

OCCLUSION

Occlusal theory
Temporomandibular disorders
Occlusal disease
Osteoarthritis of TMJ
Disease of lateral pterygoid muscle (provisional name)
Disease of retrodiscal tissue (provisional name)
Centric relation
Determining of centric relation
Malocclusion
Occlusal analysis
Occlusal equilibrations
Examinations and diagnosis of occlusal equilibrations

Method of occlusal equilibrations
Case of occlusal equilibrations
Occlusal plane
Vertical dimension
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Anterior guidance
Long centric
Bruxism
Noise of TMJ
Occlusal splint
Ideal occlusion



(OCCLUSION)

Occlusal analysis

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References

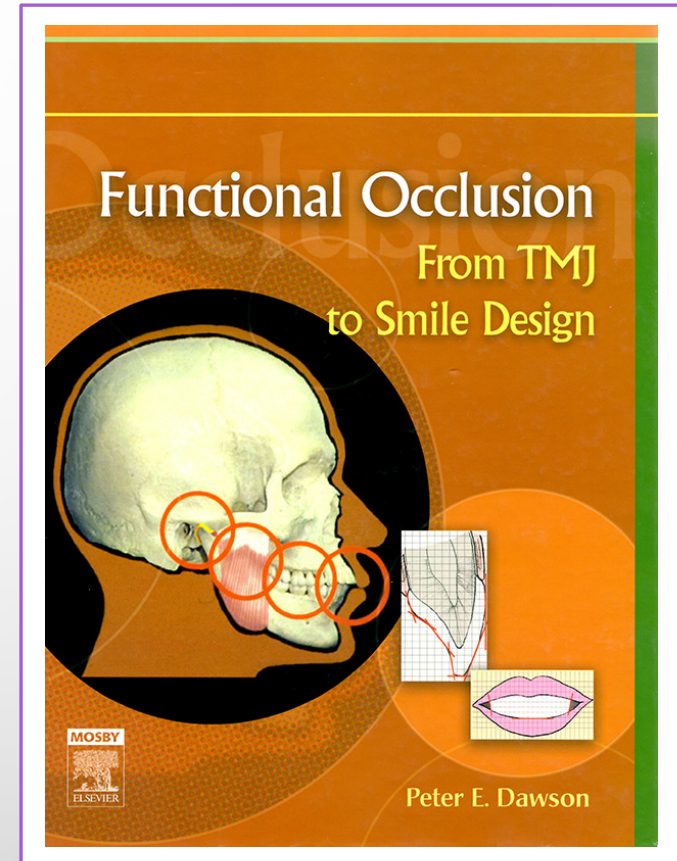


(OCCLUSAL ANALYSIS)

Introduction

Occlusal analysis is the examination of a patient's occlusion for abnormalities. Occlusal analysis can be performed in the patient's mouth. However, in order to obtain detailed occlusal analysis information to establish a treatment plan, it is necessary to perform the occlusal analysis on a study cast mounted on a semi-adjustable articulator.

In this lecture, we will explain the specifics of occlusal analysis based on the centric relation, the lateral position of mandible, and the protrusive position of mandible, contrasting occlusal analysis performed in the mouth with occlusal analysis on the study cast. In addition, the method of trial occlusal adjustment and the method of writing a diagnosis of occlusal analysis will be explained.



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1. Occlusal analysis of the centric relation

With the patient in the supine position, hold the mandible with both hands and guide the mandibular condyle into a stable position in the mandibular fossa, as shown in the upper photo on the right. Once the mandible is guided to the centric relation, have the patient perform an axial movement of the mandible with the TMJ as the axis. Once the axial movement is confirmed, we slowly bring the upper and lower jaw teeth into contact with each other and check the contact points by interviewing the patient. For example, "Is the first tooth to make contact on the right side or the left side? This will help the patient to recognize the contact site at an early stage.

As shown in the lower photo on the right, occlusal analysis of the centric relation is to check and record the premature contact points by means of articulating paper.

When the mandible is guided into the centric relation and bites together, the relationship between the centric relation and intercuspal position is considered normal if many teeth are in contact and stable, or if there is little or no misalignment between the centric relation and intercuspal position.



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1. Occlusal analysis of the centric relation by study cast

Shift the incisal pin upward so that the tip of the incisal pin does not contact the table.

As shown in the upper photo on the right, premature contact in the centric relation can be recorded by gently closing the upper arch of the articulator with the articulating paper between the upper and lower jaws.

As shown in the lower photo on the right, when an premature contact is present in the centric relation, no other teeth except the premature contact are in contact.



