PROSTHESIS

COMPLETE DENTURE

LEC.9 Vertical jaw relation

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Vertical relation

Vertical dimension —vertical height of face (vertical height of lower third of face),vertical distance between maxilla and mandible

2 types

I. Vertical dimension of rest V.D.R

- Definition

Vertical height of lower third of face when muscles at minimum tonic contraction "at physiologic rest position"

Where

- ✓ There is balance between action of elevator muscles and action of depressor muscles +gravity so mandible is hanged in relation to maxilla
- ✓ patient set upright ,looking straight forward where Frankfort horizontal plane (canthus tragus line) is parallel to floor
- ✓ Lips just contact and teeth or record block are aparted away from each other(separated)
- ✓ This position is reproducible but can be affected by some variables

How to measure

Place point in the most protruded area of nose and chin and measure distance between them to be vertical dimension of rest

Factors affecting V.D.R

A-Short term variables (in the same day) "reversible"(in short time)

1) head position: if head tilted posterior/backward so increase vertical dimension of rest .and if tilted forward so decrease V.D.R so patient should be at right
2) Stress during stress decrease vertical dimension of rest due to contraction of elevator muscle attached to mandible so patient must be at rest and comfort
3) mouth content: there is great tendency to decrease V.D.R following extraction of natural teeth and for new postural position
4) Pain oral ,prei oral pain or in muscles support mandible so affect V.D.R as aprotective will be assumed

5) Respiration: during inspiration so slight increase vertical dimension of rest and reverse at expiration

B-long term variables (irreversible)(throughout life)

1-aging

- ✓ by aging so increase continuous occlusal wear of teeth so slight decrease vertical dimension of rest as affect muscle which mandible to maxilla in new position
- ✓ by aging so loss of natural teeth which have properioceptors in periodontal ligament which are sensitive to pressure and maintain VD so increase tonus of elevator muscle and approximate mandible to maxilla
- ✓ also present with chronic neuromuscular disorders in elderly patient

2-Proxisim, clenching in natural teeth

- ✓ Bruxism tapping of teeth with movement (eccentric lateral and protrusive)
- ✓ Clenching tapping of teeth without movement

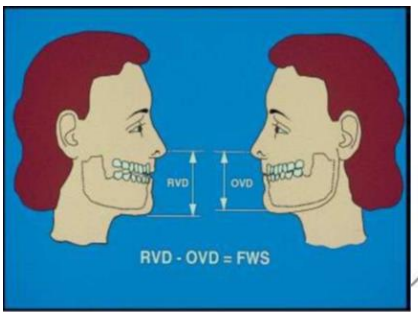
Where muscles with hypertonicity so decrease vertical dimension of rest

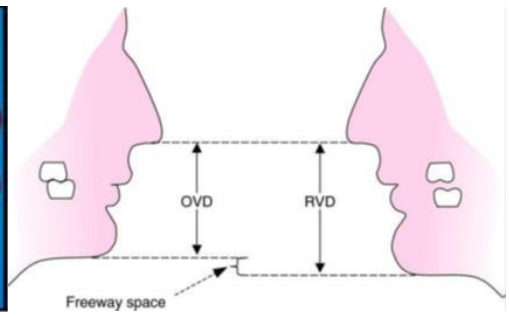
2 .Vertical dimension of 0cclusion V.D.O

❖ Deffinition

Vertical height of lower third of face when patient in maximum intercuspal postion or bite on record block

- ✓ Vertical dimension of occlusion is less than vertical dimension of rest by 2:4mm which is free way space (inter occlusal space(
- ✓ In edentulous patient not have vertical dimension of occlusion so measure vertical dimension of rest and adjust record block to give vertical dimension of occlusion less than V.D.R by 2:4mm





N.B With well-developed ridge

During adjustment in lower and decrease from its height , if found no sufficient wax in lower to set teeth so decrease height in upper and adjust parallelism again and increase height in lower to allow setting of teeth so upper lip will be long

Free way space /interoccIusaI distance

- ✓ Distance between occlusal surface of teeth when mandible in physiologic rest position Difference between V.D.R and V.D.O equal to 2:4mm(in special cases may reach to 9)
- ✓ To be detected by inspection at angle of mouth to be viewed between posterior teeth

