Basic concepts of occlusion

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Occlusion

- Oc + clusion
- meaning
- Oc = Up
- Clusion = closure
Occlusion

• Contact relationship of upper and lower teeth
• Interarch relationship
• Facial and lingual view
TERMINOLOGY OF OCCLUSION

• **IDEAL OCCLUSION** – PRECONCEIVED THEORITICAL **CONCEPT OF OCCLUSAL STRUCTURAL & FUNCTIONAL RELATIONSHIPS** THAT INCLUDES IDEALISED PRINCIPALS & CHARACTERISTICS THAT AN OCCLUSION SHOULD HAVE

• **MORPHOLOGICAL OCCLUSION(ORTHODONTIC CONCEPT)** - BASED ON THE RELATIONSHIP OF CUSP & GROOVE i.e. MB CUSP OF MAXILLARY IST MOLAR FITTING IN THE BUCCAL GROOVE OF MANDIBULAR IST MOLAR

  IT IS CONCERNED WITH RELATION BETWEEN THE MAXILLARY & MANDIBULAR TEETH IN RETRUDED POSITION(CR) & INTERCUSPAL POSITION(CO)
• **BALANCED OCCLUSION** – AN OCCLUSION IN WHICH BALANCED AND EQUAL CONTACTS ARE MAINTAINED THROUGHOUT THE ENTIRE ARCH DURING ALL EXCURSIONS OF MANDIBLE *(PROSTHODONTIC CONCEPT)*

• **FUNCTIONAL OCCLUSION** – AN OCCLUSION WHICH WILL PROVIDE HIGHEST EFFICIENCY DURING ALL EXCURSIVE MOVEMENTS OF MANDIBLE & WHICH IS WITHOUT PAIN & REMAINS IN STATE OF HEALTH

• **THERAPEUTIC OCCLUSION** – AN OCCLUSION THAT HAS BEEN MODIFIED BY APPROPRIATE THEURAPEUTIC MODALITIES IN ORDER TO CHANGE A NONPHYSIOLOGIC OCCLUSION TO ONE THAT IS AT LEAST PHYSIOLOGIC IF NOT IDEAL
Normal

- Always a range
  - the absence of disease
  - include not only a range of anatomically acceptable values but also physiological adaptability.
NORMAL OCCLUSION (STRANG)

• “Structural composite consisting fundamentally of teeth & jaws, characterized by a normal relationship of so called occlusal inclined planes of teeth that are individually and collectively located in architectural harmony with their basal bones & with cranial anatomy; exhibit correct proximal contacting & axial positioning & have associated with them normal growth, development, location & correlation of all environment tissue & parts”
Normal occlusion

- Not ideal
- it is a range
- Acceptable values
- Physiologically adaptable
- Molars class- I
Therapeutic occlusion

- treated occlusion
- to counteract traumatic occlusion.
Physiologic occlusion

• No signs of occlusion related pathology of soft or hard tissue
• may not be an ideal occlusion
Traumatic occlusion

- produces abnormal occlusal stress
- capable of producing or has produced an injury to the periodontium.
Ideal occlusion

• an aesthetic and physiologic ideal
• functional harmony
• stability of masticatory system & Neuromuscular harmony
Ideal occlusion

- Ideal concept
- Optimum esthetic dental skeletal and soft tissue
- Optimum function
- Optimum stability
- Perfect interdigitation
- Ideal overjet/overbite
- Molar/angulation/inclination/tight contacts/no rotation/cos
Class I canine

• The maxillary canine has a cusp-embrasure relationship with the mandibular canine and first premolar. The tip of its cusp is slightly mesial to the embrasure.
Coinciding midline

• The maxillary incisors overlap the mandibular incisors and the **midline** of the arches match.
CENTRIC OCCLUSION

• Maximum intercuspal position
CENTRIC OCCLUSION

• Majority of individuals have maximum intercuspation 1-2mm forward of centric relation naturally.
Centric occlusion

• Maxillo-mandibular position determined by teeth
• considered coincident with ‘maximum intercuspation’ or ‘habitual closure’
• Majority of individuals have maximum intercuspation 1-2mm forward of centric
Centric occlusion

• Vary considerably during life of individual

• Factors responsible for changes:
  - Eruption of teeth
  - occlusal wear
  - changes from deciduous to permanent teeth
  - Restorations
Retrusive functional occlusion

The most retrusive position is the centric occlusion in complete dentures CR and CO at the same point
CENTRIC RELATION (CR)

- The position of the mandible in relation to maxilla irrespective of tooth contact
- The most stable joint position
Condyle in centric relation

- most anterosuperior position in the articular fossa resting against the posterior slope of the articular eminence
Condyle in centric relation

