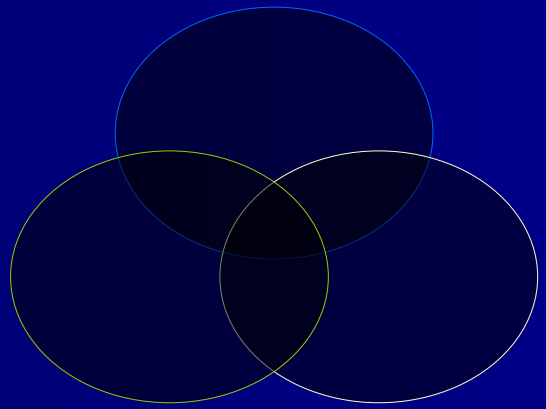
VERTICAL JAW RELATION



Vertical jaw relation/Vertical dimension

Def^n

- *GPT-8.*
  - *Distance b/w two selected points one on a fixed and one on a movable member*

    or
  - *The vertical dimension of face b/w any two arbitrary selected points located one above and one below the mouth , usually in the midline.*

Clinical significance

- **Re-establish the functional position**
- **Functional efficiency**
- **Structural balance.**
- **Esthetics**
- **Phonetics**
- **Comfort**

Concepts of Rest Position

As early as **1771, Hunter** *wrote, "In the lower jaw, as in all the joints of the body, when the motion is carried to its greatest extend, in any direction, the muscles & ligaments are equally relaxed. Hence, it is that commonly & naturally, the teeth of the two jaws are not in contact, nor are the condyles of the lower jaw so far back in the cavities as they can go.*

- **Wallisch (1906)** *was one of the first to define the physiologic rest position of the mandible.*

- **In the late 1920's Sicher & Tandler**, *stated the role of the musculature in controlling the posture of the mandible.*

- **Gillis (1941)** *defines rest position as "that position from which all mandibular movements begins & to which they return.*

Complete Denture Prosthodontics : Sharry 3rd edn

Niswonger (1934)

- *It is a natural position of the mandible when the opening and closing are in state of equilibrium.*
- *He observed physiologic act of swallowing in 200 patient.*
- The individual mandibular rest position remains constant throughout life.

Complete Denture Prosthodontics : Sharry 3rd edn

Schlosser (1941) *conducted a series of phonetic experiments*

- *Edentulous patients were repeatedly able to bring the mandible to an identical rest position by sounding the letter 'm'.*

Brodie (1942) *vertical height remain constant through out life. Boos(1943) and Jaffe (1954) apparently agree with this view.*

Variability of Rest Position

Harris and Hight (1936) *the vertical dimension of the face was dependent on the occlusal contacts in the closing movement of the mandible.*

Leof (1950) *believes that vertical relation is not constant but is readily affected by age, disease & emotion.*

Complete Denture Prosthodontics : Sharry 3rd edn

Olsen (1951) *the resting position was not rigidly stable.*

Coulouriotes (1955) *the rest position of the mandible may not remain constant throughout life.*

Landa (1954) *stresses that the freeway space is never static. It varies as head position changes.*

Complete Denture Prosthodontics : Sharry 3rd edn

Atwood (1957) *decrease in the vertical dimension of mandibular rest position after the removal of opposing occlusal contacts.*

Complete Denture Prosthodontics : Sharry 3rd edn

Classification

1) *Vertical dimension of occlusion*
2) *Vertical dimension of rest*
3) *Vertical dimension in the other positions.*

- *Vertical dimension of occlusion: (GPT-8)*

  The distance b/w two points when the occluding members are in contact. OR

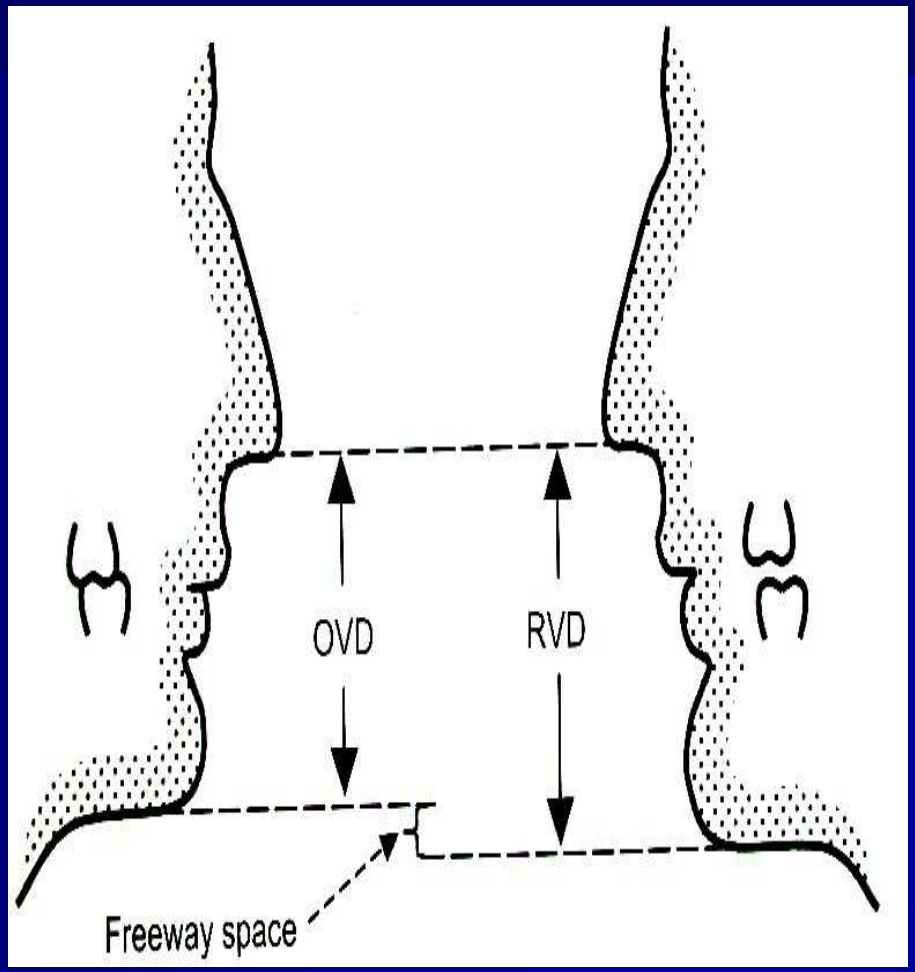
  It is the relation of the mandible to the maxilla when the occlusal stops are provided by the teeth/occlusion.

- *Vertical dimension of rest:*

  The distance b/w two selected point measured when the mandible is in the physiologic rest position.

INTEROCCLUSAL DISTANCE /INTEROCCLUSAL REST SPACE.

- *Difference b/w the resting vertical dimension and vertical dimension of occlusion.*
- *First studied by Dr.M E Niswonger*
- *2-4mm.*



Physiologic rest position

- *GPT-8: The mandibular position assumed when the head is in an upright position and the involved muscles, particularly the elevator and depressor groups, are in equilibrium in tonic contraction, and the condyles are in a neutral, unstrained position*

- *Wallisch (1906)- that position of mandible wherein all muscle action is eliminated & the mandible is passively suspended.*

- *Posselt--- " postural position of mandible"*

Physiologic rest position

- *Niswonger – 'neutral position when opening & closing muscles of mandible are in state of equilibrium.'*

- *opening factors— gravity, suprahyoid, infrahyoid, post cervical muscles(extensor)*
- *Closing factors— masticatory muscles & fascial muscles.*

Hypothesis

- *1 st hypothesis(active): postural position—muscles – minimal contracture to maintain posture of mandible —tonus.*

- *2nd hypothesis:(passive): elastic elements of jaw musculature & not any muscle activity, balance the influence of gravity.*

Methods for recording vertical jaw relation

Mechanical methods:

1. ***Ridge relation:***
   a)*distance of incisive papilla from mandibular incisors*
   b) parallelism of ridges

2. ***Measurement of former dentures***

3. **Pre-extraction records-**
   - *Profile radiographs*
   - *Casts of teeth in occlusion*
   - *Facial measurements*

Physiologic methods

1. *Physiologic rest position*
2. *Phonetics & esthetics as guide*
3. *Swallowing threshold*
4. *Tactile sense*
5. *Patient reported perception of comfort*

Boucher's prosthodontic treatment for Edentulous patient 10th edn

Mechanical methods

Ridge relation:

- *Distance from Incisive papilla to mandibular incisors*

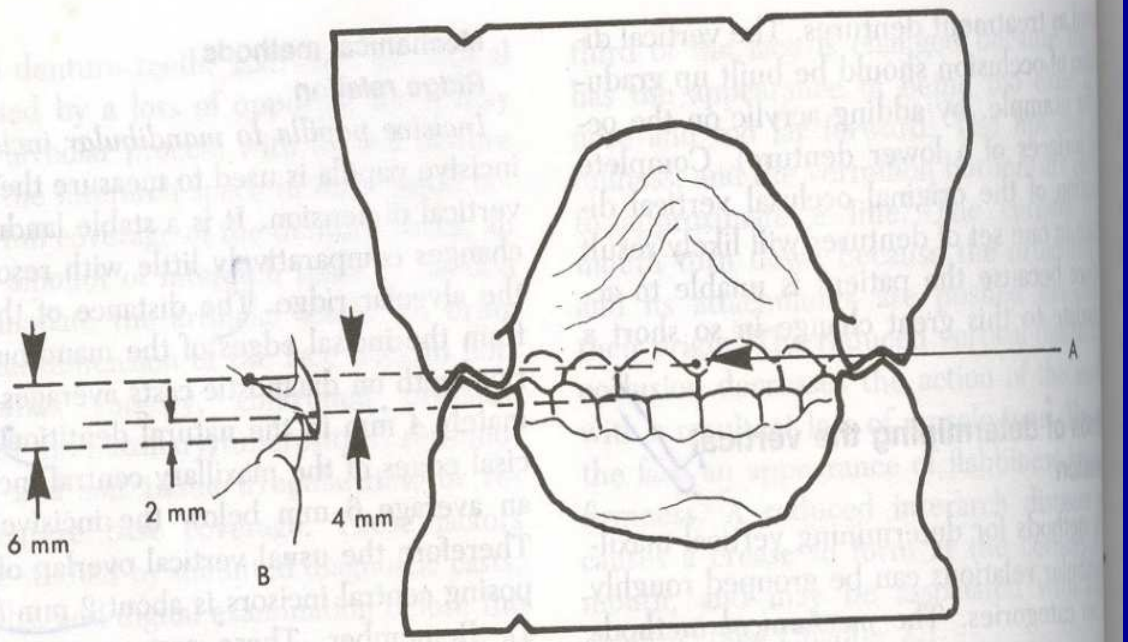


Fig. 12-1 Sectioned casts, posterior view. When the teeth are in centric occlusion, the incisal edges of the mandibular central incisors are 4 mm from the incisive papilla. *A*, A sagittal view of the central incisors, *B*, shows the vertical overlap to be about 2 mm.

Mechanical methods

Ridge relation:

- *Parallelism of ridges*

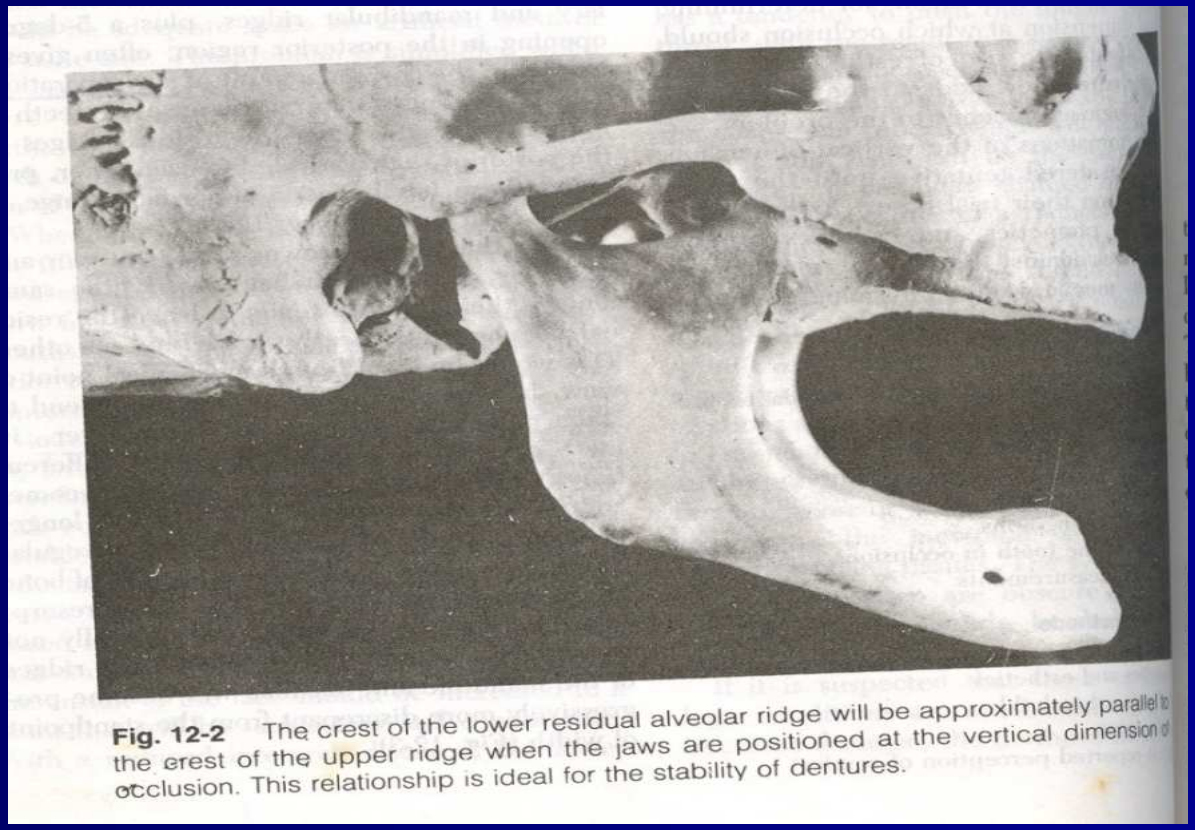


Fig. 12-2 The crest of the lower residual alveolar ridge will be approximately parallel to the crest of the upper ridge when the jaws are positioned at the vertical dimension of occlusion. This relationship is ideal for the stability of dentures.

MEASUREMENT OF FORMER DENTURES:

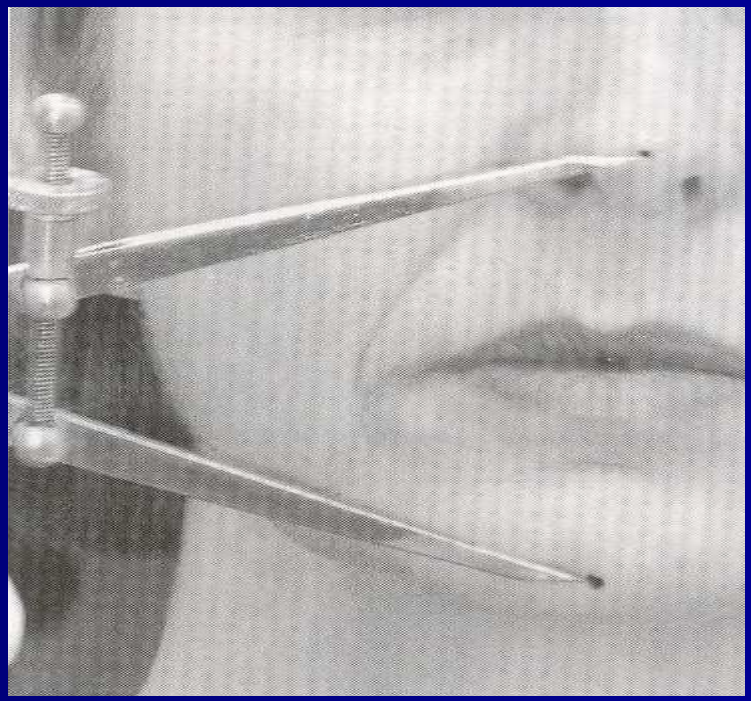
- *Dentures –measured--- correlated ---patient's face.*
- *Measurements - b/w borders of maxillary & mandibular denture------ Boley gauge.*

PRE – EXTRACTION RECORDS:

1. *Profile radiographs*
2. *Casts of teeth in occlusion*
3. *Facial measurements*

