Occlusion in Complete Denture

Types of Occlusion

1- Balanced occlusion
2- Monoplane occlusion
3- Lingualized occlusion

Balanced occlusion

It refers to the bilateral, simultaneous, anterior, and posterior occlusal contact of teeth in centric and eccentric positions.
Developed to lessen or limit tipping or rotating of the denture bases in relation to the supporting structures.
There should be at least three points of contact in the occlusal plane. Two are located posteriorly and one anteriorly. Absent in natural dentition.

Parts of the occlusal scheme

Occlusal scheme has three units

1). Incising units

2). Working units

3). Balancing units

Incising units: include all four incisors.

The requirements of the Incising units:

(a) These units should be sharp in order to cut efficiently.

(b) The unit should not contact during mastication except during protrusion.

(c) They should have as flat incisal guidance as possible considering esthetics and phonetics.

(d) They should have increased horizontal overlap to allow for base settling without interference.

Working units: Include the canines & the posterior teeth of the side towards which the mandible moves.

In lateral excursion: (working side):

- ***Anterior teeth*-** the maxillary & mandibular anterior teeth contact on the working side.
- ***Posterior teeth*-** the buccal & lingual cusps of the maxillary & mandibular posterior teeth are in contact. If lingualized occlusion, the maxillary lingual cusp will be in contact with the mandibular lingual cusp.

The requirements of the Working units:

(a) They should be efficient in cutting and grinding.

(b) They should have decreased bucco-lingual width to minimize the work force directed to the denture foundation.

(c) They should function as a group with simultaneous harmonious contacts at the end of the chewing cycle and during eccentric excursions.

(d) The occlusal load should be directed to the anterioposterior center of the denture.

(e) Plane should be parallel to the mean foundation of the ridge.

Balancing Units: includes canines & posterior teeth opposing the working side.

In lateral excursion: (balancing side):

- ***Anterior teeth***- the maxillary & mandibular anterior teeth may contact on the balancing side.
- ***Posterior teeth***- the lingual cusps of the maxillary teeth will be in contact with the buccal cusps of the mandibular teeth. With monoplane-balanced occlusion, usually, only the second molars are in contact or the balancing ramp.

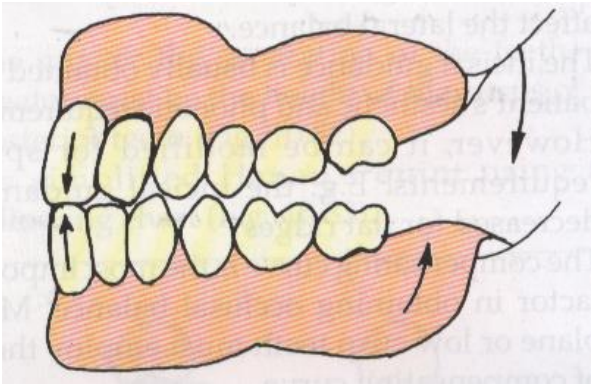
The requirements of the Balancing Units:

(a) They should contact on the second molars when the incising units contact in function.

(b) They should contact at the end of the chewing cycle when the working unit contact.

(c) They should have smooth gliding contacts for lateral and protrusive excursions.

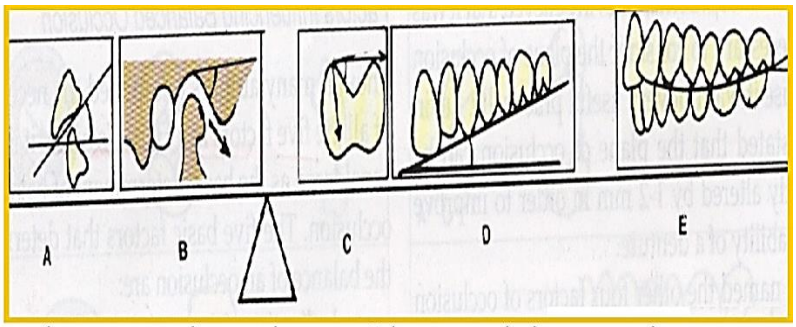
In natural teeth when the mandible is protruded so that the incisal edges of the upper & the lower teeth contact, there is a gap between the upper & lower posterior teeth, this is termed as “Christensen’s phenomenon”.