- is in relation with the thinner most part of the articular disc
Slide in centric

• Sliding from premature contact in centric relation to maximum intercuspal position (centric occlusion) is known as Slide in centric
Freedom in centric

- If premature contact in centric relation is removed by grinding then the ability to close from maximum intercuspal position (centric occlusion) without interference any place between CR and CO is known as Freedom in centric
**Figure 16-44** A, Incorrect assumption about the normal position of the disk-condyle assembly. B, Correct position of the assembly in centric relation.
Classification of Occlusion

Based on Mandibular Position

- centric
  - Functional
  - Lateral
    - Canine guided
  - protrusive
    - Non functional
- Ecentric
  - Group function
Centric Relation (CR)

- maxillomandibular relationship Defined by the position of the condyles, rather than the teeth
- condyles articulates with the thinnest avascular portion of their respective discs
- in the anterosuperior position against the slope of articular eminence.
- This position is independent of tooth contact
- Hinge position
Centric relation (retruded contact position)

- “Relation of mandible to maxilla when the condyles are in most superior and retruded position in their glenoid fossa with the articular disc properly interposed”

- It is called as terminal hinge position

- Bone to bone relationship

- Most retruded unstrained position of mandible from which opening and lateral movements can be made
Centric Relation

- Purely rotary movement about the transverse horizontal axis
Eccentric occlusion
• contact of teeth during movement of mandible.
  ➢ Functional occlusion
  ➢ Non-functional occlusion
• a) *Functional occlusion*
working side occlusion
towards which the mandible moves.
• functional occlusion can be of two types
  Lateral functional occlusion
  Protrusive functional occlusion
• lateral functional occlusion can be of two types.
1. Canine guided occlusion

• During lateral mandibular movement
• the opposing upper and lower canines of the working side contact
• disclusion of all posterior teeth on the working side and balancing sides.
2. Group function occlusion –

contact of canine and other posterior teeth on the working side during lateral movement of mandible
Protrusive functional occlusion

eccentric contacts during forward /protrusion of mandible. Ideally the six mandibular anterior teeth contact along the lingual inclines of the maxillary anterior teeth posterior disocclude.
Incisal guidance

• Lingual surface of upper anterior teeth guides the mandible in protrusion

• The anterior teeth protect the posterior teeth by providing for a plane of guidance during excursions, thus allowing the cusps of the posterior teeth to disclude rather than strike one another during lateral or protrusive movements from centric relation.
Non-functional occlusion

• They are tooth contacts that occur in the segment away from which the mandible moves. For example if the mandible is moved to the left side, contact occur on right side.
Mutually protected occlusion

- a **mutually protected occlusion** is an occlusal scheme in which the anterior teeth protect the posterior teeth, and vice versa.

- **Mutually Protected**: Posterior teeth prevent excessive contact of the anterior teeth in maximum intercuspation. Anterior teeth disengage the posterior teeth in all mandibular excursive movements.
Bilaterally balanced occlusion

• Balanced occlusion in complete dentures can be defined as stable simultaneous contact of the opposing upper and lower teeth in centric relation position and a continuous smooth bilateral gliding from this position to any eccentric position.

• **Bilateral occlusal balance** – this is present when there is equilibrium on both sides of the denture due to simultaneous contact of the teeth in centric and eccentric occlusion. It requires a minimum of three contacts for establishing a plane of equilibrium.
Advantages of balanced occlusal

• Distribution of load
• Stability
• Reduced trauma
• Functional movement
• Efficiency
• Comfort
GUIDANCE OF TOOTH:

Condylar guidance

• Path of transcranial rotation axis of condyles travel during mandibular opening.

• CG Angle
  • depends on steepness of articular eminence
  • considered to be fixed factor
  • unalterable
• **CONDYLAR GUIDANCE ANGLE:**
  - at which condyle moves away from horizontal reference plane.

• CG angle when mandible move laterally,
  • Greater than when mandible protrudes
Difference b/w natural and prosthetic occlusion

**Natural occlusion**
- The natural tooth is suspended by the PDL
- Under loading, the resilient PDL provides a shock-absorbing feature for the teeth
- The mean value for axial mobility of the teeth is 25 to 100 µm

**Prosthetic occlusion**
- The dental implant is in direct contact with the bone
- A high stress concentration occurs at the crestal bone when loaded
- The axial displacement of osseointegrated implants is 3 to 5 µm
• **Natural occlusion**

  • During lateral loading, the tooth moves at the apical third of the root, and the force is instantly dissipated from the crest of the bone along the root.

  • Overloading of teeth include widening of the PDL, fremitus, and mobility of the tooth.

• **Prosthetic occlusion**

  • The implant moves at 10-50 µm laterally; and the concentration of forces is at the crestal bone.

