
This case of a patient with low-frequency hearing loss and ear fullness was reported [8]

A 66-year-old woman presented with a chief complaint of pain of the lower right third molar. She had right tinnitus, difficulty in hearing low-frequency sound, and right ear fullness. She initially visited an ENT clinic. After various tests, she was diagnosed with sudden deafness and low-frequency hearing loss. She was treated with oral steroids, such as isosorbide, diphenidol and domperidone without any improvement of the symptoms.

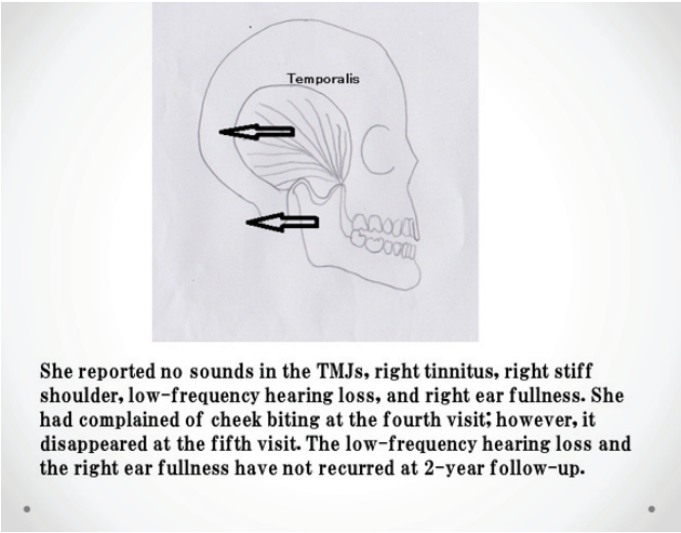
The lower right third molar was extracted at the initial visit. At the third visit (3 days after the second visit), she wore the bite plate for 5 min and the BPOP (muscular position) wax record was obtained. A premature occlusal contact was recognized on the right second molars.



Her mandible deviated 2 mm posterior from the muscular position on both sides.



Occlusal adjustments were performed on the dental models mounted on the articulator until the posterior teeth bilaterally made contacts according to the occlusal position correcting therapy. Subsequently, the occlusal adjustments in the mouth were performed referring to the models.



In the present case, the premature occlusal contact on the right second molars retracted the mandible backward with the contraction of the right temporal muscle, making the teeth meet together and causing the tensor tympani tension to be synchronously produced with the temporal muscle contraction. The tensor tympani tension restricted the movement of auditory ossicles (malleus, incus, and stapes), causing low-frequency hearing loss. Moreover, the tensor tympani tension caused the contraction of the semicanalis musculi tensoris tympani that resulted in ear fullness. Initially, the contraction of tensor tympani might cause intermittently only when the teeth meet together. However, when the contraction is repeated and prolonged, tensor tympani would be fatigue. The intermittent contraction would change to continuous contraction, resulting in sudden deafness.

These ear symptoms described so far demand cooperation between medical and dental practitioners.

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