Factors affecting balanced occlusion (Law of Articulation) (Hanau's quint)

There are five factors involved in eccentric occlusal balance in complete dentures.

1- Condylar guidance.
2- Incisal guidance.
3- The occlusal plane.
4- The compensatory curves.
5- Cusp angulation (Relative Cusp Height).



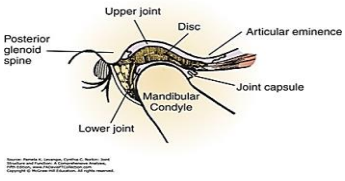
A). Incisal guidance B). Condylar guidance
C). Cuspal angulation D).plane of occlusion
E). Compensating curve.

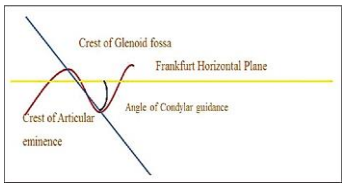
1- Condylar Guidance: The angle between the protrusive condyle path (down the eminence) and a horizontal reference plane (Frankfort horizontal plane). It is a definite anatomic feature about 33^0 that depends on the inclination of the floor of the glenoid fossa. It should be determined on the patient and set on the articulator by eccentric records so that the patient's TMJ is in harmony with the occlusion programmed on the articulator. The steeper the condylar guidance, the more separation of the teeth that will occur when the mandible moves in a protrusive or lateral movement **(Christensen's phenomenon)**. If the condylar angle (angle between the path of the condyle and the Frankfort horizontal plane) is steep, it's difficult to produce balance occlusion because when the condyle travels downward and forward large space is created posteriorly when the anterior teeth are edge to edge. So compensation should be made by altering the other factors to obtain the desired balance. It is the only factor that can be recorded from the patient, the dentist has no control over the condylar inclination and cannot change or modify it to fit particular occlusion.

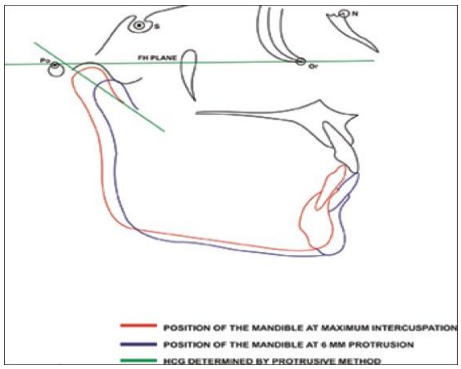
Components of condylar guidance

a) Horizontal condylar guidance: guides the forward movement for protrusive balance.

b) Lateral condylar guidance: guides the sideward or lateral movement of the mandible.







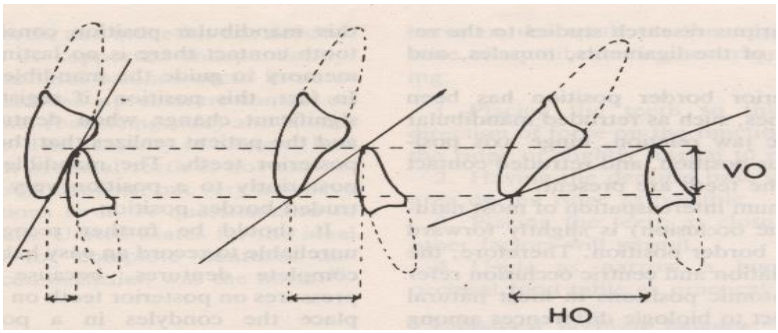
2- Incisal Guidance

Defined as: The influence of the contacting surfaces of the mandibular and maxillary anterior teeth on mandibular movements. Incisal guidance occurs during protrusive movements in which mandibular teeth move downward & forward. Incisal guidance is influenced by esthetic, phonetic, ridge relations, arch shape, and inter ridge space. If the incisal guidance is steep, steep cusps or occlusal plane or steep compensatory curve is needed to balance occlusion. It is determined by the dentist & customized during anterior try-in in which the desired overjet & overbite are determined. This angle varies directly with the vertical overbite and inversely with the horizontal overjet, if the overjet is increased, the inclination of incisal guidance is decreased. The incisal guide angle should be acute with suitable vertical overlap and horizontal overlap to achieve balanced occlusion**.** This angle is set to 10° in CD and not exceeding 20°.