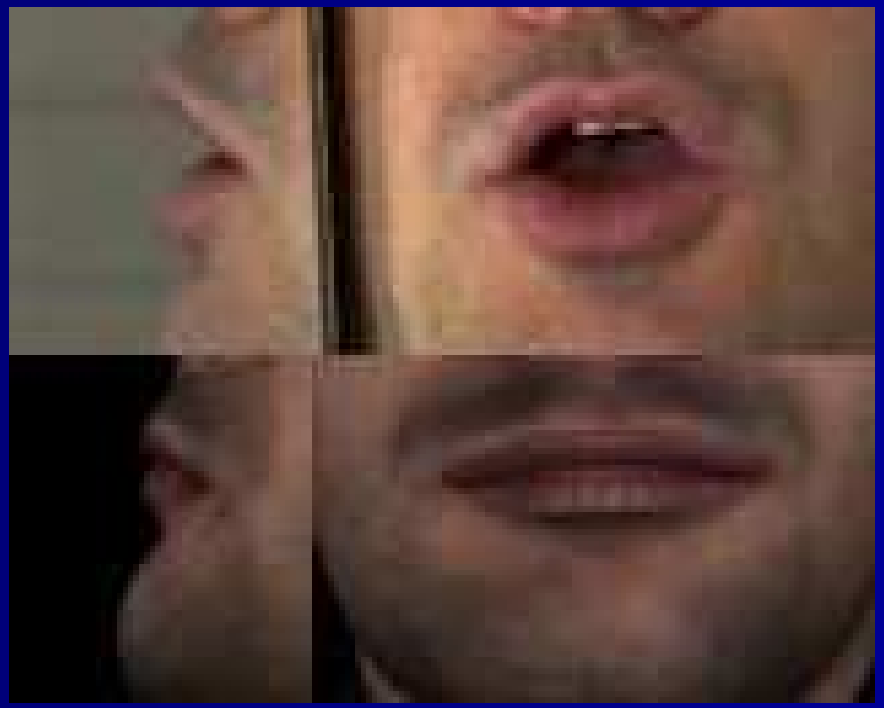
Physiologic methods

1. *Physiologic rest position*



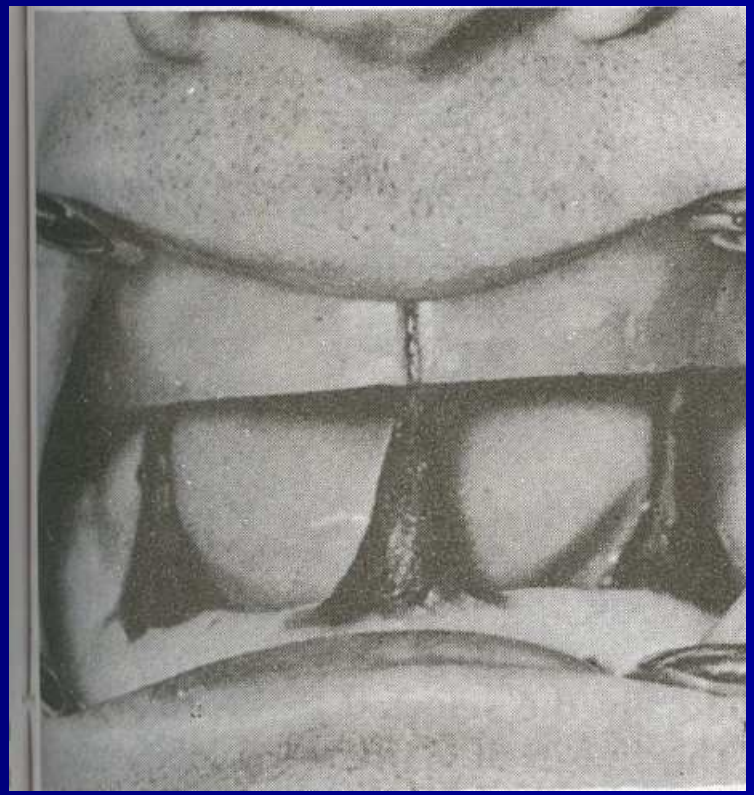
Physiologic methods

2. *Phonetics & Esthetics*



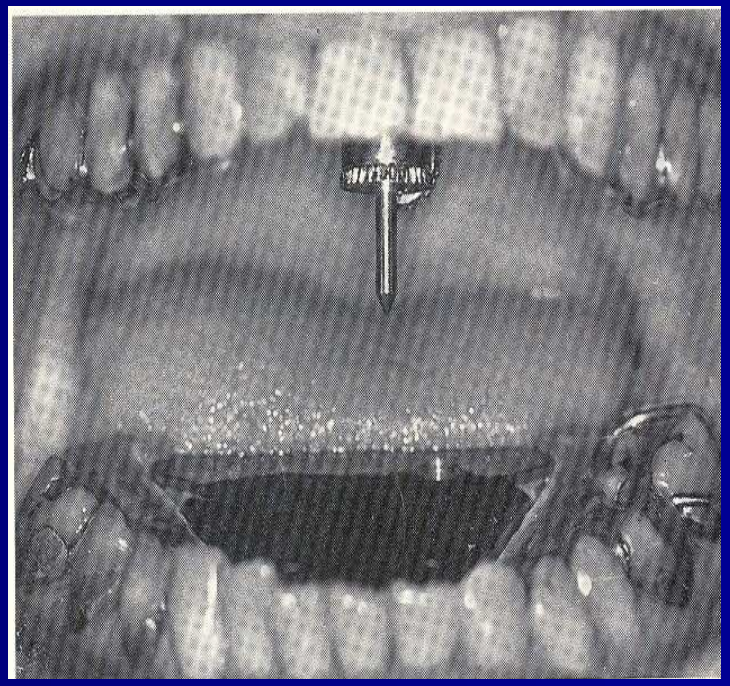
Physiologic methods

3. *Swallowing threshold*



Physiologic methods

4. *Tactile sense & Patient reported perception of comfort*



Physiologic methods

Boos bimeter

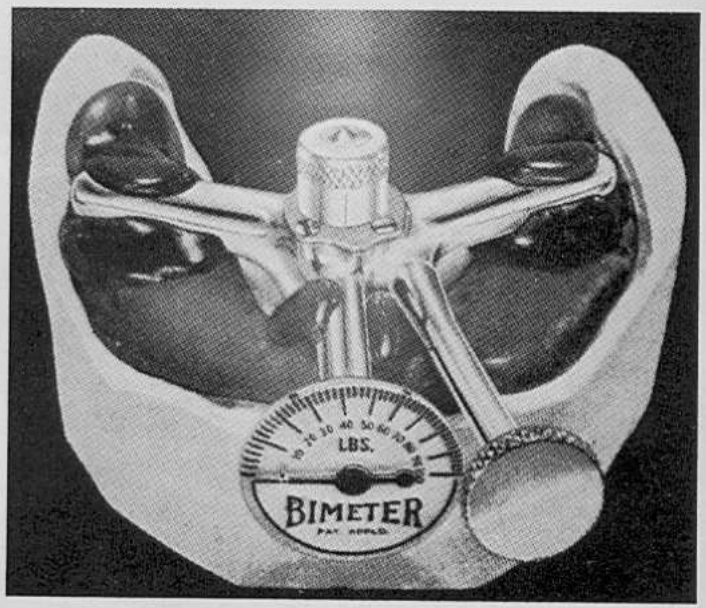
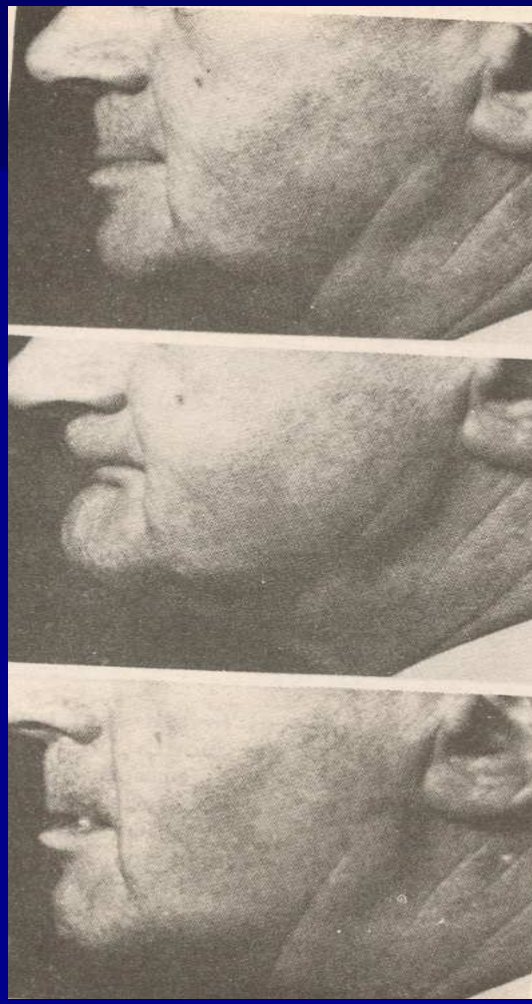


FIG. 11–13. The Bimeter. (From *Swenson's Complete Dentures*. C. Boucher, ed. St. Louis, C. V. Mosby, 1973.)

