RAPID MAXILLARY EXPANSION

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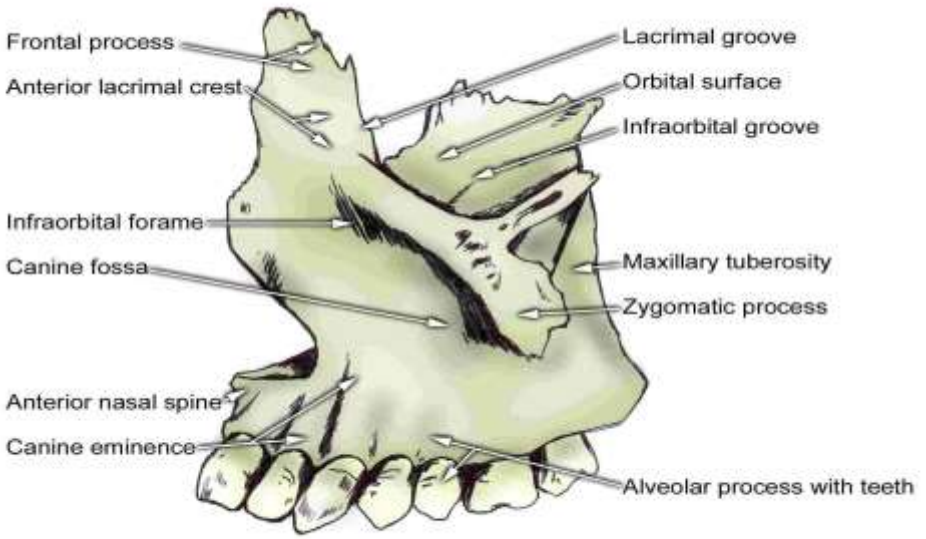
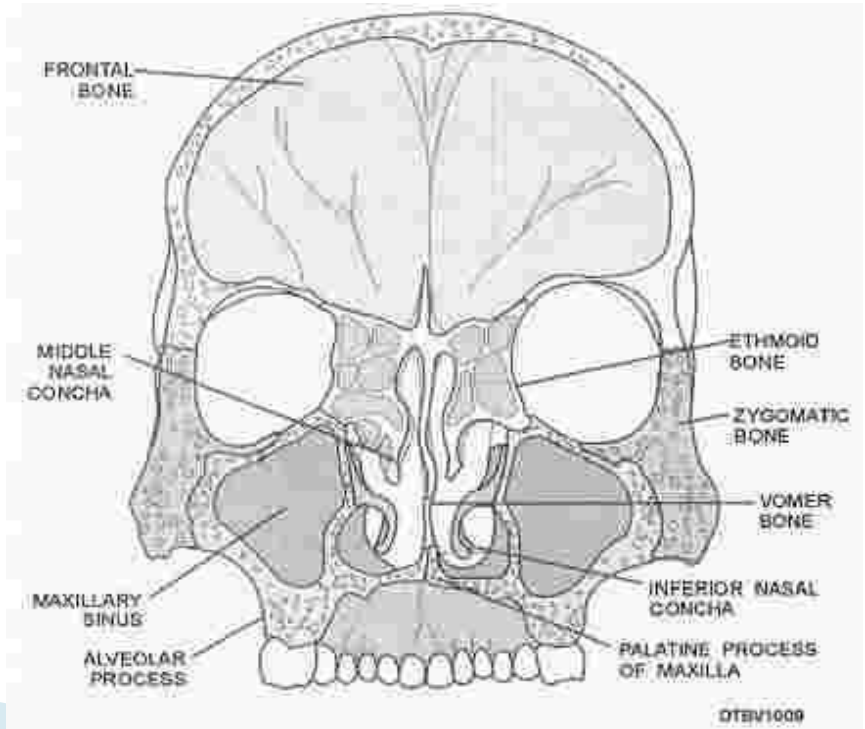
Introduction

- *Expansion is one the conservative methods of **gaining space**.*
- *It can also be used to correct the intermaxillary and dental arch relationships primarily in transverse dimension.*
- *Enables correction of **crossbites** early in treatment.*