Component of incisal guidance:

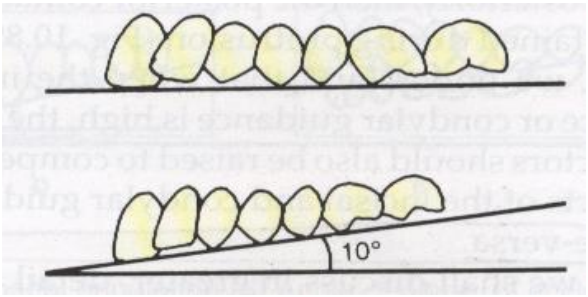
1) Horizontal component (overjet)

2) Vertical component (overbite).



3) Plane of Occlusion or Occlusal Plane

Defined as "An imaginary surface which is related anatomically to the cranium and which theoretically touches the incisal edges of the incisors & the tips of the occluding surfaces of posterior teeth. It represents the mean curvature of the surface. The occlusal plane is established in the anterior by the height of the lower cuspid, which is nearly coincident with the commissure of the mouth, and in the posterior, by the height of the retromolar pad. It is also related to the ala-tragus line. It should be nearly parallel to the ridges, raising the occlusal plane in the posterior will minimize the vertical separation of the teeth in eccentric movement and aid in balancing denture occlusion. Tilting of the plane >10^{o} is not advisable.



4) Compensating Curve

"The anteroposterior and lateral curvatures in the alignment of the occluding surfaces and incisal edges of artificial teeth which are used to develop balanced occlusion"**.** Determined by the inclination of posterior teeth and their vertical relationship to the occlusal plane. There are two types of curves:

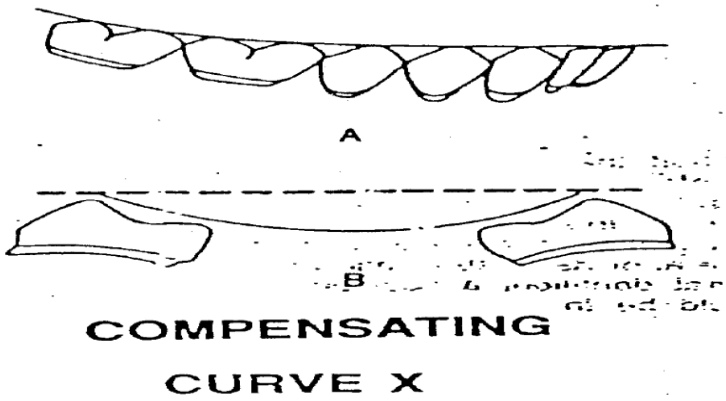
(1) **Anterioposterior compensating curve- Curve of Spee**

Refers to the anteroposterior curvature of the occlusal surfaces. Anatomic curvature of the occlusal alignment of teeth beginning at the tip of lower canine and following the buccal cusps of the natural premolars and the molars,

continuing to the anterior border of the ramus" as described by Graf Von Spee. When the patient moves his mandible forward, the posterior teeth set on this curve will continue to remain in contact. Thus avoiding disocclusion.

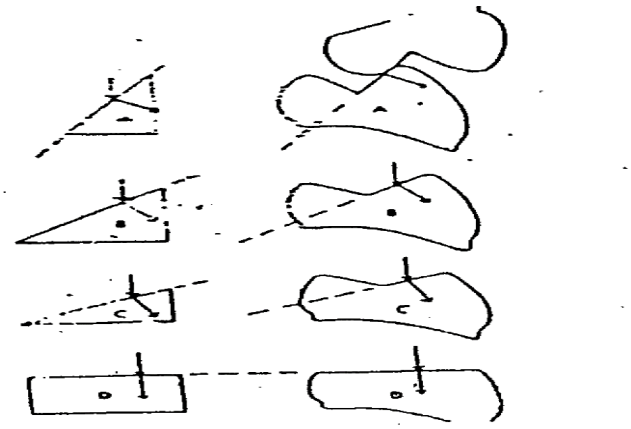
(2) Lateral compensating curves - Curve of Wilson