Factors affecting free way space

1. ridge resorption : increase ridge resorption so increase amount of free way space
2. lip length : if long lip so increase free way space as if increase height of occlusion rim cause leverage to denture

Importance/significance of free way space with denture

1) allow speech ,mastication without any interference
2) preserve of T.M.J and muscles and ligament
3) preservation of ridge, denture bearing areas
4) allow patient of mentainance normal appearance: restore appearance as if decrease or increase impair esthetic explained in high and low vertical dimension

Effects of in accurate vertical dimension

Effects of excessive increase of vertical dimensian (decrease free way space)

1) pain due to trauma from continuous teeth contact caused by obliterated free way space ,soreness ,localized ulceration along crest of the ridge and sulcus
2) increase bone resorption due to persistent pressure on masticatory mucosa diminished blood supply ,ischemia, and inflammatory process that encourage bone resorption
3) facial and masticatory muscles spasm this is due to

a. muscles are in constant state of strain "not allowed to be relaxed to physiologic length
b. due to continuous strain ,metabolites are accumulated in muscle fibers and

stimulate their constriction

c. patient failed to find relaxed comfortable resting position so TMJ disorders develop

4) T.M.J pain due to muscle spasm

5) impairment in mastication due to masticatory muscles spasm ,stretch

6) bad esthetic,appearance due to over opening of the mouth so elongation of the face at rest lips are aparted and whwen try to get them together ,facial strain appearand increase amount of teeth appear

7) clicking and cluttering between teeth during rest and speaking due to unexpected occlusal contact (noisy).

Effects of excessive increase of vertical dimensian (decrease free way space)

1) poor esthetic Cover closure of mouth lead to aging appearance ,close approximation of nose —chin distance the face appear flabby (sok tissue sag and fall in and lines of face are deepened),mandible become protruded and prognathic appearance
2) reduce masticatory efficiency Jreduce inter arch distance ,reduce the biting forces because muscles of mastication acting from attachment which has been brought close together
3) cheek biting "characteristic feature" due to loss of muscle tone and flabby cheeks tend to become entrapped between teeth during mastication
4) angular chelitis inflammation at angle of the mouth with laceration as has wrinkles associated with fungal infection as result of fallen of vermillion border beyond angle of mouth and deep fold bathed with saliva

☒ causes of angular chelitis

a. long period of edentulous patient
b. low vertical dimension of denture
c. viamen B deficiency

5) pain on T.M J costen's syndrome during occlusion with denture ,condyle pushed upward and posterior press on tympanic membrane and auricle temporal nerve so cause(radiating pain-tennitis-tenderness —mild deafness clicking on T.M.J)(condyle press on ligament contact TMJ to ear)

pain on T.M.J and decrease masticatory efficiency„ poor appearance in high and low vertical dimension)

- ☒ in high vertical —condyle and disk move forward „
- ☒ in low vertical —condyle and disk move back ward

Methods of determination of vertical dimension

Vertical stopper supper and lower posterior teeth oppose to each other, used as guide for vertical dimension and shape of teeth

1-Pretextracting record (patient has teeth (vertical stopper)

a. Profile record
b. Articulating cast
c. Facial measurement

2-Post extracting record (patient without teeth)

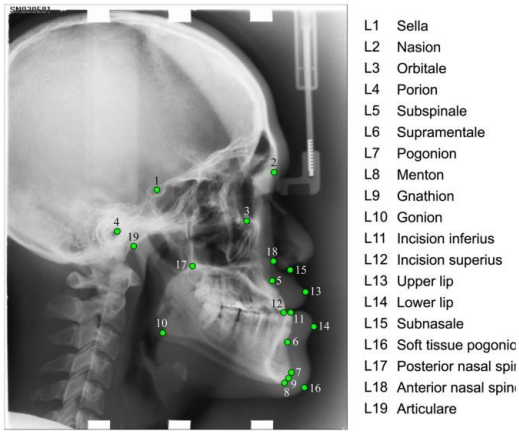
a. Mechanical
b. Physiologic

PRETEXTRACTING RECORD MEASURE `V.D.O

a. profile record

1-Profile photograph

Recorded by photograph to patient where he is at occlusion with good lip support and facial height then enlarge it to life size and measure distance between z anatomical landmark (one in nose ,other in chin) to be vertical dimension of occlusion then after extraction adjust record block to this measurement