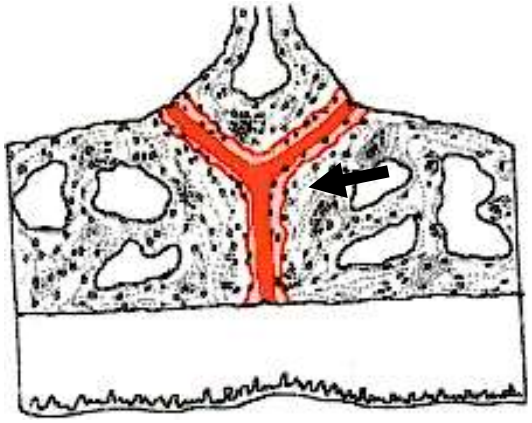
APPLIED ANATOMY OF THE MAXILLA

- Maxilla is articulated to 7 facial bones and 2 cranial bones, mostly by sutures superiorly and posteriorly.
- Anterior and inferior segment of maxilla are free.
- Buttressing is strong postero-supero-medially and laterally to palatine bone, pterygoid plates and zygomatic bones

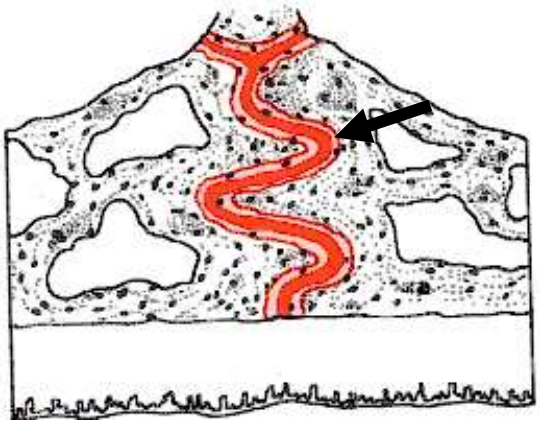




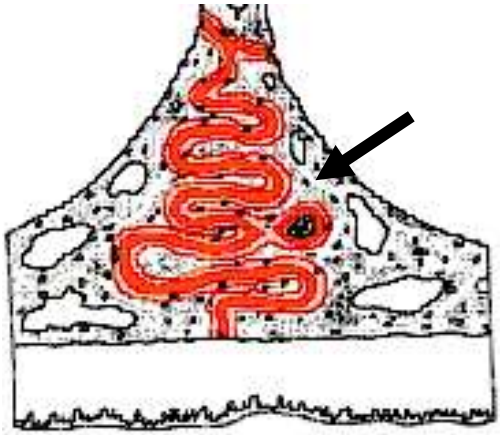
The Mid Palatal Suture



In infancy it is “Y” shaped & binds the vomer with the palatine proceses



In juvenile period, the junction between the three bones becomes higher assuming a “T” shape



By adolescence, suture may become densely interdigitated as a jigsaw puzzle

Persson et al (1977) have reported earliest closure in 15 yr old girl and oldest unossified suture in 27 yr old woman

CLASSIFICATION

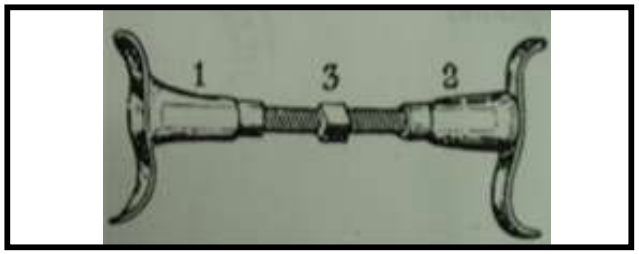
- **On the basis of the type**
  - Removable
  - Semifixed . E.g. 3D Modular appliances, Precision arches
  - Fixed

- **On the basis of the effect by the forces**
  - Slow / Dentoalveolar / Orthodontic→ Fixed , Semi-Fixed & Removable
  - Passive → Lip bumper / Oral Screen / Frankel / Bionator
  - Rapid / Orthopedic → Fixed

- **On the basis of the region to be expanded**
  - In the lateral direction
  - In AP direction – unilateral / Bilateral

RAPID PALATAL EXPANSION

- Narrow maxilla has been mentioned by Hippocrates. But no Rx.
- Emerson C. Angell, in 1860 palatal expansion with a screw appliance in 2 weeks in a 14 yr girl.



- Pfaff, in 1929 described improved nasal function after maxillary expansion.

- Haas, in 1960 introduced the Haas appliance. Reported increased nasal width, gain in arch and lowering of mandible with bite opening.