Refers to the mediolateral curve that contacts the buccal and lingual cusp tips on each side of the arch. It results from the inward inclination of the lower posterior teeth, making the lingual cusps lower than the buccal cusps on the mandibular arch; the buccal cups are higher than the palatal cusps on the maxillary arch because of the outward inclination of the upper posterior teeth. For mandibular teeth, the curve is also concave and for maxillary teeth it is convex.



5- Cuspal Angulation

Define as; "Angle made by the average slope of a cusp with the cuspal plane measured mesiodistally or buccolingually"**.** It is an important factor that modifies the effect of the plane of occlusion & the compensating curves. Mesiodistal cusps are reduced to prevent the locking of cusps. In shallow bite cases, the cuspal angle should be reduced to balance the incisal guidance. In deep bite cases with steep incisal guidance, the jaw separation is more during protrusion. Teeth with high cuspal inclines are required for these cases.



CUSP HEIGHT

Interaction of the five factors

Of the four factors that the dentist can control two of them **(the incisal guidance and the plane of occlusion)** can be altered only a slight amount because of esthetic and physiologic factors.

The important working factors for the dentist to manipulate are **the compensating curve and the inclinations of the cusp** on the occlusal surfaces of the teeth.

For the balanced occlusion, it is important to use an adjustable articulator

How to record the condylar guidance?

After recording of jaw relation (orientation relation, vertical, centric jaw relation) then a protrusive record should be made, inorder to set the condylar guidance on the articulator according to the following steps: -

1. place V shape notch.

2. allow the patient to protrude a minimum of 5-6mm, but less than 12mm.

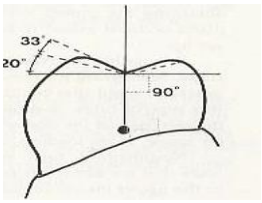
3. place elastomeric registration material between the occlusal rim while the patient close in a protruding position.

4. after the complete setting of material, the record base and registration are removed, and placed on articulator.

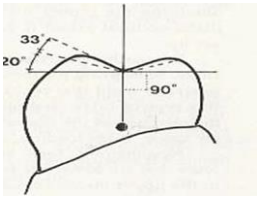
5. on the articulator the condylar element released from the hinge position, the record approximated. The condyle element is rotated until there is maximum interdigitating of the registration and opposing occlusal rim.

Types of posterior teeth

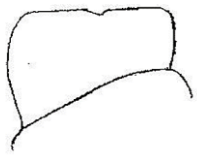
1**. An anatomic tooth_**is one that is designed to simulate the natural tooth form. The standard anatomic tooth has inclines of approximately 33 degree or more.



2. When the cusp incline is less steep than the conventional anatomic tooth of 33 degree it can be classified as a **modified or semi-anatomic_**tooth. It can be considered basically anatomic and will articulate in three dimensions.



3. A non-anatomic_tooth is flat and has no cusp heights to interdigitate with an opposing tooth and has depression or groove to enhance its grinding effect on food. They articulate in only two dimensions.



Selection of Posterior Tooth Forms

Factors affecting the selection of posterior teeth forms:

1- The capacity of the ridge to receive and resist forces of mastication.

2-Inter ridge distance.

3- Ridge relationship.

4-Esthetics.

5- Patients age and neuromuscular coordination.

Requirements of balanced occlusion:

l-All the teeth on the working side should glide evenly against the opposing teeth.

2- No single tooth should produce any interference or disocclusion of the other teeth.

3- All the teeth should be contacts in the balancing side but they should not interfere with the smooth gliding movements of the working side.

4-There should be simultaneous contact during protrusion.

General considerations for balanced occlusion:

1- The wider and larger the ridge the closer teeth to the ridge, the greater the lever balance.

2- The smaller and narrower the ridge and the farther the teeth from the ridge, the poorer the lever balance.