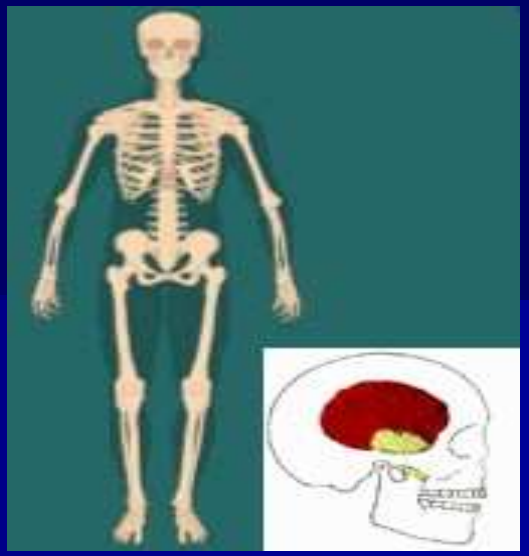
Electromyography

Effect of increased vertical dimension

1) *Increased risk of trauma- clenchi of teeth.*
2) *Discomfort to patient*
3) *Teeth are liable to contact – causing clicking during speech*
4) *Trauma & pain – basal seat area of denture*
5) *Loss of freeway space- muscular fatigue*
6) *Clicking sound*
7) *Elongated appearance of face*
8) *Bone resorption*
9) *Loss of retension & stability of dentures*
10) *Generalised hyperemia.*

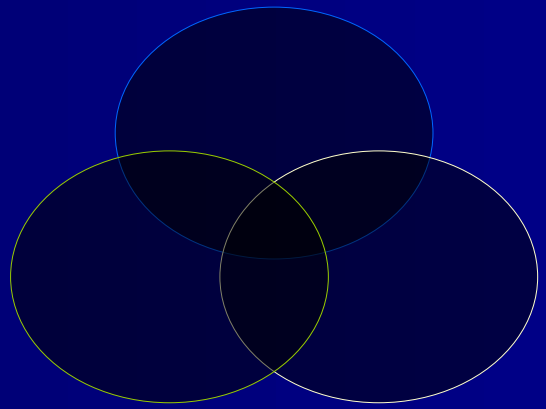


Effect of decreased vertical dimension



1) *Reduced masticatory efficiency*
2) *Poor esthetics*
3) *Cheek biting/ tongue biting/ lip biting*
4) *Denture look*
5) *Angular chelitis*
6) *Pain in TMJ*
7) *Coston's syndrome*
8) *prognathism*

Horizontal Jaw relation



Horizontal jaw relations

Centric relation

Eccentric relation

Protrusive record

Lateral record

Centric relation

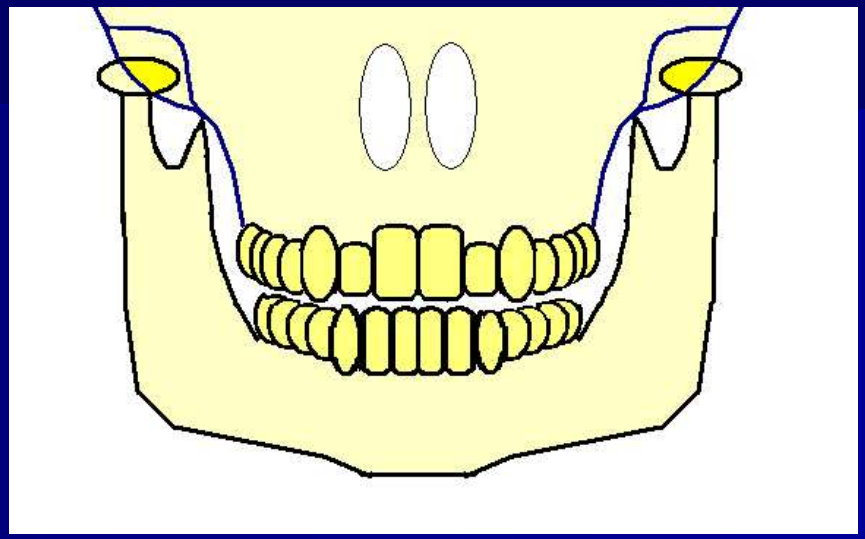
- *Most controversial topic in prosthodontics*

Def^n

- *"maxillomandibular relationship – condyles articulate – thinnest avascular Portion of disk –anterior superior position- slopes of articular eminence".—independent of tooth contact. restricted to purely rotary movement – transverse horizontal axis. GPT -8*

- *Most posterior relation of lower to upper jaw- lateral movements can be made at given vertical dimension. Boucher*

Significance of centric relation



- *Ideal arch – arch relationship.*
- *Hinge position- only pure rotation without any tanslation*
- *Reproducible position- reliable reference*
- *Reference position for occlusal reconstruction*
- *Posterior border position & posterior limit – mandibular motion.*

Centric relation is the terminal hinge relation

REVIEW OF LITERATURE

- **Philip Pfaff et al in 1756.** *The dentist of Frederick the Great of Germany, first to describe this technique of "taking a bite". known as the "mush", "biscuit", or "squash" note*

- **Christensen in 1905** *used "impression wax" for "bite" records.*

- **In 1910, Greene** *described a mush bite made from modeling compound in which he used a plaster wash to achieve a more accurate record.*

- *In* **1929, Stansbery** *incorporated a curved plate with a 4-inch radius (corresponding to Monson's curve) mounted on the upper rim. A central bearing screw was attached to a lower plate was injected to a lower plate with a 3-inch radius curve (reverse-Monson curve). After extra oral tracing plaster was injected between the plates to form a biconcave centric registration.*

- **In 1954, Brown** *recommended repeated closures into softened wax rims.*

- **Shafaghl, et al** *in* **1975** *conducted a study to investigate diurinal changes in centric position within a period of one day.*
- *records obtained in the morning showed most antero inferior position of the condyles and at night showed the most postero-superior positioning the condyles*

- **Williamson, E.H. in 1978** *and concluded that "the condyles to be significantly more superior in glenoid fossae when anterior guidance was used.*

- **Guichet N.F. in 1978** *anterio-posterior distance between the retruded (now CR) and the ICP position was about 1.25 mm (+ 1.00) on average.*

- **Rosner and Goldberg (1986)** *Records of 75 patients indicated that 60% of the CO records were placed anterior and inferior to CR*

- **Shildkraut et al (1994)** *orthodontist advocated hand held articulated casts used in orthodontic treatment planning be replaced with the so called prosthodontic mounting with face bow and CR records*

- **Yoshiyuki Watanabe 2009** *The gothic arch apex varied, depending on body position. In the supine position,the gothic arch apex and the tapping point were close to the mandibular position determined by bilateral manipulation through digital gothic arch tracer*

Methods of recording centric relation

- *Boucher's*
  - *A) static methods-*
    - *Interocclusal record*
    - *Central bearing device*
    - *Tracing devices*
  - *B)functional methods-chew in technique*
    - *Needles technique*
    - *House technique*
    - *Essig technique*
    - *Patterson technique*

- *Heartwell*
  - *Functional methods*
    - *Needles-house method*
    - *Patterson method*
  - *Graphic method*
    - *Intraoral devices*
    - *Extraoral devices*
  - *Physiological /interocclusal check record method*

- ***Michael meyer(1982)***

- *Direct checkbite(interocclusal)record*
- *Graphic recording(intra/extraoral)*
- *Functional recording*
- *cephalometrics*

Needles- house method

- *Needles-3 metal styli-house- 4.*
- *Compound maxillary occlusal rim*
- *4 diamond shaped tracing*