2-Profile radiograph

Make lateral cephalometric radiograph where patient in occlusion and measure distance between 2 anatomical landmark ((one in upper "nasion "other in lower "menton") after extraction ,construct record block at this measurement and to be sure make another radiograph

3-Profile sil houette

Adapt soft lead wire on outline contour of the patient face (forehead, brow, nose, sub nasal ،lip,chin) while patient in occlusion then adhere to thick carton to stabilize wire and trimmed to wire outline so when extract teeth adjust record block on patient till template (wire, carton) adapt in its position

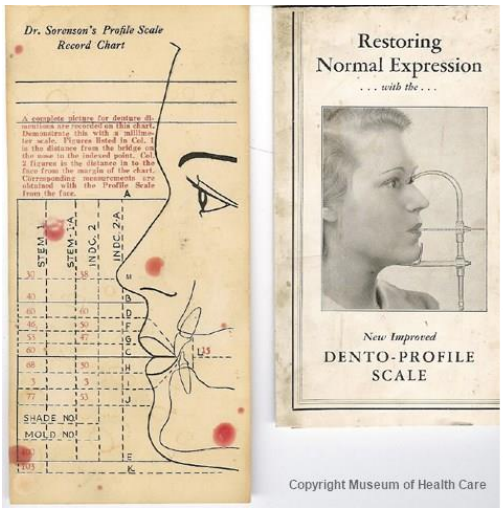
b-ArticuIatinq casts

by 2 methods used provided that patient has vertical stopper

1) Make impression to upper and lower and pour them then mount them and measure distance between 2 fixed anatomical landmark as hamular notch in upper and retromolar pad in lower or incisive papilla in upper and crest of the lower ridge in lower then after extraction adjust record block to give this measurement
2) make impression compound where teeth are present then after extraction ,place teeth in compound and pour it so casts has vertical stoppers of natural teeth so continue as before

c-FaciaI measurement

1-Swensons dent profile scale



Measure distance between bridge of nose and base of nose plus distance from bridge of nose till to parting lines of the lips equal to distance from bridge of nose to inferior border of mandible before extraction and adjust record block to give same measurement

2-Willi gauge

It is advice has fixed arm placed at base of nose and sliding arm adjusted to be at

inferior border of the chin when patient at occlusion so after extraction adjust record block to give same measurement

3-Wright formula

Interpupillary distance on a photograph : interpupillary distance on patient -brow chin distance on photograph :brow chin distance in patient (X)

4-Acrylic face mask

Make impression to face where patient is on occlusion and pour it then make face mask on it ,measure distance between tip of nose and tip of chin then adjust record block to give the same measurement

5-Tatto

Apply tattoo dye on upper and lower anterior mucosa and measure distance between them where patient in occlusion ,after extraction adjust

POST EXTRACTING RECORD (PATIENT WITHOUT TEETH)

A-*MECHANICAL METHODS*

These methods are called so because they do not require any functional movement. They are measured using simple mechanical devices.

Ridge relation **:** It is defined as, " *The positional relationship of the mandibular ridge to the maxillary ridge*"—GPT. It can be measured by two methods namely:

1. Distance from the incisive papilla to mandibular incisors.
2. Parallelism of ridges.

Distance from the incisive papilla to mandibular incisors:

Incisive papilla is a stable landmark that does not change a lot with the resorption of the alveolar ridge. The distance of the papilla to the maxillary incisor edge is 6 mm. Usually the vertical overlap between the upper and lower incisors is 2 mm (overbite). Hence the distance between the incisive papilla and the lower incisors will be approximately 4 mm. Based on this value, the vertical dimension at occlusion can be calculated (Fig. 9.57).

