**The Occlusion**

Occlusion is the relationship of the teeth in the mandibular arch to those in the maxillary arch as they are brought together. The occlusion is examined and recorded as part of the oral examination. Knowledge of the occlusion of each patient can contribute significantly to complete care and instruction. Recognition of malocclusion assists in the referral of patients to the orthodontist, gives many valuable points of reference for patient instruction, and determines necessary adaptations in techniques.

**Key Words:**

Ankylosis: union or consolidation of two similar or dissimilar hard tissues previously adjacent but not attached.

Dental ankylosis: rigid fixation of a tooth to the surrounding alveolus as a result of ossification of the periodontal ligament; prevents eruption and orthodontic movement.

Centric occlusion: the maximum intercuspation or contact of the teeth of the opposing arches; also called habitual occlusion.

Centric relation: the most unstrained, retruded physiologic relation of the mandible to the maxilla from which lateral movements can be made.

Diastema: a space between two adjacent teeth in the same arch.

Facet: A facet is a shiny, flat, worn spot on the surface of a tooth, frequently on the side of a cusp.

Occlusal guard: a removable dental appliance usually made of plastic that covers a dental arch and is designed to minimize the damaging effects of bruxism and other oral habits; also called bite guard, mouth guard, or night guard.

Occlusal prematurity: any contact of opposing teeth that occurs before the desirable intercuspation.

Orthopedics: correction of abnormal form or relationship of bone structures; may be accomplished surgically (orthopedic surgery) or by the application of appliances to stimulate changes in the bone structure through natural physiologic response (orthopedic therapy); orthodontic therapy is orthopedic therapy.

Parafunctional: abnormal or deviated function, as in bruxism.

Pathologic migration: the movement of a tooth out of its natural position as a result of periodontal infection; contrasts with mesial migration, which is the physiologic process maintained by tooth proximal contacts in the normal dental arches.
Tongue thrust: the infantile pattern of suckle-swallow movement in which the tongue is placed between the incisor teeth or alveolar ridges; may result in an anterior open bite, deformation of the jaws, and abnormal function.

Trauma from occlusion: injury to the periodontium that results from occlusal forces in excess of the reparative capacity of the attachment apparatus; also called occlusal traumatism.

**Static Occlusion**

Static occlusal relationships are seen when the jaws are closed in centric relation. The static occlusion can be efficiently observed in occluded study casts and seen directly in the oral cavity when the lips and cheeks are retracted. Classification of malocclusion and the variations that occur with each category are described here.

*I. Normal (Ideal) Occlusion*

The ideal mechanical relationship between the teeth of the maxillary arch and the teeth of the mandibular arch is as follows:

- All teeth in the maxillary arch are in maximum contact with all teeth in the mandibular arch in a definite pattern.
- Maxillary teeth slightly overlap mandibular teeth on the facial surfaces.

*II. Malocclusion*

Any deviation from the physiologically acceptable relationship of the maxillary arch and/or teeth to the mandibular arch and/or teeth.
Types of Facial Profiles (Figure 16-1)

A. Mesognathic
Having slightly protruded jaws, which give the facial outline a relatively flat appearance (straight profile).

B. Retrognathic
Having a prominent maxilla and a mandible posterior to its normal relationship (convex profile).

C. Prognathic
Having a prominent, protruded mandible and normal (usually) maxilla (concave profile).

Malrelations of Groups of Teeth

A. Crossbites

- Posterior. Maxillary or mandibular posterior teeth are either facial or lingual to their normal position. This condition may occur bilaterally or unilaterally (Figure 16-2).
- Anterior. Maxillary incisors are lingual to the mandibular incisors (Figure 16-3).

B. Edge-to-Edge Bite
Incisal surfaces of maxillary teeth occlude with incisal surfaces of mandibular teeth instead of overlapping as in normal occlusion (Figure 16-4).
C. End-to-End Bite
Molars and premolars occlude cusp-to-cusp as viewed mesiodistally (Figure 16-5).

D. Open Bite
Lack of occlusal or incisal contact between certain maxillary and mandibular teeth because either or both have failed to reach the line of occlusion. The teeth cannot be brought together, and a space remains as a result of the arching of the line of occlusion (Figure 16-6).

E. Overjet
The horizontal distance between the labioincisal surfaces of the mandibular incisors and the linguoincisal surfaces of the maxillary incisors (Figure 16-7).
One way to measure the amount of overjet is to place the tip of a probe on the labial surface of the mandibular incisor and, holding it horizontally against the incisal edge of the maxillary tooth, read the distance in millimeters.