3- The more lingual (inside) the teeth are placed in relation to the ridge crest, the greater the balance.

4- The more centered the force of occlusion anteroposteriorly, the greater the stability of the base.

5- Previous denture-wearing experience.

Advantages of Balanced Occlusion

1- Esthetic
2- Distribution of load
3- Stability
4- Functional movement
5- Efficiency
6- Comfort

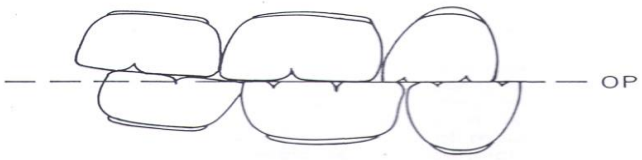
Disadvantages of Balanced Occlusion

1- More occlusal disharmony during the setting of teeth and difficult to correct by adjustment.
2- Stable bases and precise jaw closer is required.
3- Increased horizontal forces due to the presence of an incline plane of the cups.
4- Difficult to adapt in jaw relation other than class l.

Balanced Occlusion with Non-Anatomic or Flat Teeth

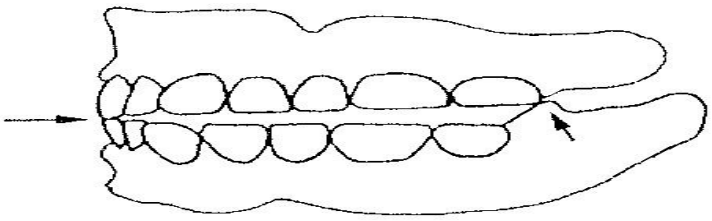
Balanced occlusion with cuspless teeth can be achieved in several ways:

1- Zero-degree teeth with the inclination of the lower second molar.

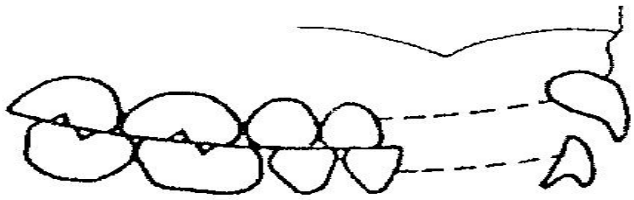


tilting the second molar

2- Zero-degree teeth with balancing ramps placed posterior to the most distal molar.



3. Zero-degree teeth set to steep compensatory.



Monoplane or None balanced Articulation

It is also called **Neutrocentric occlusion.** This type of occlusion assumes that the anterior-posterior plane of occlusion should be parallel to the denture foundation area and not dictated by condylar inclination. This type of occlusion involves:
-The plane of occlusion is completely flat. There is no curve of Wilson or curve of Spee (no compensating curve) incorporated into the setup.
- There is no vertical overlap of the anterior teeth.
- When setting these teeth, the horizontal and lateral condylar guidance should be set at zero.
- Non-anatomical cuspless teeth (zero degree) are used.
-The occlusal plane is flat and parallel to the upper and lower residual ridges.
- The teeth are set flat with no medial or lateral inclination, elimination of inclined plane, therefore, more stability,
- The patient is instructed to avoid incising with anterior teeth to avoid displacement of the denture.
-The buccolingual width of the teeth is reduced.
- The number of teeth is reduced (removing the second molar teeth) to direct the forces in the 1st molar and bicuspid areas.
-When the foundation tissue is compromised, i.e**.** is severely resorbed ridge, knife-edge, or one that is covered with thick movable flabby tissues, favorable control of occlusal forces can be utilized by the use of non-anatomic teeth arranged following the monoplane occlusion concept.

Indications of the monoplane occlusion (Neutrocentric concept)

1) Flat ridge(s).
2) Class II jaw relations.
3) Class III jaw relations.
4) Maxillofacial patients.
5) Handicapped patients.
6) Crossbite.
7) Doubtful or without any perfect centric relation records.

Advantages of Monoplane (Neutrocentric) Occlusion

1- Simple and less time-consuming.
2- Need less precise jaw relation records.
3- Lateral forces are reduced by eliminating (neutralizing) cuspal inclines.
4- Easier occlusal adjustments.
5- Occlusion is not locked.
6- Good for patients with Class II (Retrognathic), Class III (Prognathic), and crossbite ridge relations.
7- For the geriatric patient.