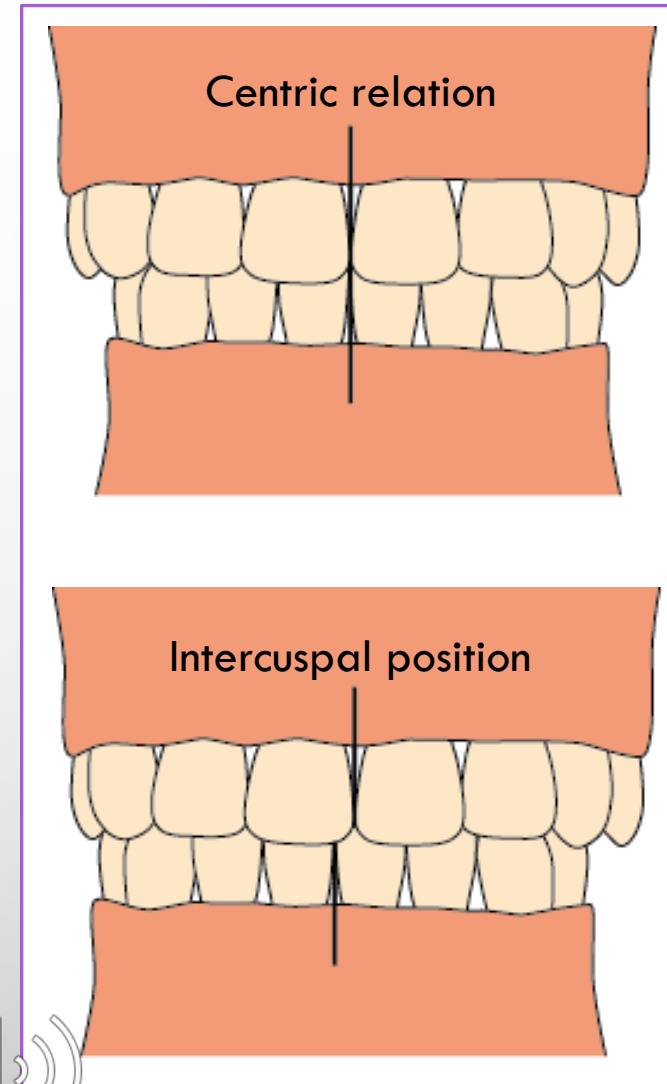
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2. Relationship between centric relation and intercuspal position

The upper right illustration show the mandible guided to the centric relation. Generally, when the patient's mandible is guided to the centric relation, the midline of the upper and lower jaws are aligned. After that, the patient is asked to chew firmly and the occlusal head is placed in the intercuspal position. If there is no deviation between the median and anterior-posterior directions, and the centric relation and the intercuspal position are in alignment, the bite is considered normal.

On the other hand, after instructing the patient to "chew firmly", the midline of the upper and lower jaws may shift as shown in the illustration lower right. In such cases, we check in which direction and how many mm the intercuspal position is shifted from the centric relation.

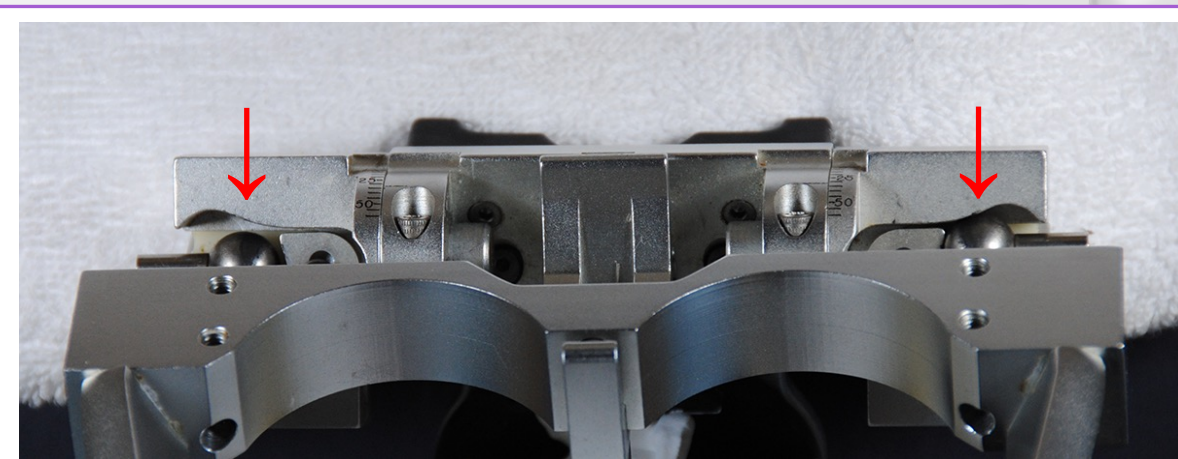
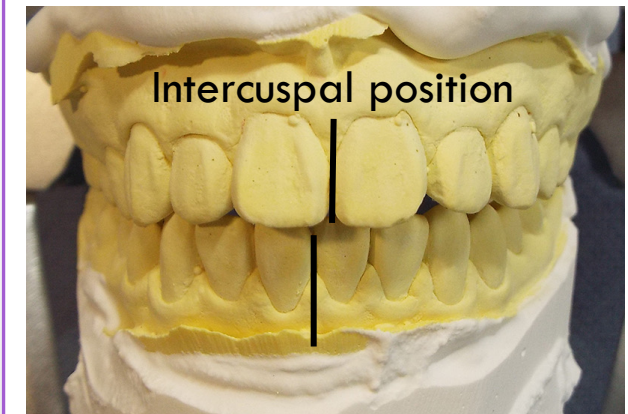
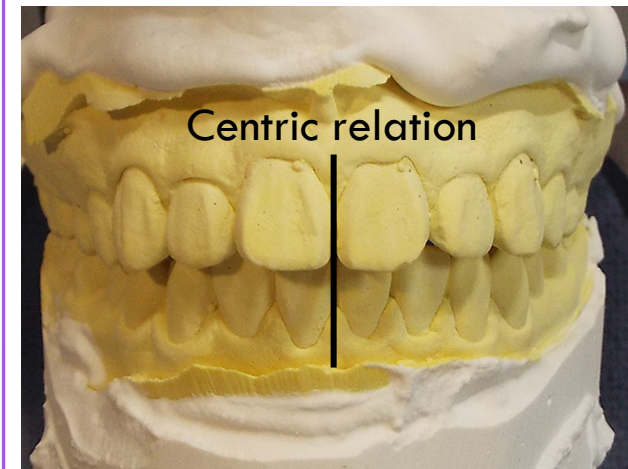
The occlusal analysis between the centric relation and the intercuspal position is to measure and record the existence, direction and distance of the "deviation". For example, "the occlusal position is displaced by X mm from the centric relation in the direction of Y" is recorded.