F. Underjet
Maxillary teeth are lingual to mandibular teeth. Measurable horizontal distance between the labioincisal surfaces of the maxillary incisors and the linguoincisal surfaces of the mandibular incisors (Figure 16-8).

G. Overbite
Overbite, or vertical overlap, is the vertical distance by which the maxillary incisors overlap the mandibular incisors.

- *Normal Overbite.* An overbite is considered normal when the incisal edges of the maxillary teeth are within the incisal third of the mandibular teeth, as shown in Figure 16-9 in side view and in Figure 16-11A in anterior view.
• **Moderate Overbite.** An overbite is considered moderate when the incisal edges of the maxillary teeth appear within the middle third of the mandibular teeth (Figure 16-11B).

• **Deep (Severe) Overbite**
  - Deep (severe): When the incisal edges of the maxillary teeth are within the cervical third of the mandibular teeth (Figure 16-11C).
  - Very deep: When in addition the incisal edges of the mandibular teeth are in contact with the maxillary lingual gingival tissue. A side view of very deep overbite is shown in Figure 16-10.

• **Clinical Examination of Overbite**
  - Direct observation: With the posterior teeth closed together, the lips can be retracted and the teeth observed, as in Figure 16-11. The degree of anterior overbite is judged by the position of the incisal edge of the maxillary teeth:
    - Normal (slight), within the incisal third of the mandibular incisors (Figure 16-11A).
    - Moderate overbite, within the middle third (Figure 16-11B).
    - Severe overbite, within the cervical third (Figure 16-11C).
  - Mirror view: By placing a mouth mirror under the incisal edge of the maxillary teeth, one can sometimes see the mandibular teeth in contact with the maxillary palatal gingiva. When contact is not visible, an examination of the lingual gingiva may reveal teeth prints or at least enlargement and redness from the contact.

**Malpositions of Individual Teeth**

A. Labioversion - A tooth that has assumed a position labial to normal.
B. Linguoversion - Position lingual to normal.
C. Buccoversion - Position buccal to normal.
D. Supraversion - Elongated above the line of occlusion.
E. Torsiversion - Turned or rotated.
F. Infraversion - Depressed below the line of occlusion, for example, primary tooth that is submerged or ankylosed.
FIGURE 16-3 Anterior Crossbite. Maxillary anterior teeth are lingual to mandibular anterior teeth. Anterior crossbite occurs in Angle's Class III malocclusion.

FIGURE 16-4 Edge-to-Edge Bite. Incisal surfaces occlude.

FIGURE 16-5 End-to-End Bite. Molars in cusp-to-cusp occlusion as viewed from the facial.
FIGURE 16-6 Open Bite. Lack of incisal contact. Posterior teeth in normal occlusion.

FIGURE 16-7 Overjet. Maxillary incisors are labial to the mandibular incisors. Measurable horizontal distance is evident between the incisal edge of the maxillary incisors and the incisal edge of the mandibular incisors. A periodontal probe can be used to measure for recording the distance.

FIGURE 16-8 Underjet. Maxillary incisors are lingual to the mandibular incisors. Measurable
horizontal distance is evident between the incisal edges of the maxillary incisors and the incisal edges of the mandibular incisors.

**FIGURE 16-9** Normal Overbite. Profile view to show the position of the incisal edge of the maxillary tooth within the incisal third of the facial surface of the mandibular incisor.

**FIGURE 16-10** Deep (Severe) Anterior Overbite. Incisal edge of the maxillary tooth is at the level of the cervical third of the facial surface of the mandibular anterior tooth. See the facial view in Figure 16-11C.
FIGURE 16-11 Overbite, Anterior View. (A) Normal overbite: incisal edges of the maxillary teeth are within the incisal third of the facial surfaces of the mandibular teeth. (B) Moderate overbite: incisal edges of maxillary teeth are within the middle third of the facial surfaces of the mandibular teeth. (C) Severe overbite: the incisal edges of the maxillary teeth are within the cervical third of the facial of the mandibular teeth. When the incisal edges of the mandibular teeth are in contact with the maxillary lingual gingival tissue, the overbite is considered very severe. See the profile view in Figure 16-10.

Determination of The “Classification of Malocclusion”

The determination of the classification of occlusion is based on the principles of Edward H. Angle, presented in the early 1900s. He defined normal occlusion as “the normal relations of the occlusal inclined planes of the teeth when the jaws are closed” and based his system of classification on the relationship of the first permanent molars.