Disadvantages of Neutrocentric Occlusion

1-Least esthetic

2- Poor bolus penetration

3- Cannot be balanced in eccentric excursions.

Lingualized Occlusion

The lingualized occlusion concept is a variation of the bilaterally balanced occlusion concept. The premolars and molars are arranged so that only the lingual cusps of the upper posterior teeth make contact with the central fossae of the lower posterior teeth. This type of occlusion involves:

- The use of a large upper palatal cusp against wide lower central fossa,

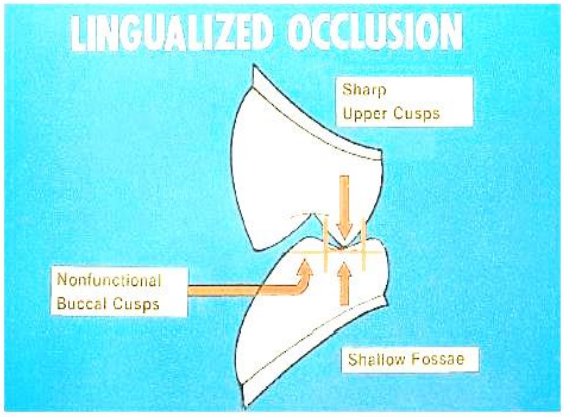
- The buccal cups of the upper and lower teeth do not contact each other.

- It is identified by the occlusal contacts of the maxillary lingual cusps of the posterior teeth initially with occlusal surfaces of the mandibular teeth in maximum intercuspation, and the continuous contacts of the lingual cups with mandibular teeth during various movements of the mandible.

- This concept also can be considered as a balanced articulation, the teeth are anatomical or semi anatomical teeth with some modification:

1- Sharp maxillary lingual cusp in the posterior teeth opposing a widened central fosse on the occlusal surface of the mandibular antagonists in maximum intercuspation and the buccal cusp is out of occlusion.

2- The mandibular teeth have reduced facial and lingual cusps and widened central fosse.



Advantages of Lingualized Occlusion

May be used incorporating many of the advantages but few of the disadvantages of other occlusal types:

1-Esthetics
2. Better penetration of the food bolus
3. Decrease of vertical and lateral forces
4. Simpler technique, less precise CR records
5. Useful in a wide variety of patient
6. Added stability is gained during parafunctional movements with a balanced occlusion.
7. Easier to adjust occlusion
8. May be used in Class II, Class III, and crossbite

Characteristic	**Anatomic**	**Lingualized**	**Neutrocentric**
l. Better esthetics	+	+	-
2. Ease of penetration (decreased vertical stress)	+	+	-
3. Denture stability during parafunctional movement.	+	+	-
4. Simpler technique, less precise records	-	+	+
5. Decreased lateral forces	-	+	+
6. Ease of adjustment	-	+	+
7. Good for Class ll and Class III jaw relation.	-	+	+
8- Good stability, forces centralized and neutralized	-	+	+

Factors affecting the selection of the occlusal types in Complete Denture

l- Age of the patient.

2- Condition of oral health (soft tissue and residual ridge).

3- Social status and demand of the patient esthetic and function.

4- Skill and philosophy of the dentist in occlusion concept, the dentist must really on clinical skill and experience when selecting an occlusal type for the patient.

5- The availability of the material and dental laboratory efficiency.

Factors affecting an accurate start for denture occlusion

l- Accurate measurement of vertical dimension of occlusion.

2- Accurate recording of centric jaw relation.

The previous two factors depend on the skill of the dentist and clinical judgment.

3-Properly constructed bite rim (strong, polished, smooth, round equal thickness border resembling finished denture).

In general, all complete denture occlusions have certain common factors in their design for example; occlusion requires that the teeth in the upper and lower dentures contact in centric occlusion when the mandible is in centric jaw relation to the maxilla. Tooth contacts in this relationship are established to distribute stresses evenly over the entire denture base supporting area to preserve the supporting structure that must carry the load during function.