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2. Relationship between centric relation and intercuspal position by study cast

Check the centric relation occlusal state of the study cast, as shown the upper photo on the right. Next, find a position in the mandible where can be held and as many teeth as possible can bite together stably, as shown by the model on the center right. This position is the intercuspal position. The direction and extent of the deviation of the intercuspal position from the centric relation is checked and recorded. Furthermore, as shown in the lower photo on the right, by observing the left and right condyloid balls (red arrows) of the articulator, the position of the left and right mandibular condyles in the intercuspal position can also be confirmed.



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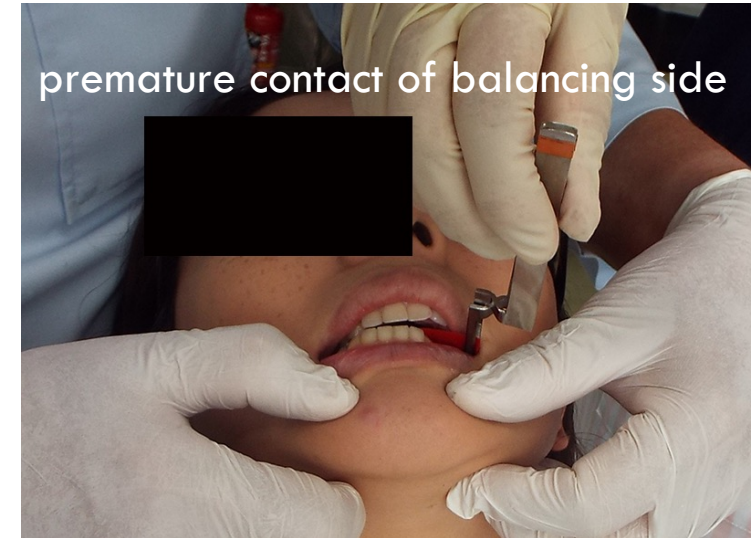
3. Occlusal analysis of the lateral position of mandible



As shown in the upper and lower photo on the right, the mandible is guided in a lateral direction to check whether the anterior teeth, especially the canines on the working side, make contact. In the case of normal occlusion, the incisal edges of the maxillary and maxillary canines on the working side are in contact, allowing the bite through meat and threads.

If contact of the anterior teeth cannot be obtained in the mandibular lateral orientation, intercept the articulating paper on the balancing side molars to confirm premature contact on the side, as shown in the upper photo on the right. If premature contact cannot be confirmed on the balancing side, as shown in the lower photo on the right, articulating paper is interposed on the working side molars to confirm premature contact on the working side.

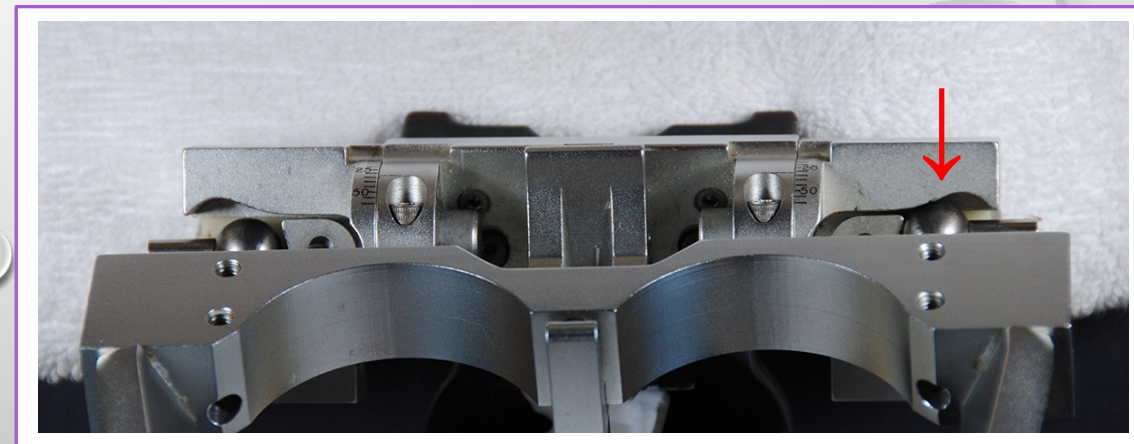
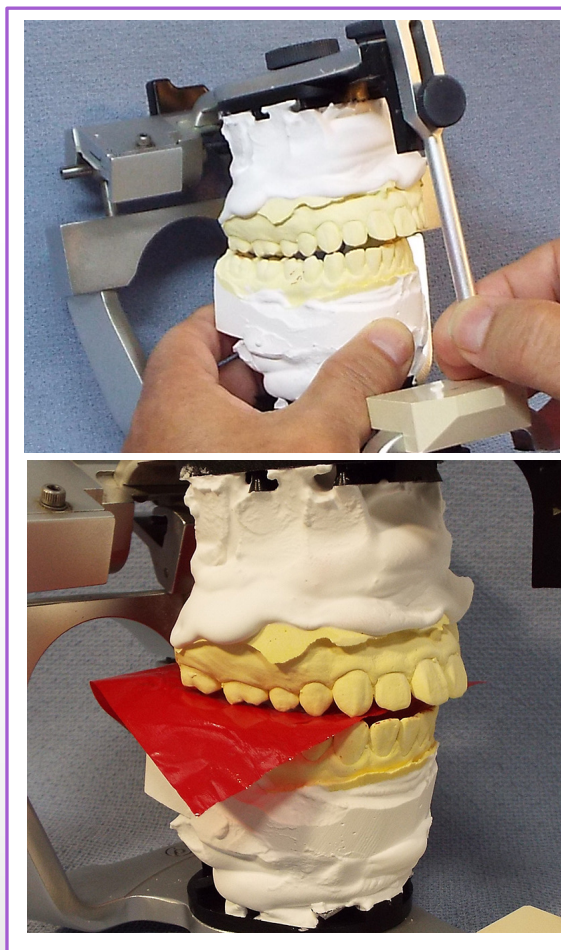
Once an premature contact is identified, record its location.