- A more comprehensive picture of malocclusion is made by the orthodontist, who studies the relationships of the position of the teeth to the jaws, the face, and the skull.
- Three general classes of malocclusion are described in the following sections. These classes are designated by Roman numerals.
- Because the mandible is movable and the maxilla is stationary, the classes describe the relationship of the mandible to the maxilla. For example, in distoclusion (Class II) the mandible is distal, whereas in mesioclusion (Class III) the mandible is mesial to the maxilla, as compared to the normal position.
Normal (Ideal) Occlusion (Figure 16-12)

Facial Profile—Mesognathic (Figure 16-1).

B. Molar Relation—The mesiobuccal cusp of the maxillary first permanent molar occludes with the buccal groove of the mandibular first permanent molar.

C. Canine Relation—The maxillary permanent canine occludes with the distal half of the mandibular canine and the mesial half of the mandibular first premolar.

Malocclusion

Class I or Neutroclusion (Figure 16-12)

- Facial Profile. Same as normal occlusion.
- Molar Relation. Same as normal occlusion.
- Canine Relation. Same as normal occlusion.
- Malposition of Individual Teeth or Groups of Teeth.
- General Types of Conditions That Frequently Occur in Class I
  - Crowded maxillary or mandibular anterior teeth.
  - Protruded or retruded maxillary incisors.
  - Anterior crossbite.
  - Posterior crossbite.
  - Mesial drift of molars resulting from premature loss of teeth.

Class II or Distoclusion (Figure 16-12)

- Description. Mandibular teeth posterior to normal position in their relation to the maxillary teeth.
- Facial Profile. Retrognathic; maxilla protrudes; lower lip is full and often rests between the maxillary and mandibular incisors; the mandible appears retruded or weak (Figure 16-1, retrognathic).
- Molar Relation
  - The buccal groove of the mandibular first permanent molar is distal to the mesiobuccal cusp of the maxillary first permanent molar by at least the width of a premolar.
When the distance is less than the width of a premolar, the relation should be classified as “tendency toward Class II.”

- **Canine Relation**
  - The distal surface of the mandibular canine is distal to the mesial surface of the maxillary canine by at least the width of a premolar.
  - When the distance is less than the width of a premolar, the relation should be classified as “tendency toward Class II.”

**Class II, Division 1**

- Description: The mandible is retruded and all maxillary incisors are protruded.
- General types of conditions that frequently occur in Class II, Division 1 malocclusion: Deep overbite, excessive overjet, abnormal muscle function (lips), short mandible, or short upper lip.

**Class II, Division 2**

- Description: The mandible is retruded, and one or more maxillary incisors are retruded.
- General types of conditions that frequently occur in Class II, Division 2 malocclusion: Maxillary lateral incisors protrude while both central incisors reteude, crowded maxillary anterior teeth, or deep overbite.

**Class III or Mesioclusion** (Figure 16-12)

- **Description.** Mandibular teeth are anterior to normal position in relation to maxillary teeth.
- **Facial Profile.** Prognathic; lower lip and mandible are prominent (Figure 16-1).
- **Molar Relation**
  - The buccal groove of the mandibular first permanent molar is mesial to the mesiobuccal cusp of the maxillary first permanent molar by at least the width of a premolar.
  - When the distance is less than the width of a premolar, the relation should be classified as “tendency toward Class III.”
• **Canine Relation**
  
  o The distal surface of the mandibular canine is mesial to the mesial surface of the maxillary canine by at least the width of a premolar.
  
  o When the distance is less than the width of a premolar, the relation should be classified as “tendency toward Class III.”

• **General Types of Conditions That Frequently Occur in Class III Malocclusion**
  
  o True Class III: Maxillary incisors are lingual to mandibular incisors in an anterior crossbite (Figure 16-3).
  
  o Maxillary and mandibular incisors are in edge-to-edge occlusion.
  
  o Mandibular incisors are very crowded but lingual to maxillary incisors.
Normal (Ideal) Occlusion
Molar relationship: mesiobuccal cusp of maxillary first permanent molar occludes with the buccal groove of the mandibular first permanent molar.

Malocclusion
Class I: Neutroclusion.
Molar relationship: same as Normal, with malposition of individual teeth or groups of teeth.

Class II: Distoclusion.
Molar relationship: buccal groove of the mandibular first permanent molar is distal to the mesiobuccal cusp of the maxillary first permanent molar by at least the width of a premolar.
Division 1: mandible is retruded and all maxillary incisors are protruded.

Class II: Distoclusion.
Division 2: mandible is retruded and one or more maxillary incisors are retruded.