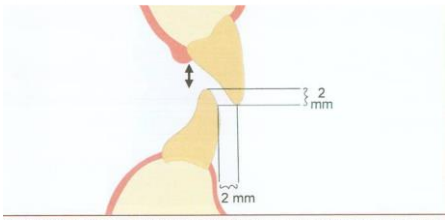


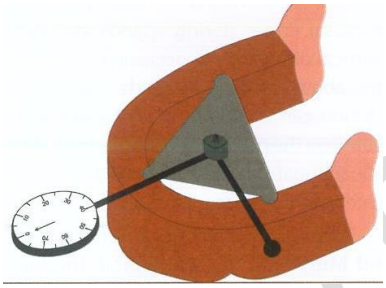
Fig. 9.57: Distance between the incisive papilla of the maxilla and the incisal edge of the lower incisor can be used as a reference to determine vertical jaw relation.

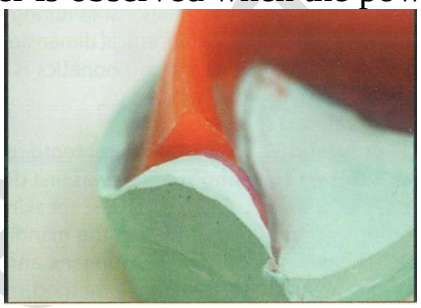
Ridge parallelism: The mandible is parallel to the maxilla only at occlusion. This factor can be used to determine the vertical dimension at occlusion. The mandible of the patient is adjusted to be parallel to the maxilla. This position associated with a 5° opening of the jaw in the temporomandibular joint gives a correct amount of jaw separation.

B-PHYSIOLOGICAL METHODS

Ralph's Boos: Ralph's Boos bimeter records the biting force at varying degrees of jaw separation.

Power point (by Boos): A metal plate (central bearing plate) is attached to the maxillary record base. A bimeter is attached to the mandibular record base. This bimeter has a dial, which shows the amount of pressure acting on it. The record bases are inserted into the patient's mouth and the patient is asked to bite on the record bases at different degrees of jaw separation. The patient registers the maximum amount of biting force when the teeth first contact in centric occlusion. The muscles of mastication exert the greatest amount of force when the muscle origin and insertion are at equal distances. The biting forces are transferred from the central bearing point to the bimeter. The pressure reading in the bimeter is noted. The highest value is called the *Power point.* The bimeter is observed when the power point is reached .





Using wax occlusal rims: A tentative vertical dimension is measured with occlusal rims and the casts are articulated in a tentative centric relation. A tracing device can be attached to the occlusal rims for a graphic tracing. The facial expression and aesthetics are used for the final value.

Procedure

• The vertical dimension at rest is established and the difference between the reference points (between the nose and chin) is recorded.

• An approximate vertical dimension at occlusion, about 2-5 mm less than that of the vertical dimension at rest is considered. The facial expression can also be used as a guide for determining this value.

• The occlusal surface of the maxillary occlusal rim is coated with petrolatum and seated in the mouth. Denture adhesive powder may be used in cases with inadequate retention.

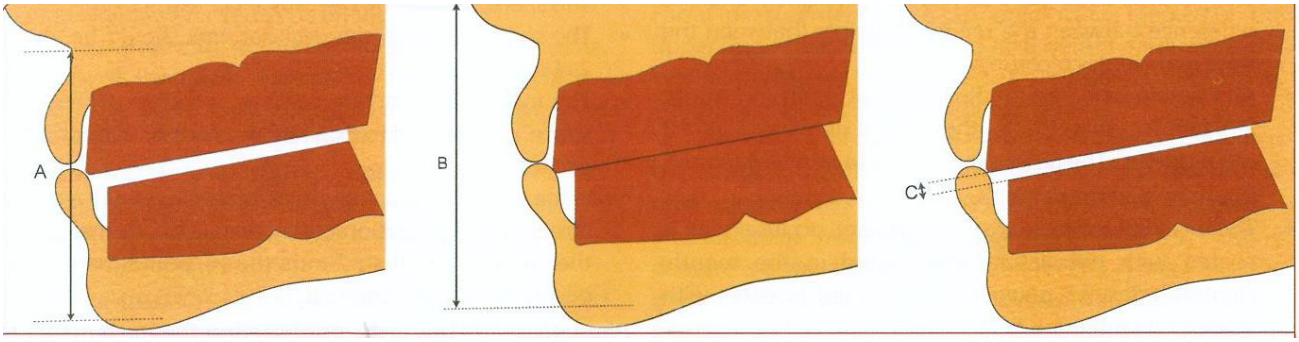
• A thin roll of modeling wax with a triangular cross section is softened in a water bath at 130° F and placed over the mandibular occlusal rim with its apex towards the maxillary rim .
• The added wax is softened again with a Blowtorch and the mandibular rim is seated into the mouth.
• The patient is asked to close his mouth slowly and stop at a comfortable position based on his tactile sensation. This gives the vertical dimension at occlusion.
• The wax is allowed to cool within the patient's mouth.
• It is removed and articulated in a tentative centric relation.
(Note: Do not confuse this method with the "Nick and Notch" method used in centric relation.)