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3. Occlusal analysis of the lateral position of mandible by study cast

As shown in the upper photo on the right, the upper bow of the articulator is shifted laterally to see if the anterior teeth make contact. At this time, check if the working lateral condylar ball of the articulator is in contact with the posterior wall, as indicated by the red arrow in the lower photo. If contact cannot be obtained with the anterior teeth, check whether the molars preventing contact are on the equilibrium or working side. In addition, as shown in the lower photo on the right, the position of the occlusal interference can be checked in more detail by interposing an articulating paper.

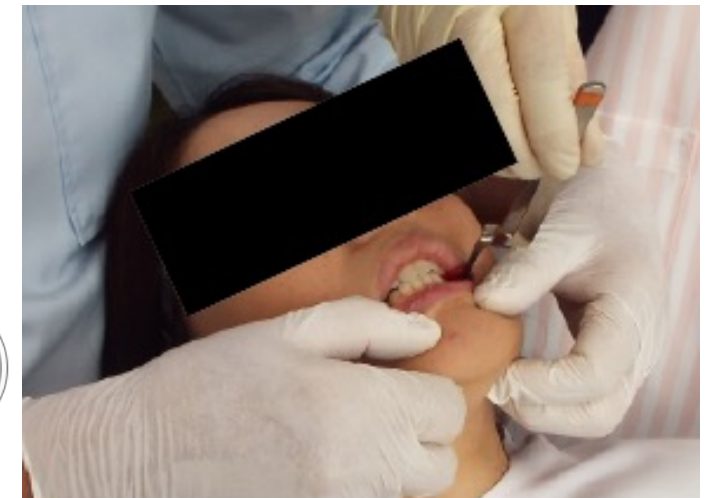


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4. Occlusal analysis of the protrusive position of mandible

With normal occlusion, the incisal edges of the upper and lower anterior teeth make contact when the mandible is protrusive position, as shown in the upper photo on the right, allowing the patient to bite through noodles and other foods. When malocclusion exists in the protrusive position of mandible, the front teeth do not make contact when the mandible is thrust forward. This prevents the patient from biting through noodles with the front teeth, triggering nocturnal bruxism and impairing the lateral pterygoid muscle.

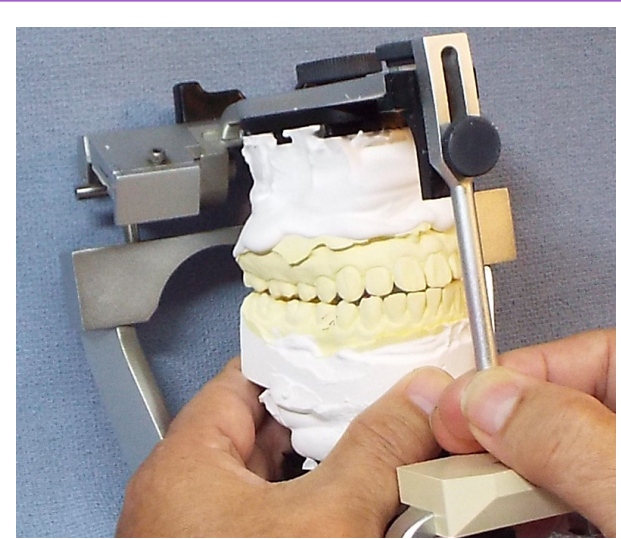
In the occlusal analysis of the mandible in the protrusive position, as shown in the lower photo on the right, an articulating paper is used as an intermediary to find and record the premature contact points of the molars that prevent the anterior teeth from contacting when the mandible is thrust forward.