  • Occlusal overloading of implants may also lead to mechanical complications of the supported prostheses, such as screw loosening or fracture, abutment or prosthesis fracture, or even implant fracture.
Important differences between natural and artificial occlusion

- Natural teeth function independently and each tooth disperses the occlusal load.
- Proprioceptive impulses from peridontium avoid the occlusal prematurities.
- Artificial teeth function as a group and occlusal loads are not individually managed.
- There is no feedback & the denture rests in centric relation. Any prematurities can shift the base.
Occlusal Contacts and Intercuspal Relations between Arches

1. Functional / Centric Holding / Stamp
   
   **Cusps**: Palatal cusp of Maxillary post. teeth and Buccal cusp of Mandibular post. teeth are actually occluded

2. Non Functional / Non Supporting Cusps: Remaining cusps
   
   • Supporting cusp – lingual cusp of maxillary posterior teeth and the buccal cusp of posterior mandibular teeth
   
   • Centric stop – areas of occlusal contact that a supporting cusp make with opposing teeth in centric occlusion
Guiding/shearing/non supporting cusp

- Cusp free of contact during centric occlusion
- Maxillary buccal and mandibular lingual cusp
Supporting/centric holding/stamp cusp

• Cusp that occlude with opposing teeth fossa or marginal ridges
• Eg: maxillary paltal and mandibular buccal cusp
Lingual cusp of maxillary teeth and facial cusp of mandibular teeth are *stamp or centric holding cusp/supporting cusp*.

The facial cusp of maxillary teeth and lingual cusp of mandibular teeth are *shearing cusp*.
Cusp to fossa occlusion
Cusp fossa relationship (lingual cusp)

- **Cusp fossa occlusion:** In this type of occlusion, the stump cusp of one tooth occludes in a single fossa of a single opponent.
Ridge fossa relationship

Lingual view of the teeth in centric occlusion.
Cusp ridge/embrasure pattern of occlusion

- It is also called as tooth to two teeth occlusion or cusp embrasure occlusal pattern.
- Fitting one stamp cusp into fossa and fitting another cusp into embrasure area of two opposing teeth.
Cusp embrasure relationship (buccal cusp)

- Cusp-embrasure occlusion: In this type of arrangement, each tooth occludes with two opposing tooth.
FIGURE 32-29 Cusp-Fossa Pattern of Occlusion
A. Relationships of opposing stamp cusps.
B. Points of occlusal contact.
Curves of occlusion

- Curve of Spee
- Curve of Wilson
- Sphere of Monson
Curve of Spee:

a. Antero-Posterior compensating curve
   Mandibular Incisors to Molars
b. Curve of Wilson:

Transverse Curve

Contacts the Buccal and Lingual cusp
tips of Mandibular posterior teeth of both sides
Curve of Wilson

It is a curve that contacts the buccal and lingual cusps tips of the mandibular posterior teeth.

It helps in two ways

• Teeth aligned parallel to direction of medial pterygoid for optimum resistance to masticatory forces.
• The elevated buccal cusps prevent food from going past the occlusal table.
curvatures
Curve of Monson

Monson (1920),

connected the curve of Spee and curve of Wilson to all cusps and incisal edges, which forms a sphere of a 4 inch radius, mandibular arch adopted itself to the curved segment of a sphere.
Spherical theory

Monson’s Sphere
Made the 4” theory three dimensional

Curve of Wilson

Curve of Spee
c. Curve of Monson:
   All cusps and incisal edges are tangent to the surface of a sphere.
   Radius of sphere approx. 4 inches
   Centre of sphere at Glabella
   This sphere is actually the curve of Monson
Sphere of monsoon
**Curve of Monson**

- 3D model of equilateral triangle
- A sphere of 4 inch radius or 8 inch diameter
Curve of monson

• Includes COS, COW
Curve of monson

- Segment of this sphere touches the cusps of posterior teeth and incisal edges of incisor and condyles
- Centre of the sphere is on glabella
- Mandibular arch adopted itself to the curved segment of a sphere
**Curve of Monson:** Curve of Monson is the curve of occlusion in which each tooth cusp and incisal edge touches or conform to a segment of a surface of a sphere 8 inches (20 cm) in diameter, with its center in the region of the glabella.
Overjet and overbite
Buccinator mechanism

• Teeth are present in the neutral zone where the net pressure of the envelope of muscle and the atmospheric pressure from outside is balanced by the tongue from inside (net pressure is zero)

• Envelop of muscle is formed by the orbicularis oris, buccinators and superior constrictor muscle
Safety Valve Mechanism

- Mandibular intercanine width - complete by 9-10 years of age in both boys and girls.