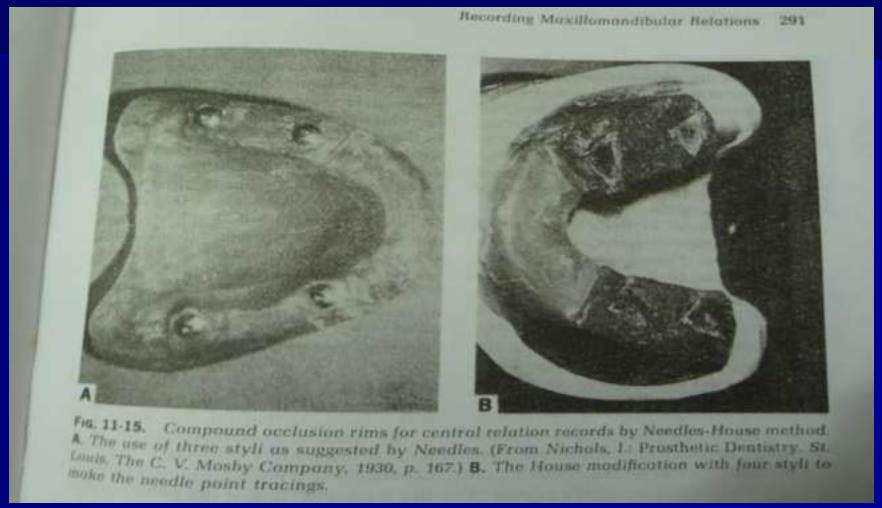
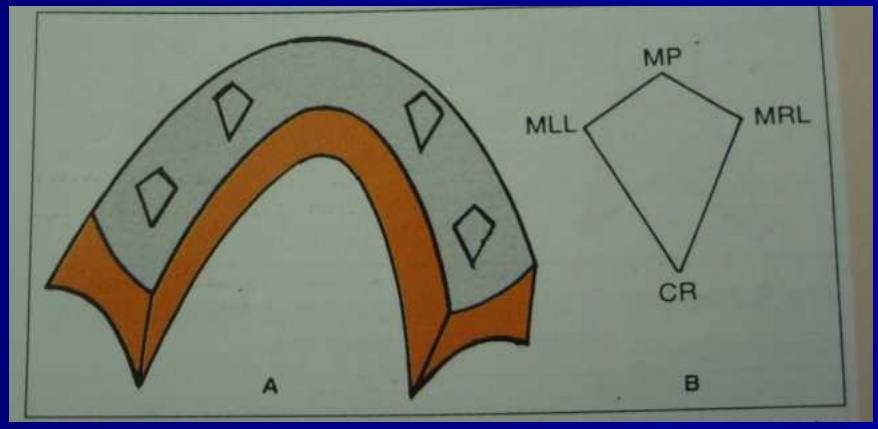
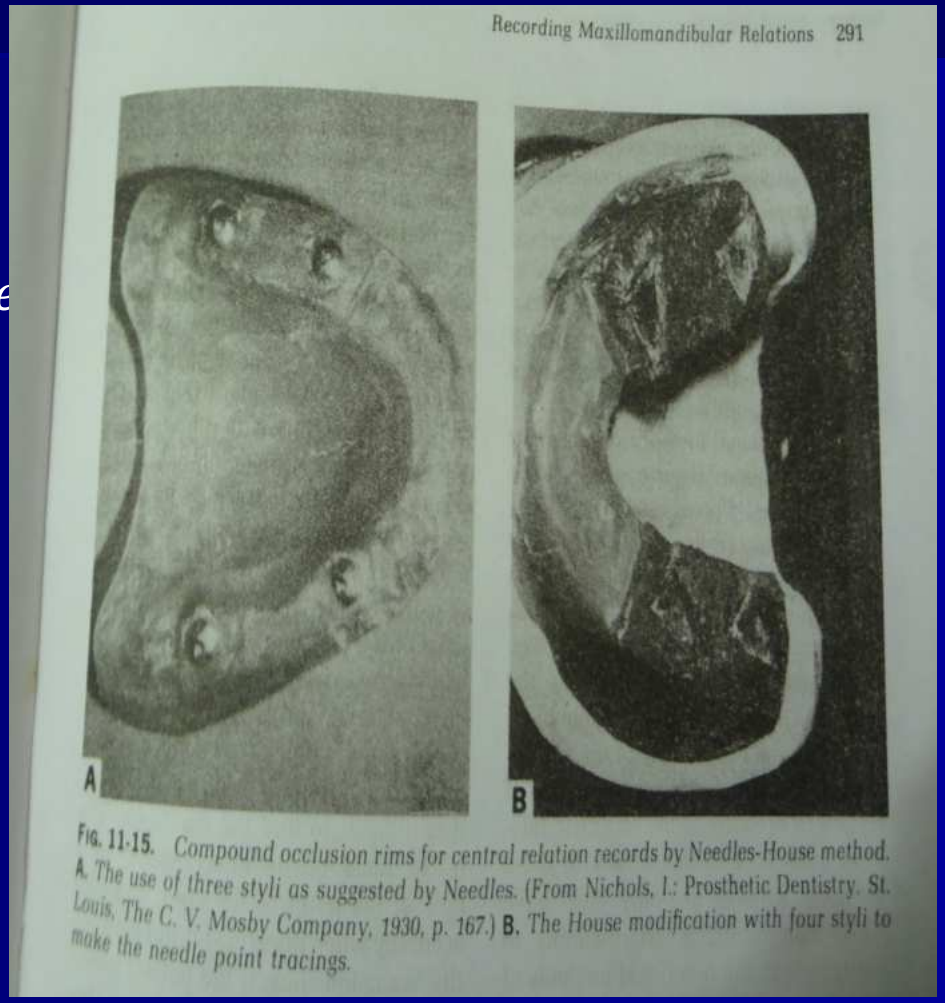


Fig. 11-15. Compound occlusion rims for central relation records by Needles-House method. A. The use of three styli as suggested by Needles. (From Nichols, I.: Prosthetic Dentistry. St. Louis, The C. V. Mosby Company, 1930, p. 167.) B. The House modification with four styli to make the needle point tracings.



Needles- house method

- *Advantages:*
  - *Easy method*
  - *Used-success-good ridge*
- *Disadvantages:*
  - *Painful*
  - *Uncomfortable*
  - *Cannot be used—flat /flabby ridges*
  - *Movement of occlusion rims- basal seat.*



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Patterson method

- *Mixture of ½ plaster + ½ carborundum paste.*
- *Mandibular movements- Compensating curves*
- *Disadvantages: time consuming.*

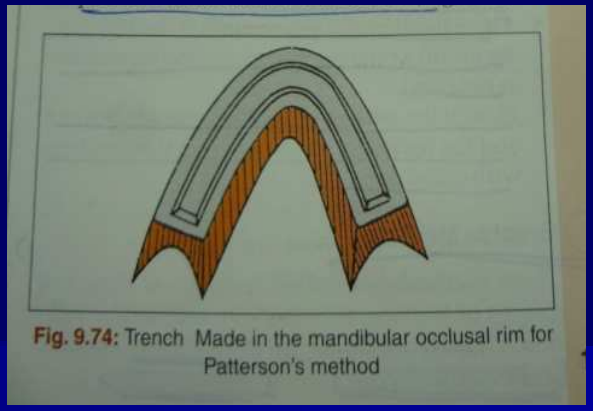


Fig. 9.74: Trench Made in the mandibular occlusal rim for Patterson's method

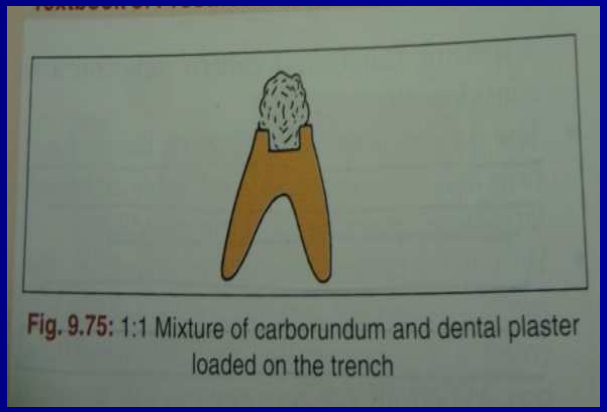


Fig. 9.75: 1:1 Mixture of carborundum and dental plaster loaded on the trench

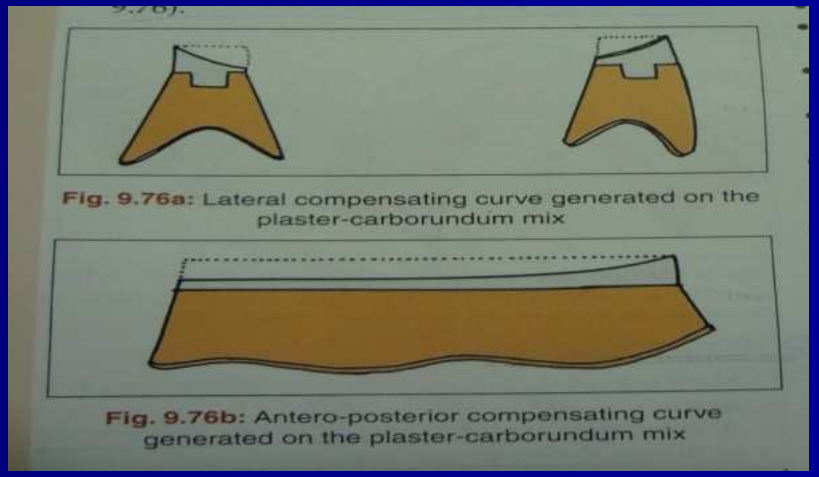
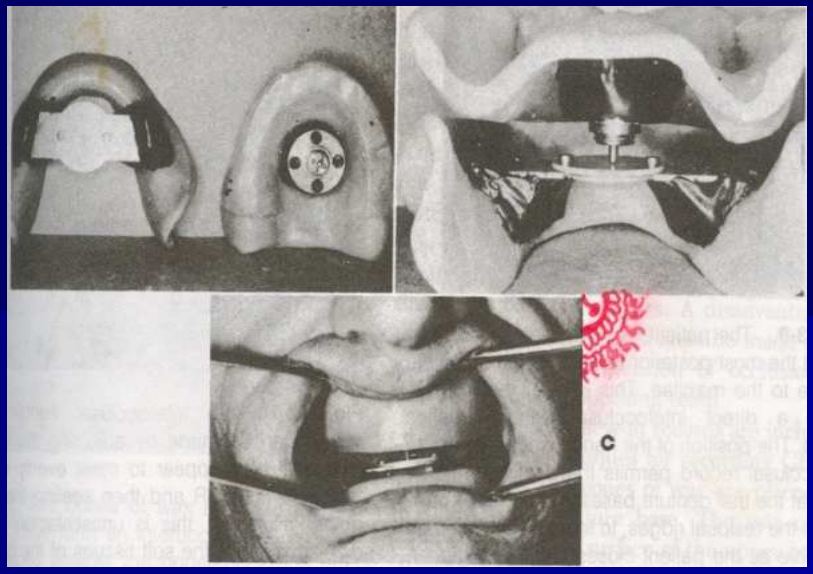