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4. Occlusal analysis of the protrusive position of mandible by study cast

As shown in the upper photo on the right, the upper bow of the articulator is shifted backward to the anterior mandibular position. At this point, check to see if the anterior teeth make contact. If there is no contact, as shown in the lower photo on the right, an articulating paper is interposed to locate and record the occlusal interference sites on the molars causing the interference.



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5. Significance of trial occlusal adjustment

The greatest advantage of occlusal analysis by a study cast is the ability to perform a trial occlusal adjustment on the study cast before starting treatment. The following three items of information can be obtained from a trial occlusal adjustment.

- a) The treatment procedure is clarified.
- b) The occlusal status at the end of the treatment can be clarified to set treatment goals.
- c) A determination can be made as to whether or not an occlusal adjustment treatment is indicated.



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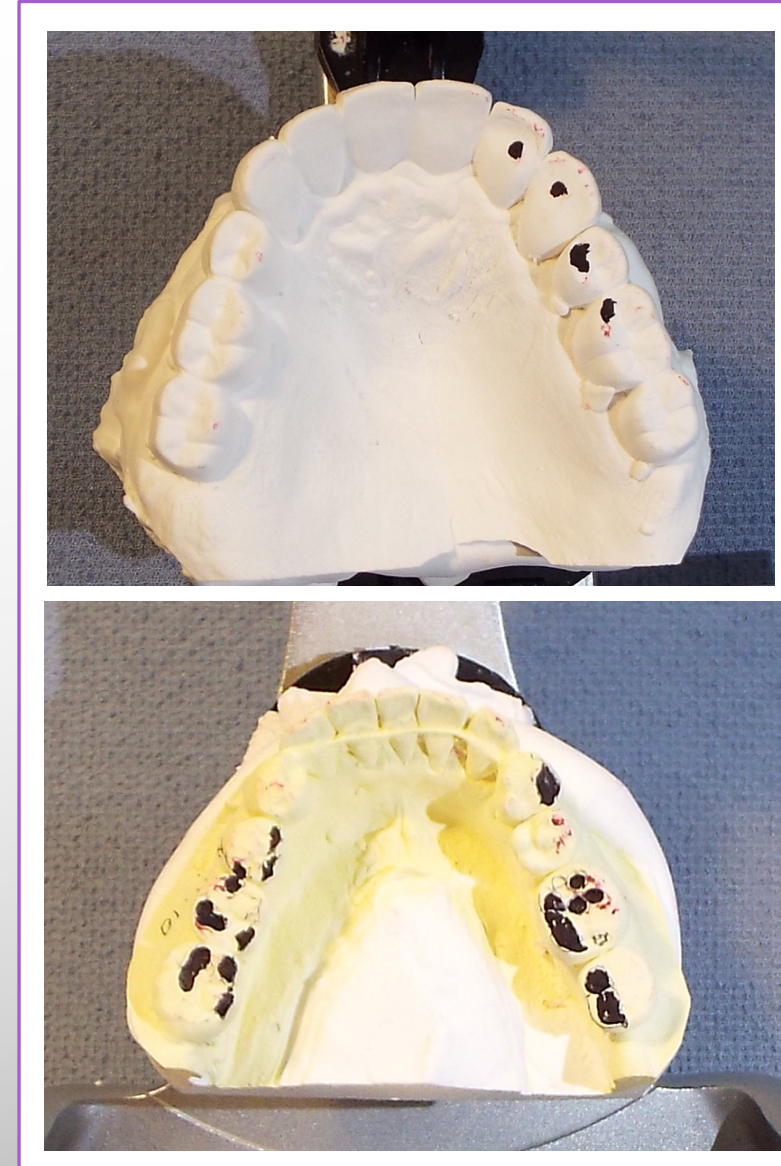
5. Significance of trial occlusal adjustment

Case Example

The black area in the upper photo on the right is the grinding point. In this case, it was possible to eliminate the premature contact with only a few grinding points, and it was clear that the malocclusion could be eliminated by a simple occlusal adjustment.

In the lower right case, it is clear that the premature contact can be eliminated only by shaving most of the lower molars.