- Maxillary intercanine width - complete by 12 years of age in girls but continues to grow until 18 years of age in boys.

- The final horizontal growth increments in the mandible causes a forward movement of the mandibular base with its teeth. This basal change eliminates any flush terminal plane tendencies that have persisted beyond the mixed dentition.
“Safety valve mechanism”
In both male & female the maxillary intercanine dimension serves as a “safety valve” for pubertal growth spurts, where there is a basal horizontal mandibular growth, partly unmatched by the maxilla, as the mandible grows downward & forward.
SIX KEYS TO NORMAL OCCLUSION
LAWRENCE F. ANDREWS (1972)

1. MOLAR RELATIONSHIP.
2. CROWN ANGULATION, THE MESIODISTAL "TIP"
3. CROWN INCLINATION (LABIOLINGUAL OR BUCCOLINGUAL INCLINATION)
4. ROTATIONS
5. TIGHT CONTACTS
6. FLAT CURVE OF SPEE / OCCLUSAL PLANE
Molar relationship
Key-1 MOLAR RELATIONSHIP

• The distal surface of the distobuccal cusp of the upper first permanent molar occluded with the mesial surface of the mesiobuccal cusp of the lower second molar
The closure of the distal surface to the mesial surfaces the better the opportunity for normal occlusion.
1. IMPROPER MOLAR RELATIONSHIP.
2. IMPROVED MOLAR RELATIONSHIP.
3. MORE IMPROVED MOLAR RELATIONSHIP.
4. PROPER MOLAR RELATIONSHIP.
Key-2  Mesio-distal crown Angulation

• The gingival portion of the long axis of crown is more distal than the incisal portion
Crown angulation (Tip)

The degree of crown tip is measured by the angle between the
- long axis of the crown
- to a line perpendicular to the occlusal plane.
A ‘plus’ reading when the gingival portion of the long axis of crown is distal to the incisal portion.

A ‘minus’ reading is when the gingival portion of the long axis of crown is mesial to the incisal portion.
KEY 3 – CROWN INCLINATION
(Labiolingual or buccolingual inclination)

It represents the angle formed by a line that is 90° to the occlusal plane and a line that is a tangent to the middle of the labial or buccal long axis of the crown (viewed from mesial or distal).
Crown Inclination
Key-3

• **Labio-lingual crown inclination**
  • Maxillary incisors
    • Positive inclination
  • Mandibular incisors
    • Slightly negative inclination.
Crown inclination of teeth

• A ‘plus’ reading is given if the gingival portion of the tangent line is lingual to the incisal portion.

• A ‘minus’ reading is recorded when the gingival portion of the tangent line is labial to the incisal portion.
• maxillary incisors - have a positive inclination  
  mandibular incisors - have a slightly negative inclination.

• All posterior teeth - have lingual crown inclination (negative inclination)
Key-3: Labio-lingual crown inclination

• The Canines and premolars
  • negative and similar.

• Maxillary first and second molars
  • More negative than canines and premolars.
Angulation Inclination

Fig. 4.23. Average maxillary crown inclination.
anterior crown inclination

- Proper inclination contribute to
  normal overbite
  Normal posterior occlusion,
Improper inclination-

when too straight-up and -down
- they lose their functional harmony and
- over eruption/supraeruption results.
Spacing between teeth -reason

• Gap may be due to insufficiently inclined anterior teeth and are often falsely blamed on tooth size discrepancy
KEY– 4 Absence of rotations

- Arch should be devoid of any rotated tooth.
- A rotated molar occupies more mesiodistal space.
- A rotated incisor occupies less space.
KEY- 4

• Absence of rotation
No rotation
KEY– 5 Tight contacts

• In absence of abnormalities such as genuine tooth size discrepancies, contact point should be tight.

• It should be free of spacing.
KEY – 5

• Tight contact
No spacing
KEY – 6. OCCLUSAL PLANE/CURVE OF SPEE

• SHOULD RANGED FROM FLAT TO SLIGHT CURVES OF SPEE.

• INTERCUSPATION OF TEETH IS BEST WHEN THE PLANE OF OCCLUSION IS RELATIVELY FLAT
A. Deep curve of spee results in a more confined area for the upper teeth, creating spillage of the upper teeth progressively mesially and distally.
• B. A flat plane of occlusion is most receptive to normal occlusion.
C. A reverse curve of spee results in excessive room for the upper teeth.
Key VII – Correct tooth size
Bolton’s ratio

- Bennett and McLaughlin in 1993
- the upper and lower tooth size ratio should be correct
- For proper overjet, overbite and alignment
- If ratio is more than the mean value then mandibular tooth material is in excess
- If it is less, then maxillary tooth material is in excess