Fig. 9.76a: Lateral compensating curve generated on the plaster-carborundum mix

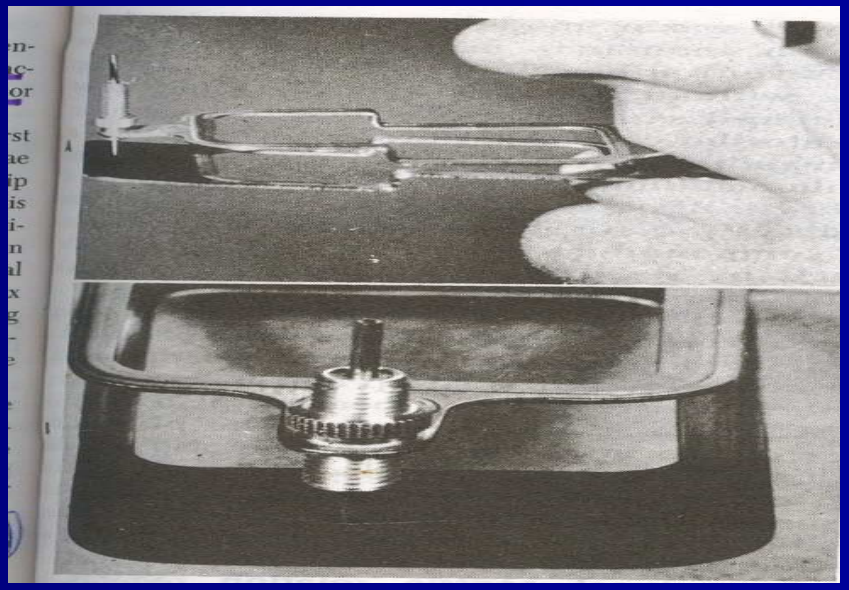
Fig. 9.76b: Antero-posterior compensating curve generated on the plaster-carborundum mix

Graphic methods:

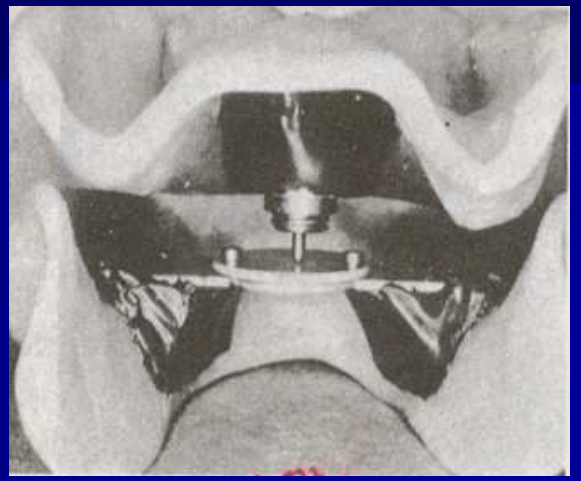
- ***Intra oral tracing & devices–***
  - *coble tracer*
  - *Swissdent ball bearing bite tracer*
  - *Micro tracer*



- ***Extra oral tracing & devices***
  - *Hight tracer*
  - *Sears tracer*
  - *Phillips extraoral tracer*



Intra oral tracing

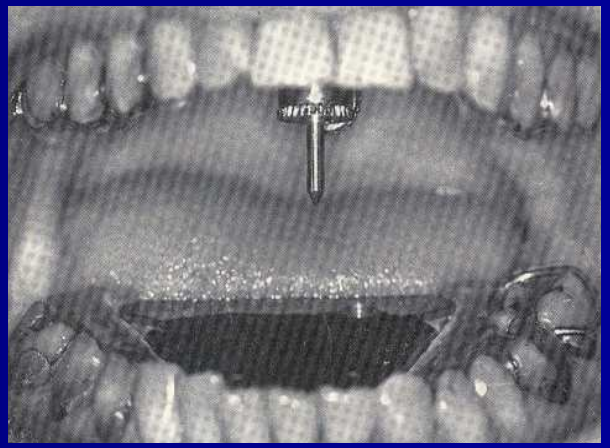


Advantages

- *Central bearing pins resists biting pressure*

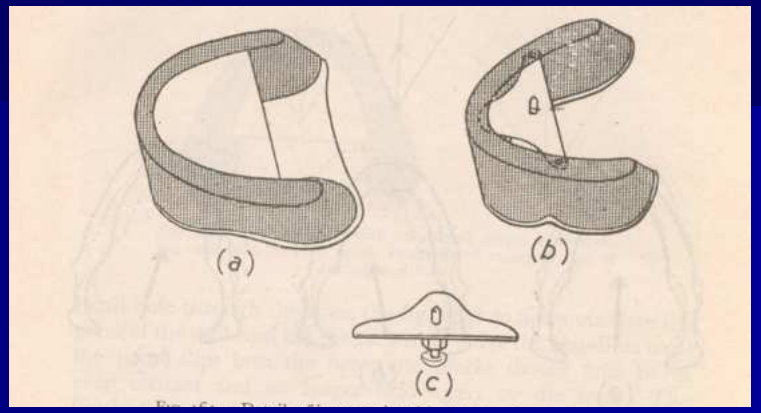
Disadvantages

- *Not a visible method*
- *Difficult to find true apex*
- *Tracer- definitely seated in a hole at point of the apex*



Extra oral tracing

- *Always combined with an intraoral bearing point- distribute equal pressure on the bases.*
- *More sharper*
- *Tracing plate- mounted on mandibular rim*

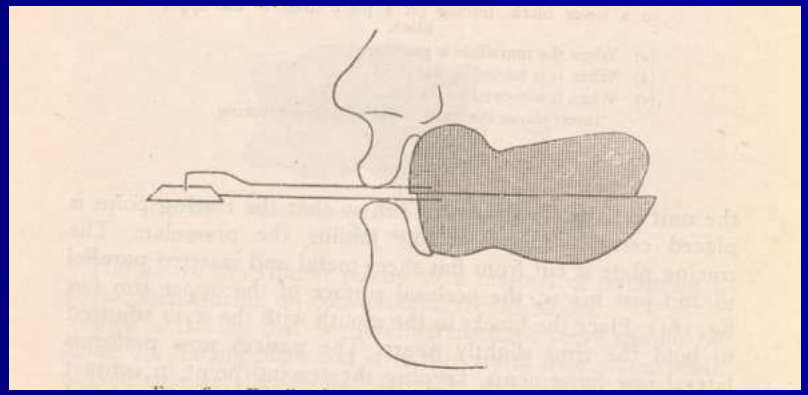


Advantages

- *Larger- apex-easily demarcated*
- *Visible during tracing*

Disadvantage

- *Lack of equal pressure on the ridges*



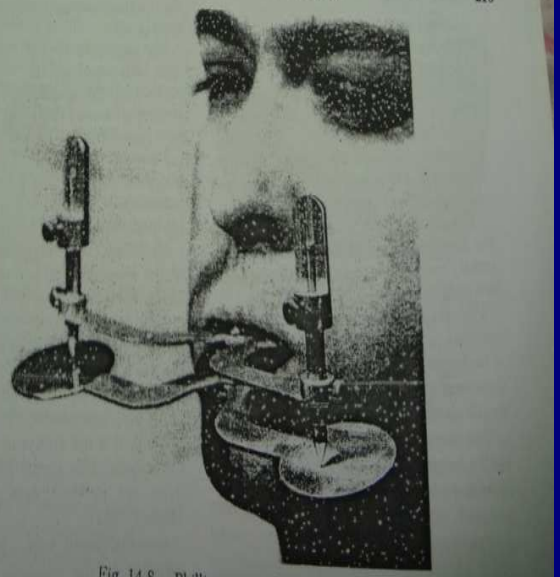


Fig. 14-8. Phillips extraoral tracer.

plates, thus forcing the upp... the lower down.

These methods have not been widely accepted, perhaps because they are not generally necessary to obtain an accurate tracing.

Meyers (19... rims to establish a "generalized ... (1923) used a mixture of carborundum ...