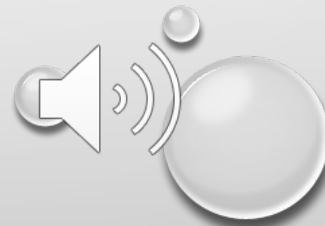
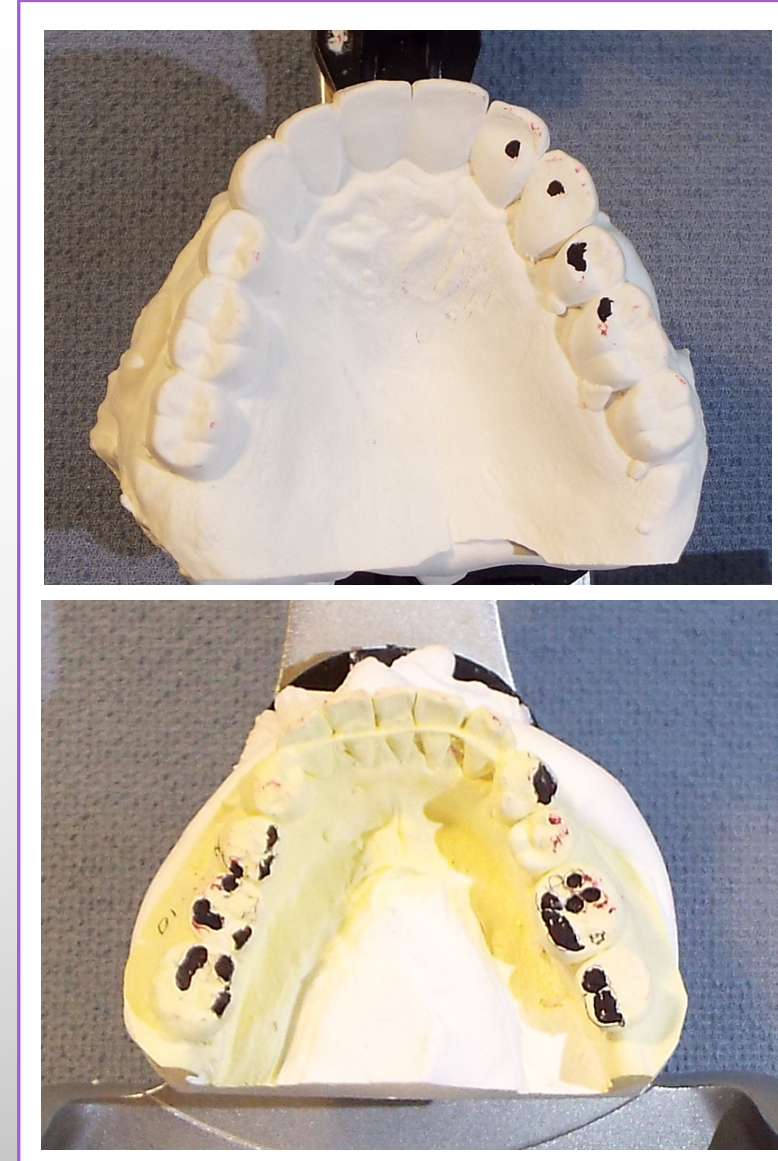
As shown above, a trial occlusal adjustment reveals the occlusal condition after the treatment is completed.



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5. Significance of trial occlusal adjustment

These two cases clearly demonstrate that occlusal adjustment is appropriate as a treatment plan. However, in the case of complex malocclusions, occlusal adjustment may not be employed as a treatment plan. In such cases, a trial occlusal adjustment indicates that oral rehabilitation is appropriate as a treatment plan. In light of the above, trial occlusal adjustments on the study cast play a very important role in setting a treatment plan for occlusal disease.



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6. Method of trial occlusal adjustment

The occlusal analysis is performed for the centric relation, lateral and protrusive positions of mandible. Similarly, the trial occlusal adjustment is performed on the study cast for the following items.

- a) Grinding of occlusal interference in the centric relation
- b) Grinding of occlusal interference in the lateral position
- c) Grinding of occlusal interference in the protrusive position

Specific methods related to each of these trial occlusal adjustments will be discussed.



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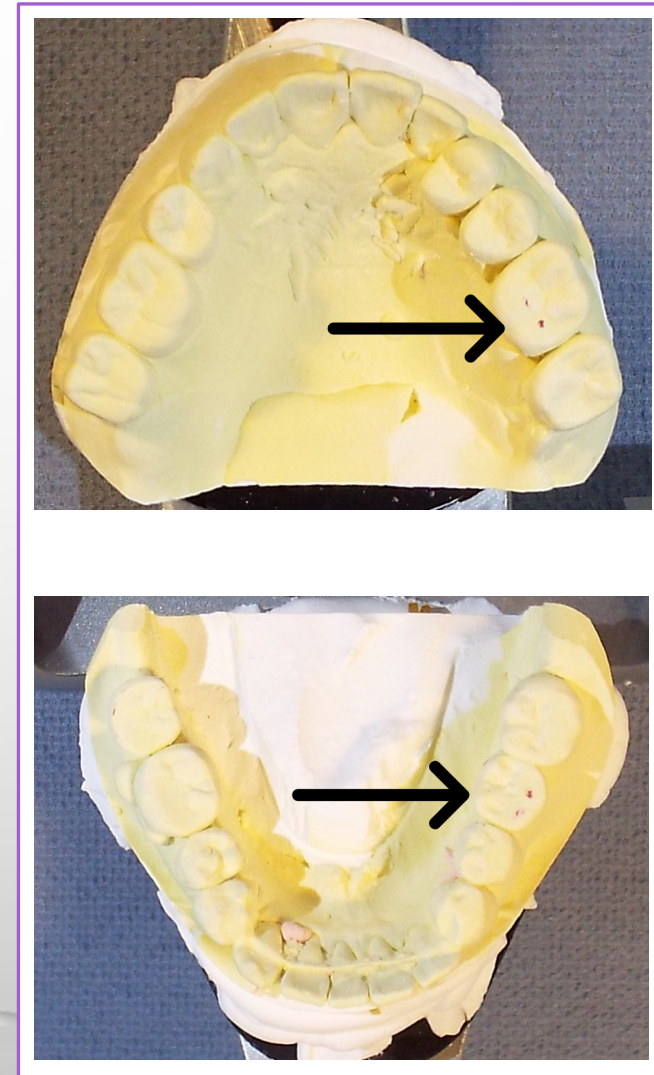
6. Method of trial occlusal adjustment

a) Grinding of occlusal interference in the centric relation

As shown in the photos on the right, the first step in the trial occlusal adjustment is to identify the premature contact sites in the centric relation. By shaving either of the identified interfering areas (arrows), the occlusal interference is eliminated. The principles of occlusal adjustment are listed below.