Indications of RME

a. Correction of crossbites – unilateral / bilateral
b. Mature cleft palate patients
c. Inadequate nasal capacity.
d. In mild arch length discrepancy in favorable facial growth
e. As a preparation of functional jaw orthopedics or orthognathic surgery.
f. In older patients with surgical intervention
g. Deep bite patients with class III tendency.

- Nasal Index = $\frac{\text{Greatest width of the piriform aperture X 100}}{\text{Height of the nasal Skeleton}}$

Less than 47mm = Nasal index considered to be narrow or Leptorrhine

25 mm = 8.5 yrs

Increase of 0.7 mm untill growth stops

Contraindications of RME

- No true C.I. (Haas, & Christie & Ruedeman)
- Anterior open bite cases, *high FMA*, convex profile.
- Skeletal asymmetry of maxilla and mandible with severe AP discrepancy.
- Relative : Older age group due to ossification of sutures.
- Pts on dilantin therapy.

Appliance design

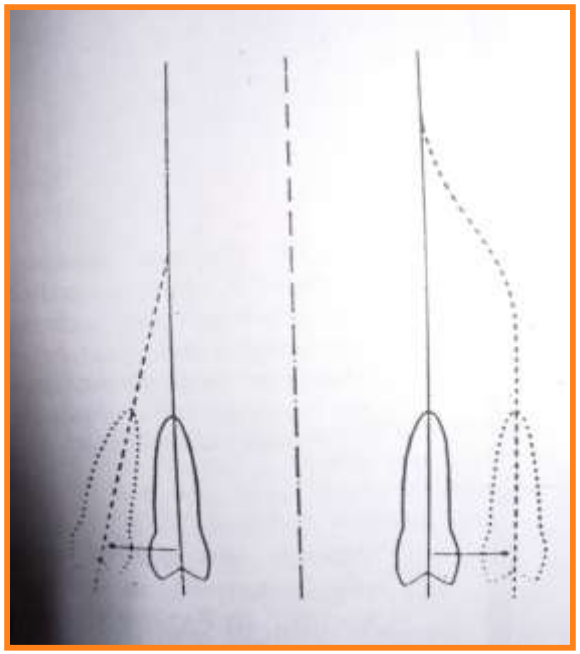
- The original design by Angell is still relevant.
- Important features are

  - ✓ Rigidity
  - ✓ Tooth utilization : maximum
  - ✓ Expansion screw vs Spring
  - ✓ Economy
  - ✓ Hygiene

RIGIDITY

- Parallel opening by rigid appliance is possible

Flexible



Rigid

Buccal tipping of dentition

Linear expansion

Rigidity...

- *Chaconas et al.*(1975)….the form of appliance determines the shape of the expansion

removable appliance would be unsuitable

- ✓ because of retention problems.
- ✓ once out of mouth ⇨ elastic recoil of the dentomaxillary tissues ⇨ replacement might prove impossible

Rigidity...

- Banded appliances vs cap splints

✓Bands ⇨ small area of connection

✓Cap splints ⇨ extensive area of connection ⇨ more rigid

Tooth utilization

- Load distribution

  Incorporate as many as teeth as possible and thus spread the load over entire alveolar length

- Bands can cemented simultaneously only to a few teeth
- Splints can adapted to all the teeth

- Appliance retention

depends on-

✓**area of adhesion,**
✓**precision of fit,**
✓**shape of clinical crowns.**

Expansion screw vs Spring

- Spring reduces the rigidity and control
- A screw is far better but should have a thread of sufficient length to complete the expansion without interruption

Economy

- Time

  Cap splints keeps the clinical time to a minimum

- Material

  Here the banded appliance has a distinct advantage over the bulky cap splints.

Hygiene

- An appliance permanently in the mouth --

✓ **increases stagnation**
✓ **reduces massage and cleansing (natural & artificial)**

- Bands –

.