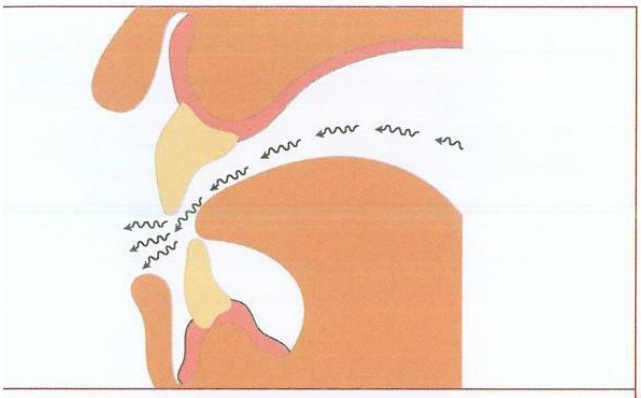
Physiological rest position (Niswonger and Thomson in 1934): This is also called as *Niswonger's method.* It is not considered as an accurate method because it requires patient's cooperation, which is variable, and alterations in jaw position can occur during this procedure.

Procedure

• Patient is asked to sit upright with his head unsupported and the eyes looking straight.
• Upper and lower occlusal rims which were modified according to the clinical guidance (refer occlusal rim fabrication) are inserted and the patient is asked to swallow and relax.
• When the relaxation is obvious, the lips are carefully parted to reveal the space present between the occlusion rims. This space is called the *Free-way space* • The space between the occlusal rims should be about 2-4mm.
• The formula "VD at rest = VD at occlusion + Free-way space" can be used to evaluate the vertical dimension at occlusion
• If the free-way space is more than 4 mm, the vertical dimension at occlusion is considered to be small and if the space is less than 2 mm, the vertical dimension at occlusion may be too great.

Phonetics: This involves observing the movements of the oral tissues during speech and more importantly listening and analyzing the speech of the patient. The maxilla and mandible show a characteristic relationship during speech. This can be used to determine the vertical dimension. There are two common methods in which phonetics is used to determine jaw relation. They are:
1. Silverman's closest speaking space.
2. The "F" or "V" and "S" speaking anterior tooth relation.





63: Silverman's closest speaking space.

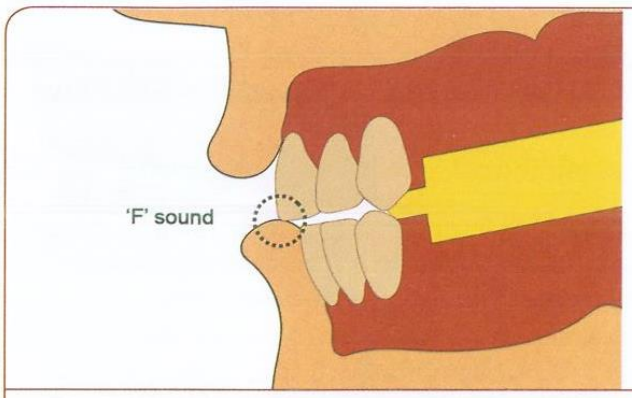


Fig. 9.64: Pound and Murrel's method.