The removal of occlusal interference in the centric relation takes precedence over all occlusal adjustments.

- (1) For cusps vs. fossae, the fossa is grinded.
- (2) For functional vs. non-functional cusps, the non-functional cusp is grinded.
- (3) For functional vs. functional cusp, the one that does not change the vertical dimension is grinded.
- (4) For incisal vs. lingual, the lingual surface is grinded.
- (5) For incisal to incisal, the one that does not affect the esthetic appearance is grinded.



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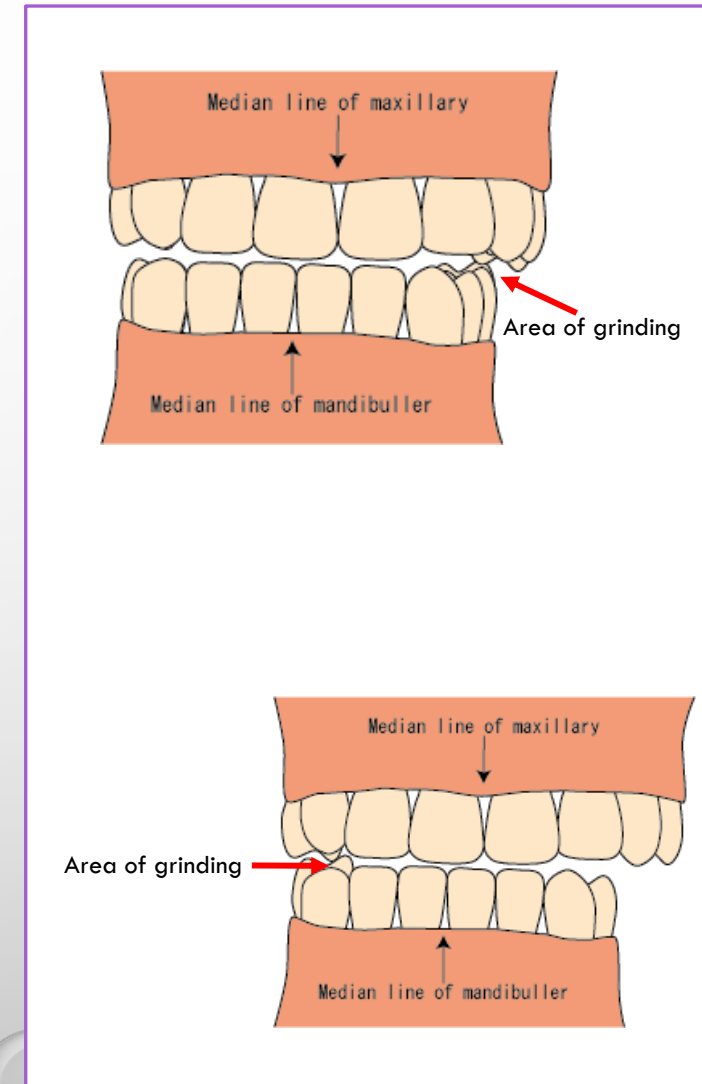
6. Method of trial occlusal adjustment

b) Grinding of occlusal interference in the lateral position

The upper bow of the articulator is moved laterally to the mandibular lateral position. At this time, check whether the anterior teeth, especially the canines, on the working side make contact. If not, the occlusal interference that is preventing the contact is checked to see if it is on the balancing or the working side and its location is noted.

As shown in the upper illustration on the right, when occlusal interference is present on the balancing side, premature contact occurs in the functional cusps of both the upper and lower jaws. In such cases, the occlusal contact of the anterior teeth on the working side is secured by grinding the occlusal interference area on either the upper or lower jaw.

As shown in the lower illustration on the right, premature contact on the working side occurs when the lingual cusps of the mandibular molars or the buccal cusps of the maxillary molars, which are non-functioning cusps, are too high. Therefore, the interfered area of the lingual cups of the mandibular molar or the buccal cups of the maxillary molar on the working side is grinded to ensure occlusal contact of the anterior teeth on the working side.