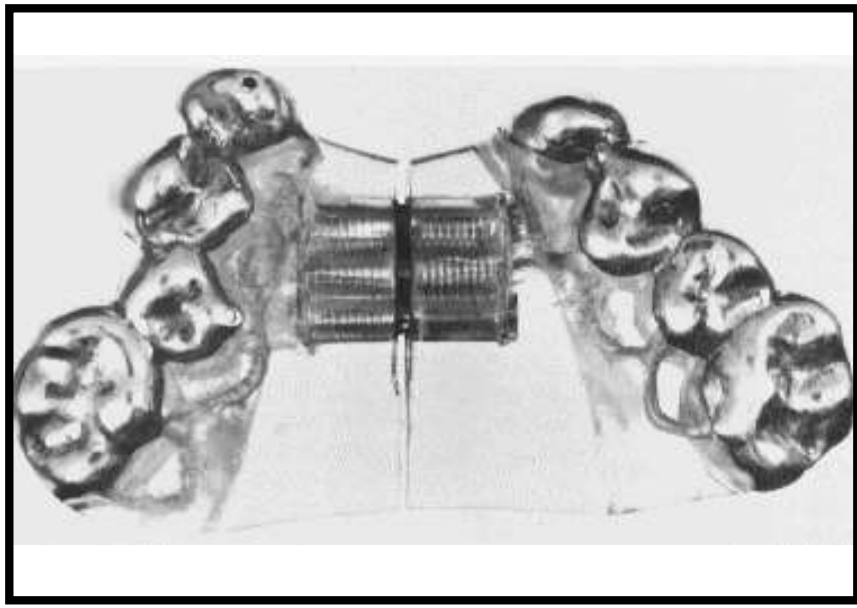
✓**minimal covering of dental and palatal tissues**
✓ **least amount of interconnecting material**

RME Appliances

- Cap Splint appliance
- Banded appliances
  - Derischweiler type
  - Haas type
  - Beiderman type
  - Issacson type
  - Arnold type
- Bonded RME appliance
- Full coverage bonded RME appliance
- Removable RME appliance
- Hilgers palatal expander

Cap Splint appliance

- Also called the Standard appliance.
- Cap splints are casted with metal flanges to engage acrylic.
- Splints can be applied to all the teeth in the arch.
- Sterling silver was commonly used.
- Glenross MK VI screw
- 45º = 0.5 mm.
- Need good lab support
- Tedious fabrication
- Not so popular now.

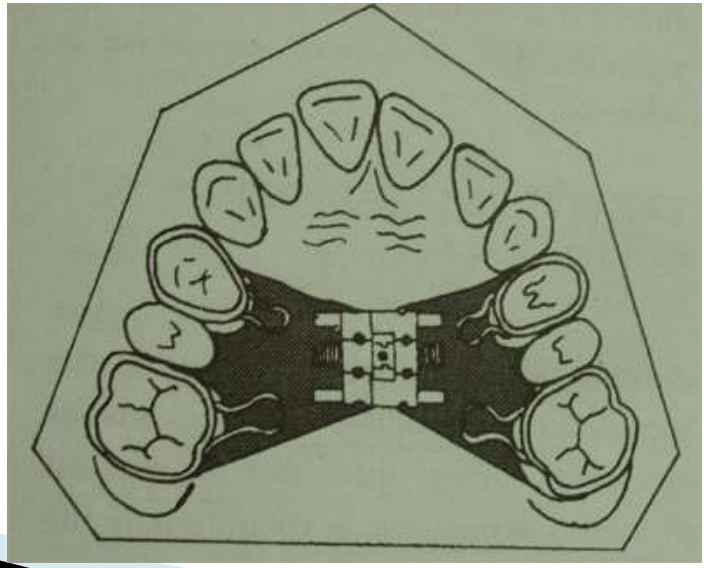


Banded appliances

- More popular
- Ist permanent molars and Ist premolars are usually banded.
- Wires may be soldered to the buccal aspects of the bands to increase rigidity.
- Brackets may also be welded to engage arch wires with other teeth.
- Can be fabricated in office / lab