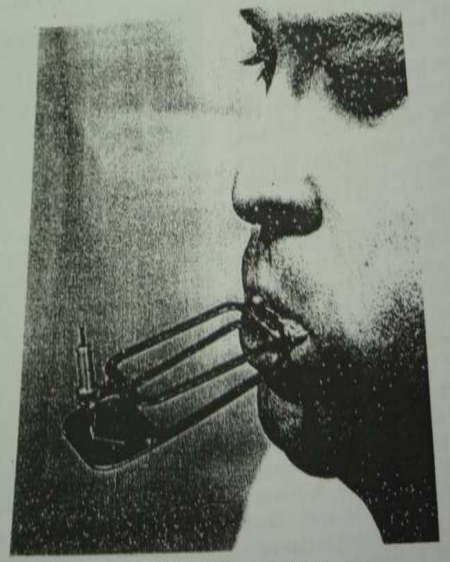
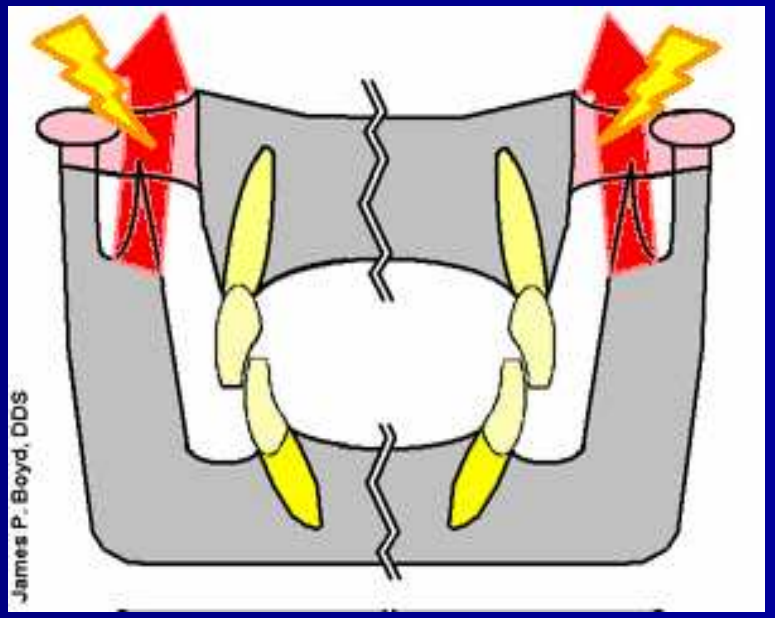


Fig. 14-7. Hight extraoral tracer.

Tactile /interocclusal check record method

Indications

- *abnormally related jaws*
- *Flabby supporting tissues*
- *Large tongue*
- *Uncontrollable mandibular movement*
- *To check the occlusion of teeth-existing denture*



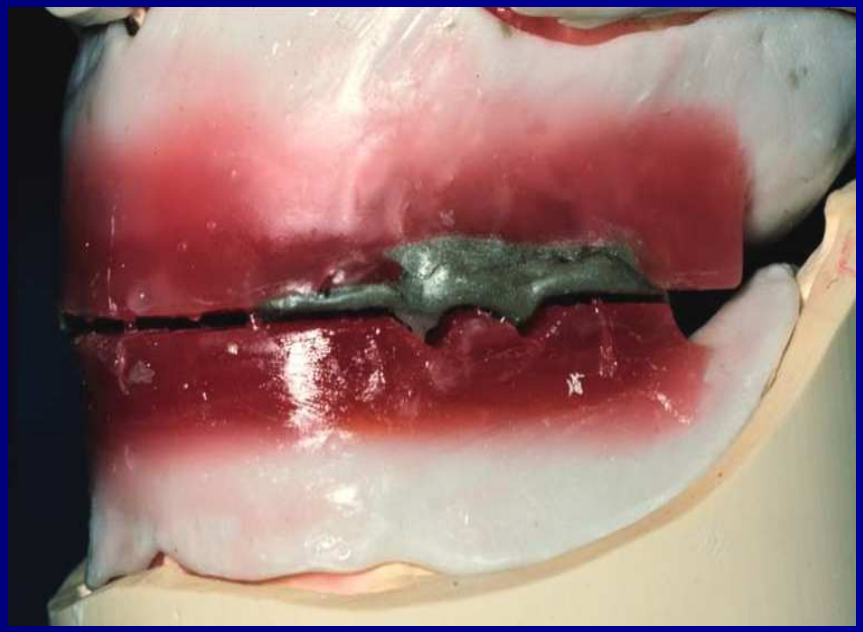
- *Two steps*

1. *Tentative centric rel^{n} using wax occlusal rims*
2. *Interocclusal check record using trial denture*

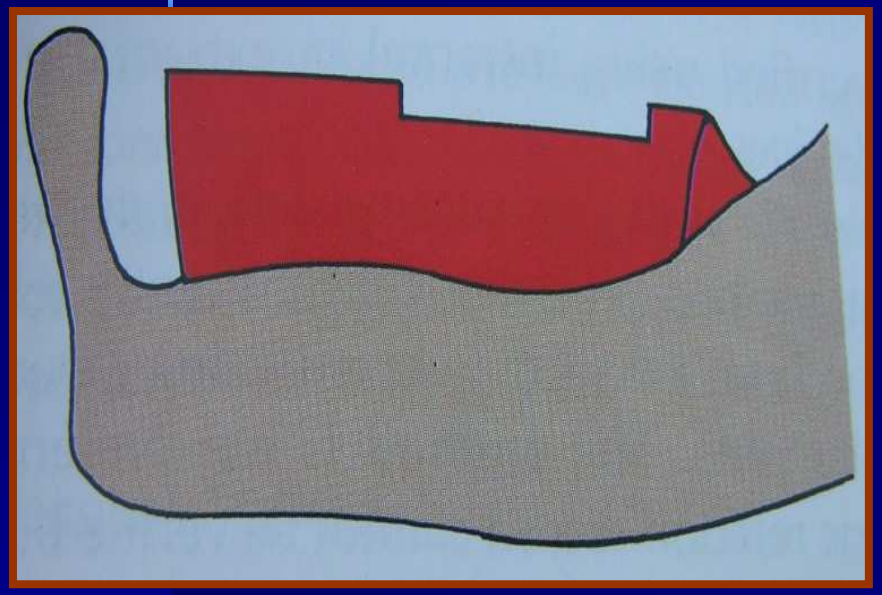
- *Alluwax*
- *Used in interocclusal check record*
- *Must be dead soft*

- *Pressureless/static method*

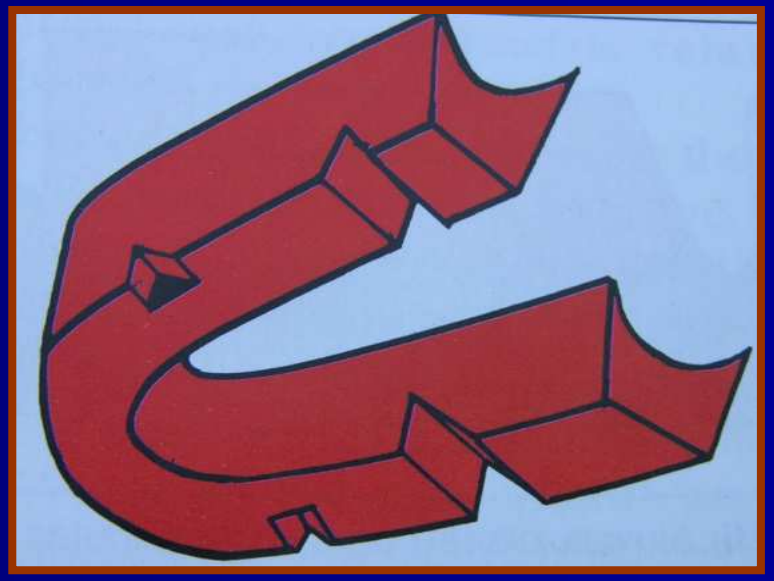
NICK & NOTCH METHOD



Procedure

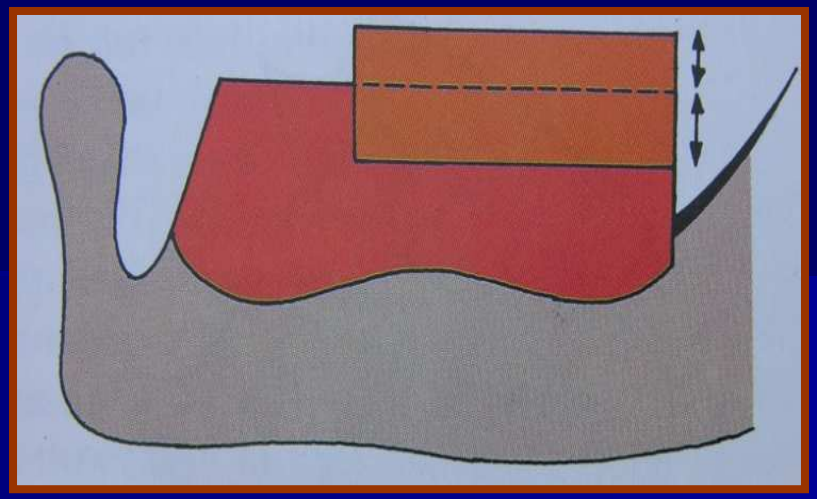


3mm of wax is removed
To make a **trough**



Nicks & notches on maxillary rim
Notch extends along the entire width of occlusal rim