Class III: Mesioclusion.
Molar relationship: buccal groove of the mandibular first permanent molar is mesial.
Occlusion of DECIDUOUS TEETH**

I. Normal (Ideal) Occlusion

A. Primary Canine Relation
Same as permanent dentition.

- *With Primate Spaces*
  - Mandibular: Between mandibular canine and first molar (Figure 16-13A).
  - Maxillary: Between maxillary lateral incisor and canine (Figure 16-13B).
- *Without Primate Spaces.* Closed arches.

B. Second Primary Molar Relation
The mesiobuccal cusp of the maxillary second primary molar occludes with the buccal groove of the mandibular second primary molar.

  - The distal surface of the mandibular primary molar is mesial to that of the maxillary, thereby forming a mesial step (Figure 16-14A).
  - Morphologic variation in molar size; maxillary and mandibular primary molars have approximately the same mesiodistal width.
- *Variation.* Terminal plane.
  - The distal surfaces of the maxillary and mandibular primary molars are on the same vertical plane (Figure 16-14B).

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FIGURE 16-13 Primary Teeth With Primate Spaces. (A) Mandibular primate space between the canine and the first molar. (B) Maxillary primate space between the lateral incisor and the canine.
The maxillary molar is narrower mesiodistally than the mandibular molar (occurs in many patients).

Effects on Occlusion of First Permanent Molars

- Terminal step: First permanent molar erupts directly into proper occlusion (Figure 16-14A).

- Terminal plane: First permanent molars erupt end to end. With mandibular primate space, early mesial shift of primary molars into the primate space occurs, and the permanent mandibular molar shifts into proper occlusion. Without primate spaces, late mesial shift of permanent mandibular molar into proper occlusion occurs, following exfoliation of second primary molar (Figure 16-14B).
Functional Occlusion

In contrast to static occlusion, which pertains to the relationship of the teeth when the jaws are closed, functional occlusion consists of all contacts during chewing, swallowing, or other normal action. Functional occlusion is associated with performance:

- Pressures or forces created by the muscles of mastication are transmitted from the teeth, after contact, to the periodontium.
- Such forces are necessary to maintain the occlusal relationship of the teeth and guide the teeth during eruption.
- The forces are also necessary to provide functional stimulation for the preservation of the health of the attachment apparatus, namely, the periodontal ligament, the cementum, and the alveolar bone.

I. Types of Occlusal Contacts

A. Functional Contacts

Functional contacts are the normal contacts that are made between the maxillary teeth and the mandibular teeth during chewing and swallowing. Each contact is momentary, so the total contact time is only a few minutes each day.

B. Parafunctional Contacts

Parafunctional contacts are those made outside the normal range of function.

- They result from occlusal habits and neuroses.
- They are potentially injurious to the periodontal supporting structures, but only in the presence of dental biofilm and inflammatory factors.
- They create wear facets and attrition on the teeth.
- They can be divided into the following:
  - Tooth-to-tooth contacts: Bruxism, clenching, tapping.
  - Tooth-to-hard-object contacts: Nail biting; occupational use of such objects as tacks or pins; use of smoking equipment, such as a pipe stem or hard cigarette holder.
  - Tooth-to-oral-tissues contacts: Lip or cheek biting.
II. Proximal Contacts

Proximal contacts serve to stabilize the position of teeth in the dental arches and to prevent food impaction between the teeth. Attrition or wear of the teeth occurs at the proximal contacts.

A. Drifting

- When proximal contact is lost, teeth can drift into spaces created by unreplaced missing teeth.
- There is a natural tendency for mesial migration of teeth toward the midline.
- In the absence of disease, the surrounding periodontal tissues adapt to repositioned teeth.

B. Pathologic Migration

- With destruction of the supporting structures of a tooth as a result of periodontal infection, and with a force to move a tooth weakened by disease and bone loss, migration of the tooth can result.
- Pathologic migration occurs when disease is present; in contrast, drifting is migration with a healthy periodontium.

Trauma from Occlusion

Periodontal tissue injury caused by repeated occlusal forces that exceed the physiologic limits of tissue tolerance is called trauma from occlusion. Other names are periodontal traumatism, occlusal traumatism, and periodontal trauma.