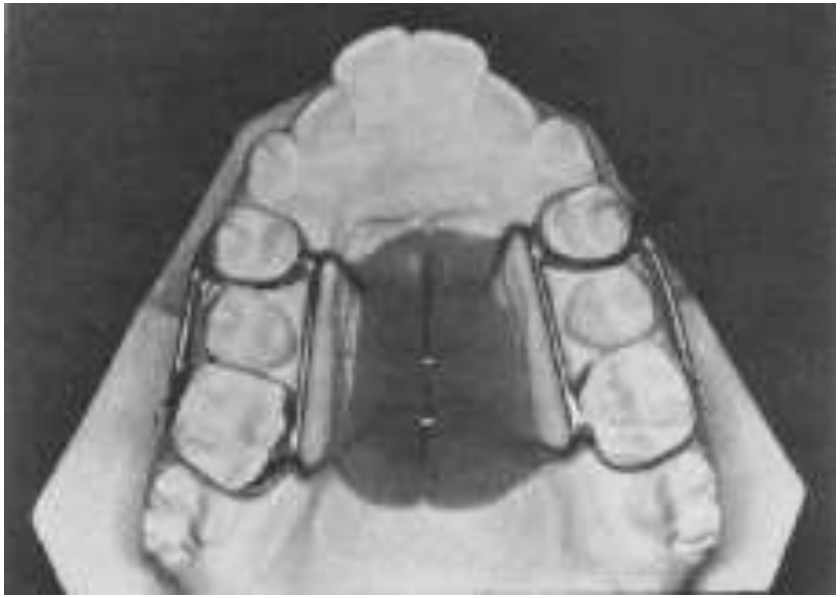
Derischweiler type

- Tags are welded or soldered to the palatal aspects of bands to provide attachments for the acrylic.
- Acrylic also extends to the palatal of all non banded teeth except incisors.



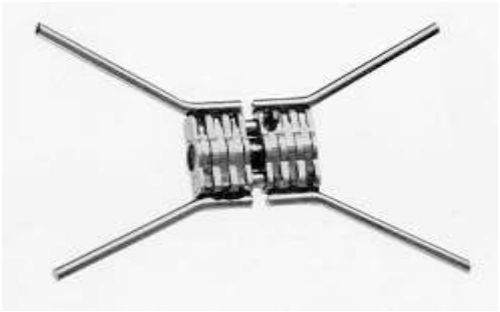
Haas type

- A length of 0.045” SS wire is soldered along the palatal aspects of the bands.
- The free ends are turned back and embedded in the acrylic base short of the bands
- A Proprietary screw is incorporated.
- Banding difficult on malposed teeth as path of insertion is not parallel
- Banding and cementation difficult on deciduous teeth



Beiderman type

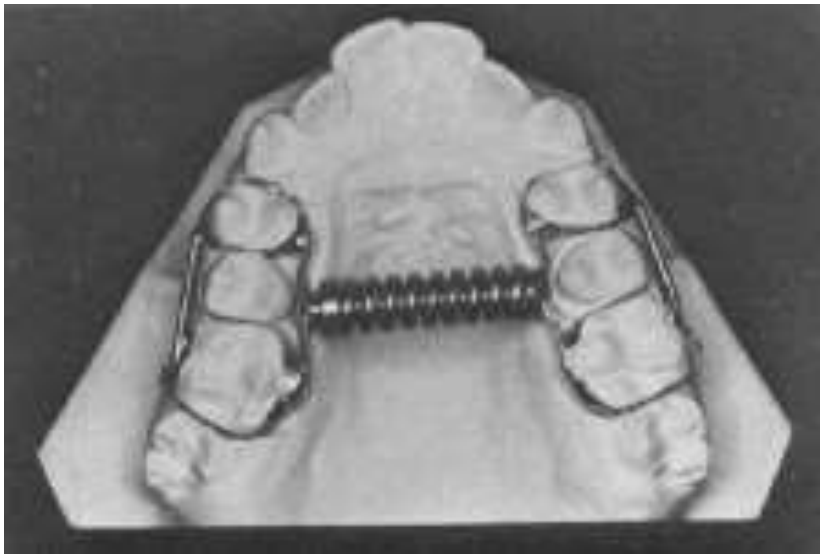
- Hygienic palatal expander
- This appliance requires a special screw, either a Hyrax or Unitek.
- These have extenions in heavy gauge wire which are soldered to the palatal apsect of bands.
- Acrylic free palate , hence no food entrapment or mucosal irritation , no ulceration