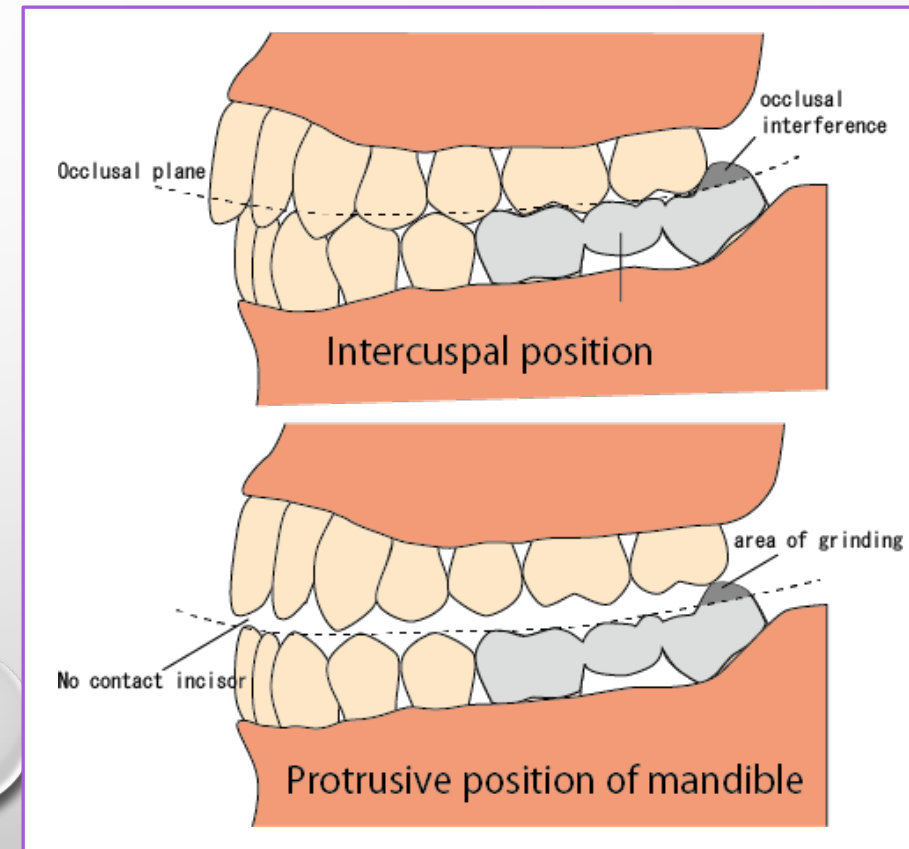
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6. Method of trial occlusal adjustment

c) Grinding of occlusal interference in the protrusive position



As shown in the upper illustration on the right, even if there is a protrusion from the occlusal plane in mandibular wisdom tooth, no abnormality is observed in the centric relation or intercuspal position. However, as shown in the lower illustration on the right, when the upper bow of the articulator is moved backward to the protrusive position of mandible, contact of the anterior teeth is not obtained. In this case, the interfering molars that are preventing occlusal contact of the anterior teeth are identified and grinded to ensure contact of the anterior teeth. In this case, both upper and lower teeth should not be ground down.



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7. Diagnostic report of occlusal analysis

Disease name	Osteoarthritis of TMJ
intercuspal position	+, 1.5 mm from the centric relation to the right anteriorly
Load testing	-, Normal
Centric relation	+, Upper left 6th proximal marginal ridge
Lateral position left	+, Lower right 7th buccal occlusal cusp
Lateral position right	+, Lower right 7th lingual cusp
Protrusive position	+, Lower left 8th buccal cusp



The appropriate name for a disease is one that indicates the site and condition of the disorder and allows the patient to recognize the disease condition. TMD and occlusal disease are group names for diseases and should be used when a diagnosis cannot be made.

(OCCLUSAL ANALYSIS)

7. Diagnostic report of occlusal analysis

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Lateral position right	+, Lower right 7th lingual cusp
Protrusive position	+, Lower left 8th buccal cusp



If the intercuspal position is consistent with the centric relation, or if the "deviation" is within 0.5 mm, the value is " - ". If the intercuspal position deviates from the centric relation by 1 mm or more, it is marked as "+" and the direction and extent of the deviation of the intercuspal position from the centric relation are described. For example, "1.5 mm to the right anteriorly from the centric relation".

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7. Diagnostic report of occlusal analysis

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Lateral position right	+, Lower right 7th lingual cusp
Protrusive position	+, Lower left 8th buccal cusp



The load test is an examination method developed by Dawson that is necessary in determining the degree of progression of occlusal disease. There are four levels of examination results: "Normal", "Plus 1", "Plus 2," and "Plus 3".

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7. Diagnostic report of occlusal analysis

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intercuspal position	+, 1.5 mm from the centric relation to the right anteriorly
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Centric relation	+, Upper left 6th proximal marginal ridge
Lateral position left	+, Lower right 7th buccal occlusal cusp
Lateral position right	+, Lower right 7th lingual cusp
Protrusive position	+, Lower left 8th buccal cusp



The occlusal interference in the centric relation should include the tooth site, cusp name, and slope name.

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7. Diagnostic report of occlusal analysis

Disease name	Osteoarthritis of TMJ
intercuspal position	+, 1.5 mm from the centric relation to the right anteriorly
Load testing	-, Normal
Centric relation	+, Upper left 6th proximal marginal ridge
Lateral position left	+, Lower right 7th buccal occlusal cusp
Lateral position right	+, Lower right 7th lingual cusp
Protrusive position	+, Lower left 8th buccal cusp



Occlusal interference in the lateral position of mandible is examined separately on the left and right sides. The record should include the tooth name, cusp name and slope name.

(OCCLUSAL ANALYSIS)

7. Diagnostic report of occlusal analysis

Disease name	Osteoarthritis of TMJ
intercuspal position	+, 1.5 mm from the centric relation to the right anteriorly
Load testing	-, Normal
Centric relation	+, Upper left 6th proximal marginal ridge
Lateral position left	+, Lower right 7th buccal occlusal cusp
Lateral position right	+, Lower right 7th lingual cusp
Protrusive position	+, Lower left 8th buccal cusp



For occlusal interference in the protrusive position of mandible, the tooth name, cusp name, and slope name should be noted.

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Occlusal analysis

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If you have any questions or doubts, please leave them in the public comment section below.

The next topic will be “ Occlusal equilibrations ”.