Aesthetics: Aesthetics can be used to aid to determine the correct vertical dimension. This is done by selecting teeth of the same size as the natural teeth and by assessing the amount of residual ridge resorption. ***Skin:*** If the vertical dimension is too high the skin of the cheeks will appear very stretched and the nasolabial fold will be obliterated, the nasolabial angle will be increased. The skin on the perioral areas can be compared with skin

over other areas of the face for reference. It should also be remembered that there are other factors like the age of the patient, which can influence the appearance of the skin. ***Lips:*** The contour and fullness of the lip is affected by the thickness of the labial flange. The occlusal rims should be contoured to aid in lip support. A flattened appearance of the lip indicates lack of lip support. In such cases vertical dimension should not be increased to provide lip support, as it would lead to failure of the denture.

Swallowing threshold:

beginning of swallowing, the teeth of the upper and lower jaws almost come in contact. This factor can be used as a guide to determine vertical dimension at occlusion. A conical occlusal rim made of soft wax is fabricated on the mandibular

record base. The upper and lower record bases are inserted in the patient's mouth. Salivation is stimulated and the patient is asked to swallow. The height of the conical wax rim is reduced due to the pressure developed while closing the mandible during swallowing. The conical wax rim may also be softened to reduce the resistance to closing.

Tactile sense or neuromuscular perception: Here the patient's tactile sense or sense for comfort is used to assess the vertical dimension at occlusion. In this method a central bearing screw/central bearing plate apparatus is used. The central bearing screw fits into the depression of the central bearing plate. The central bearing plate is attached to the maxillary occlusal rim and the central bearing screw is fixed to the mandibular occlusal rim.

Procedure

• The occlusal rims with the central bearing screw and plate are inserted into the patient's mouth.

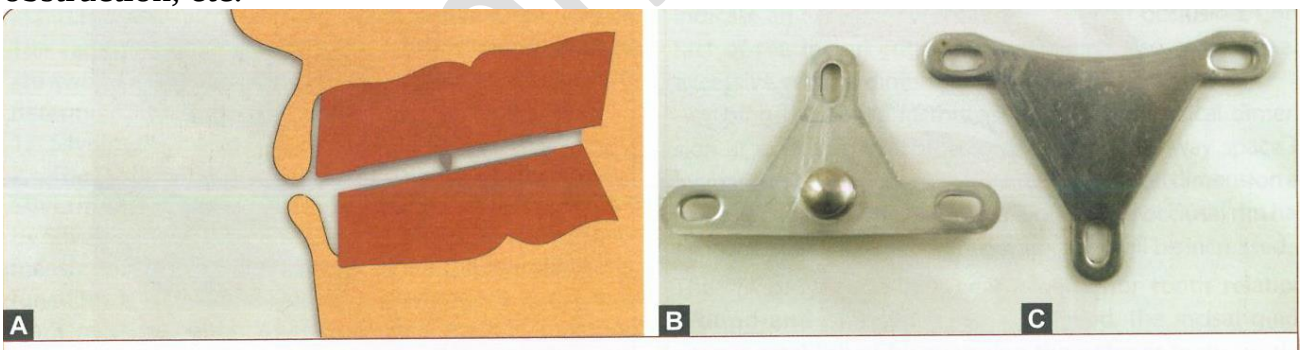
• The central bearing screw is progressively tightened. This tightening will bring both the occlusal rims towards each other.

• After a certain limit the patient will feel discomfort in his jaws due to over-tightening. This point is recorded.

• The same procedure is repeated with the central bearing plate in the mandibular rim and the central bearing screw in the maxillary rim.

• The central-bearing point is slowly reduced till the patient indicates a comfortable jaw relationship.

• The procedure is repeated to avoid errors. Disadvantages include foreign body obstruction, etc.



Figs. 9.65A to C: (A) Tactile sense method of determining vertical jaw relation; (B) Central bearing point; (C) Central bearing plate.

Patient's perception of comfort: It is a very simple and easy method of determining the vertical relation. Here, the record bases with excessively tall occlusal rims are inserted in to the patient's mouth and the excess base plate wax is removed stepwise till the patient perceives the occlusal height as comfortable. The disadvantage of this technique is that it depends on the patient's co-operation for accurate readings.