- *Wax is added on the trough & patient is asked to close in CR.*



- *The mouth should close such that the anterior part of the rim should touch.*

- *Pressure method*

Low wax rim softened in excess of height

Other methods

Celluloid strip method

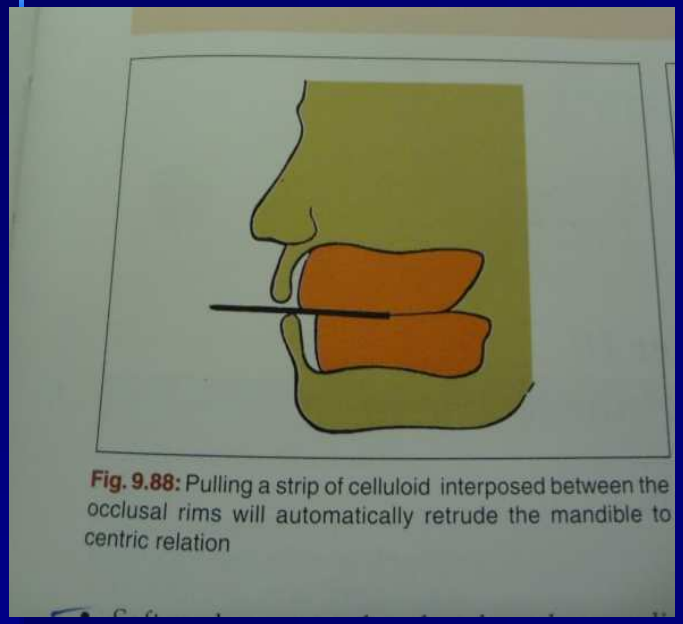


Fig. 9.88: Pulling a strip of celluloid interposed between the occlusal rims will automatically retrude the mandible to centric relation

Softened wax method

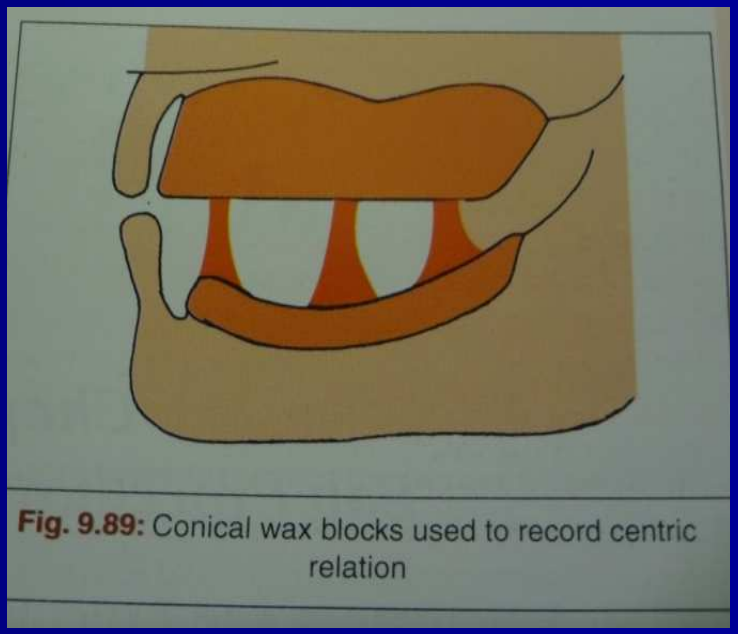
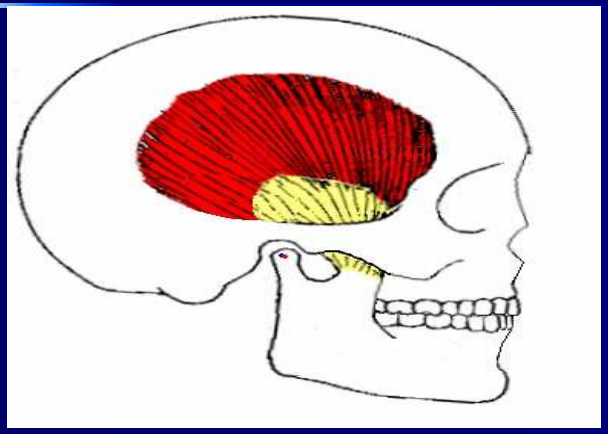


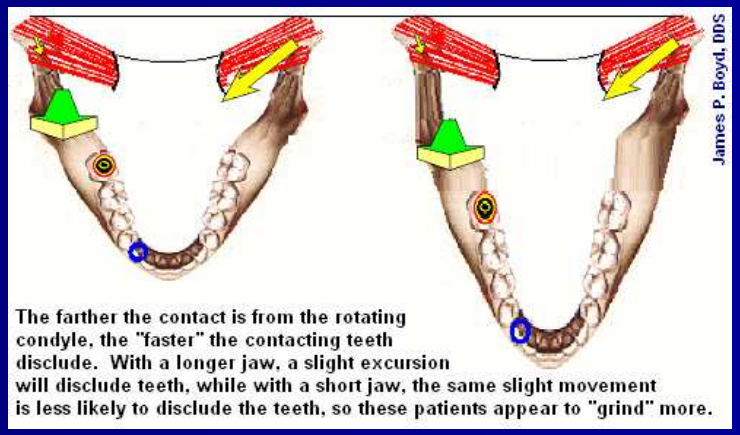
Fig. 9.89: Conical wax blocks used to record centric relation

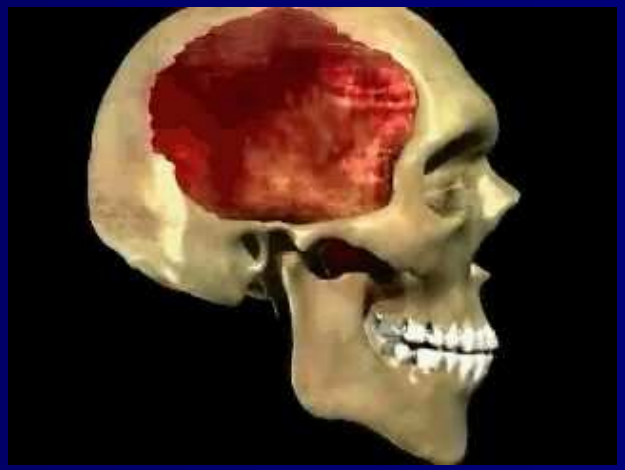
Eccentric relation record

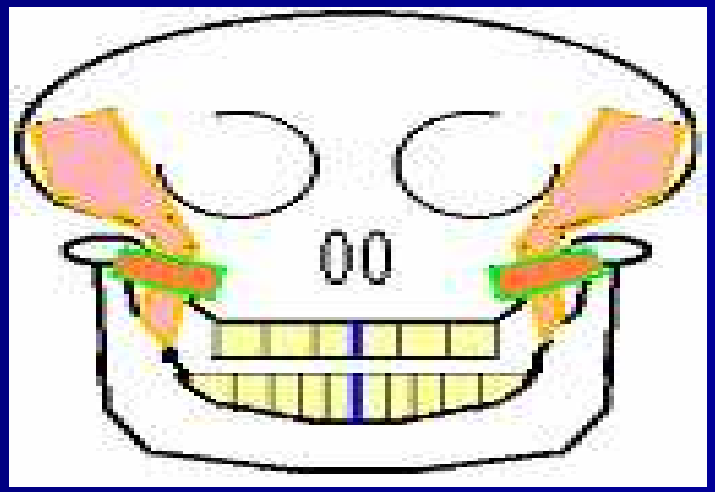
Protrusive relation record



Lateral relation record





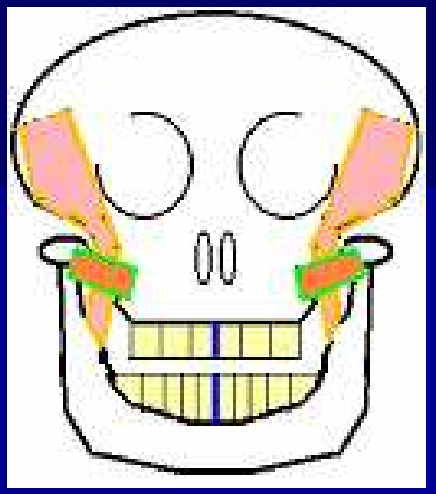


Protrusive relation

- *Christensen's phenomenon*
- *Due to downward displacement of the condyles along the articular slope.*
- *Protrusive records are made of-*
  - *Direct protrusive check record*
  - *Graphic method*
  - *Functional procedures*

Lateral jaw relations

- *Bennett movement*



- *Graphic method*
- *With check bites of wax*
- *With positional records of stone/plaster*
- *Hanau's formula:*
- $L = \frac{H + 12}{8}$ *L=lateral condylar inclination*
  H=Horizontal condylar inclination

PANTOGRAPHY

Summary

- Since there is no precise scientific method of determining the correct vertical relations, the registration of vertical relation depends upon the clinical experience and judgment of the prosthodontist – an art rather than a science
- It is obvious that the skill of the prosthodontist and the cooperation of the patient are probably the most important factors in securing an accurate centric relation records.
- The final determination cannot be made by any method until the teeth are set in position in the wax trial dentures and verified in the mouth.

Conclusion

- **“The true value of our individual work can be measured only by the degree of finesse with which we practice the art of prosthodontistry rather than by the particular school of thought to which we adhere”**

Weinberg (1959)

Thank you