

## Slight Improvement of Symptoms in a Patient with Otosclerosis by Occlusal Modification: A Case Report

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### Abstract

The relationship between some aural symptoms and dental occlusion have been reported, However, the relationship between otosclerosis and occlusion has not yet been reported. Occlusal improvement was achieved using the occlusal position correcting therapy on a patient with otosclerosis. Occlusal analysis was performed by mounting dental models on an articulator and identifying a premature occlusal contact on the right second molar artificial teeth and a deviation of the habitual occlusal position from the muscular occlusal position. Occlusal modification was performed to make the habitual occlusal position coincide with the muscular contact position. The persistent tinnitus on the right ear became intermittent. From time to time, the ringing sound of the bell appeared. And the hearing impairment on the right ear was not improved.

**Keywords:** Habitual Occlusal Position; Muscular Occlusal Position; Otosclerosis; Tinnitus

### Introduction

Although some aural symptoms associated with malocclusion have been reported, the relationship between otosclerosis and dental occlusion has not yet been reported [1]. Various symptoms have reportedly been caused by the occlusal discrepancy between the habitual occlusal position (HOP) and the muscular occlusal position (MOP) [2]. Some masticatory muscle tension might be caused due to the occlusal discrepancy, which may affect tensor tympani [3,4]. The present case study might be useful to understand one of the mechanisms of conductive hearing loss.

### Case Presentation

A 75-year-old woman presented with a chief complaint of the upper partial denture. She had hearing impairment on the right ear and she was diagnosed with otosclerosis in an ENT clinic three

years ago. Her medical history was hypertension and osteoporosis, each taking medicine. She reported the right neck pain and stiff shoulder. Also, she reported the persistent tinnitus on the right ear and from time to time, the ringing sound of the bell. Mouth opening was 42 mm and the opening pass was normal. There was no temporomandibular joint (TMJ) tenderness, however, tenderness of the right trapezius, both medial pterygoid muscles and the left lateral pterygoid muscle on palpation was observed. The lower jaw was bilaterally edentulous and wearing 8 teeth partial denture. The upper jaw was 11 teeth edentulous and wearing the partial denture (Figure 1). At the first visit, an HOP record was obtained using a vinyl polysiloxane bite material (Exabite, GC, Tokyo, Japan), while the patient was seated upright with her jaw voluntarily closed. Subsequently, the upper and lower jaw impression were obtained and dental models were fabricated. An anterior flat bite plate was fab-

ricated on the upper model using a self-curing acrylic resin (Ortho-fast, GC, Tokyo). At second visit, she wore the bite plate for 5 min and the bite plate-induced occlusal position record was obtained, using the same material as used for obtaining the HOP record. This record was considered a MOP record. A MOP wax record was obtained using a registration wax material (Bite Wafer, Kerr USA, Romulus, MI, U.S.A.) in the previously described manner. The upper and lower models were mounted on an articulator with MOP wax record. A premature occlusal contact was recognized on the right second molars (Figure 2). To examine the difference between HOP and MOP, two-dimensional measurements were performed with the modified articulator using previous records. Her mandible deviated 2 mm posteromedially from MOP on the right side and 1.5 mm anterolaterally on the left side (Figure 3). The computed tomography images were taken in the HOP and MOP however, the differences were not clear (Figure 4). Occlusal modification was performed on the lower partial denture adding a self-curing acrylic resin on the artificial teeth. The impression of the lower modified denture was taken and the model was fabricated. The lower model was mounted on the articulator with the MOP wax record. The bilateral occlusal contacts were confirmed on the articulator (Figure 5). At one week after the occlusal modification, the tenderness of the muscles on palpation was not observed. The patient reported that the persistent tinnitus on the right ear turned into intermittent and the ringing sound of the bell appeared from time to time. And the hearing impairment was not improved. When the author asked her otolaryngologist, it was almost the same as it was three years ago.

**Figure 1:** Upper and lower dental arches.

**Figure 2:** Premature occlusal contact.

**Figure 3:** The habitual occlusal position (HOP) and muscular occlusal position (MOP) records. The arrows indicate the shift from the MOP to HOP.

**Figure 4:** Bilateral tomographic images of temporomandibular joint (TMJ) in the HOP and MOP.

**Figure 5:** Confirmation of occlusal contacts on both sides in the MOP.

## Discussion

Myrhaug described that suffers from otosclerosis regularly complain of tinnitus in connection to their impairment of hearing. And these patients, for whose hearing the bell tolls, may well have an ailment of odontogenetic origin [3]. Watanabe, *et al.* reported that tinnitus occurred whenever a certain mimic facial muscle contracted voluntarily or involuntarily [4]. Myrhaug described that by contraction of the tensor tympani muscle, the shaft of the hammer is pulled inward and foreshortened. This can regularly be seen when there is a state of tension in the muscles innervated by the same trigeminal nerve as a consequence of bite anomalies [3]. 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 and trapezius, making the teeth meet together and causing the tensor tympani and the stapedius tension to be synchronously produced with the temporal muscle contraction. The masticatory muscles on the deviated side would be fatigue and cause spasm, then tensor tympani would cause spasmodic synkinesis, resulting in tinnitus. By the contraction of the tensor tympani, the shaft of the hammer was pulled inward and the capsule of the auditory ossicles slacked (Figure 6). According to Myrhaug, the capsule consists of elastic connective fibers and not collagen fibers. And the suspension of the sound-conducting

apparatus in the middle ear is very elastic and labile [3]. Therefore, the tension of the capsule was lost and sound became difficult to transmit, causing the hearing impairment. Moreover, When the position of the head changes suddenly, the capsule with a weight of the auditory ossicle swayed like a hammock and felt the sound like ringing bell. Because the tensor tympani and stapedius have not antagonists, even if these muscles return to normal condition, the slacked capsule cannot be restored. If the tympanic membrane can be pulled outwards and returned to its original position by some means, the capsule may return to its original shape and hearing may be restored. However, if the elastic fiber has been transformed into a collagen fiber due to a degenerative lesion, complete recovery will not be possible.

**Figure 6:** Diagram showing inward displacement of tympanic membrane and slack of capsule (broken line).

## Summary

From the present case, in otosclerosis, the occlusal correction seemed to have some effect on persistent tinnitus but no effect on hearing impairment.

## Acknowledgement

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