I. Types of Trauma from Occlusion

- Primary trauma from occlusion results when:
  - Excessive occlusal force is exerted on a tooth with normal bone support.
  - Example: the effect of a new restoration placed above the line of occlusion.
- Secondary trauma from occlusion occurs when:
  - Excessive occlusal force is exerted on a tooth with bone loss and inadequate alveolar bone support.
  - The ability of the tooth to withstand occlusal forces is impaired.
A tooth has lost the support of the surrounding bone; even the pressures of what are usually considered normal occlusal forces may create lesions of trauma from occlusion.

II. Effects of Trauma from Occlusion
The attachment apparatus (periodontal ligament, cementum, and alveolar bone) has as its main purpose the maintenance of the tooth in the socket in a functional state. In a healthy situation, occlusal pressures and forces during chewing and swallowing are readily dispersed or absorbed and no unusual effects are produced.

A. Excess Forces

- When the forces of occlusion are greater than can be taken care of by the attachment apparatus, damage can result.
- Circulatory disturbances, tissue destruction from crushing under pressure, bone resorption, and other pathologic processes are initiated.

B. Relation to Inflammatory Factors

- Trauma from occlusion does not cause gingivitis, periodontitis, or pocket formation. The steps in the development of inflammatory disease and pockets are outlined on page 252.
- In the presence of inflammatory disease, the existing periodontal destruction may be aggravated or promoted by trauma from occlusion.

III. Methods of Application of Excess Pressure
To understand the nature of the occlusal forces that can cause periodontal trauma from occlusion, it is helpful to recognize types of tooth contacts that can overburden a tooth or a group of teeth.3

A. Individual Teeth That Touch Before Full Closure
The contact is premature and may put excessive force on an individual tooth.

B. Two or Only a Few Teeth in Contact During Movement of the Jaw
The teeth involved receive a disproportionate amount of force.

C. Initial Contacts on Inclined Planes of Cusps
Following the initial contact, when the teeth are brought together in a closed position, there may be excess pressure on the teeth where initial contact was made.
D. Heavy Forces Not in a Vertical or Axial Direction

- Normal occlusal relationships imply a direct cusp-to-fossa position during closure, with the force of occlusion in a vertical direction toward the tooth apex and parallel with the long axis.
- When pressures are exerted laterally or horizontally, excess force is placed on the periodontal attachment apparatus.

E. Increased Frequency, Intensity, and Duration of Contacts

In the presence of parafunctional habits, such as bruxism, clenching, tapping, or biting objects, many more than the usual number of tooth contacts are made each day, and the intensity and duration are altered.

IV. Recognition of Signs of Trauma from Occlusion

No one clinical or radiographic finding clearly defines the presence of trauma from occlusion. Diagnosis of the condition is complex. The possible observations listed as follows are looked for specifically and recorded for evaluation and correlation with the patient history and all other clinical determinations.

A. Clinical Findings That May Occur in Trauma from Occlusion

- Tooth mobility.
- Fremitus.
- Sensitivity of teeth to pressure and/or percussion.
- Pathologic migration.
- Wear facets or atypical incisal or occlusal wear.
- Open contacts related to food impaction.
- Neuromuscular disturbances in the muscles of mastication. In severe cases, muscle spasm can occur.
- Temporomandibular joint symptoms.

Everyday Ethics

Many of the first-year dental hygiene students struggled to learn the specific classifications of malocclusion and how to recognize them in their patients.
The problem was often a locker room discussion item, and it was agreed that they noticed that the instructors didn't always look for the details of a patient's occlusion when the record was checked.

One clinic day Roxanne was confused, and she decided to just write anything down on the patient's chart. When the instructor came to check the oral examination, she questioned why Roxanne had the classification documented as a Class II (distoclusion). The student just shrugged her shoulders and said, “I don't know.”

Questions for Consideration

- What are the issues with Roxanne's apparent lack of knowledge about occlusion and saying “I don't know” to her teacher?
- What should Roxanne do to be more accurate with her clinical charting and documentation?
- Can Roxanne “justify” her actions to the patient and to the instructor? Give a rationale.

B. Radiographic Findings

Characteristics that may occur in trauma from occlusion include:

- Widened periodontal ligament spaces, particularly angular thickening (triangulation). This finding frequently occurs in conjunction with tooth mobility.
- Angular (vertical) bone loss in localized areas (see Figure 13-20).
- Root resorption.
- Furcation involvement.
- Thickened lamina dura. Although related to occlusal forces, thickened lamina dura should not be considered a detrimental or destructive effect of trauma from occlusion. It may be a defense reaction to strengthen tooth support against occlusal forces. Thickened lamina dura is frequently associated with teeth that have undergone orthodontic treatment.

References

**TEXTBOOK- WILKINS 10th**


Suggested Readings