OIS Screw

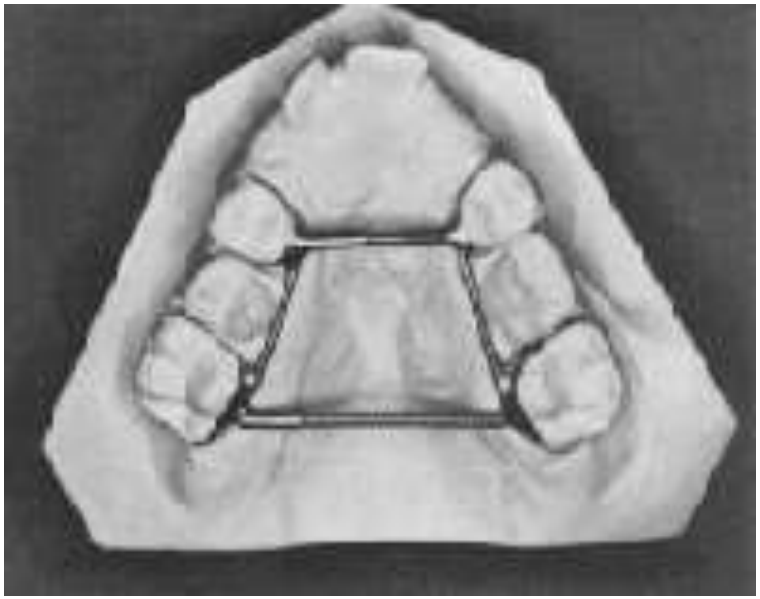
Issacson type

- This appliance has a special spring loaded screw called **Minne Expander.**
- Minne Expander is a heavy caliber coil spring that is expanded by compressing the coil.
- It is soldered directly to the bands.
- No acrylic : easier fabrication



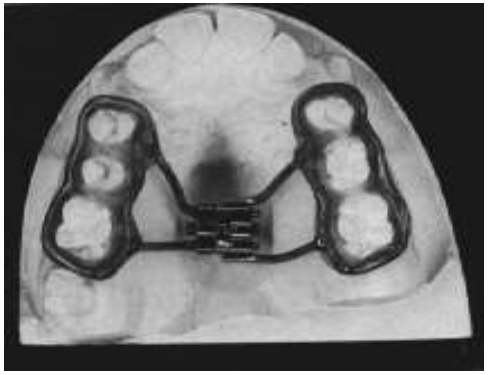
Arnold Appliance

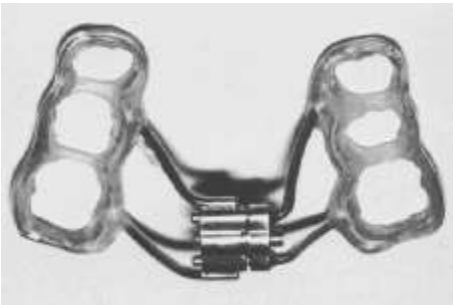
- This coil spring expander is attached by means of vertical half tubes on the molar bands.
- The tubes consist of coil springs.
- It expands the arch by lingual pressures, using coil springs for power.



Bonded RPE appliance

- **Raymond Howe** in 1982 developed this appliance
- Clears the palate of acrylic
- No banding → Can be used on malposed teeth where parallel path of insertion is not possible.
- Less error prone as bands dot have to be placed in impression.
- Easy to make on deciduous teeth



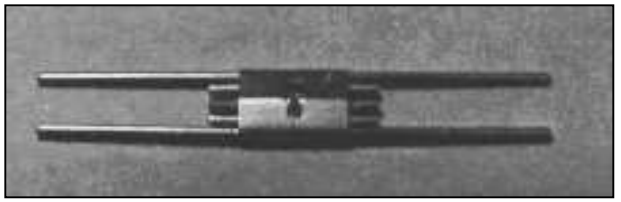


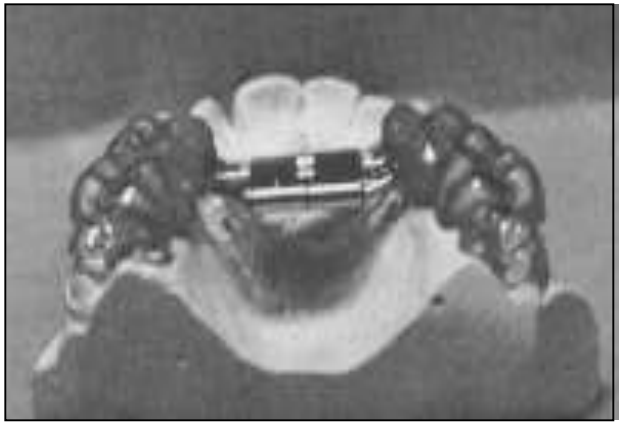
0.040" SS Wire assembly

Finished appliance

Full covered bonded RME appliance

- Developed by John Spolyar in 1984.
- Solely for tooth borne anchorage with full covered bonded buccal segments.
- Spider type expansion screw placed as anteriorly as possible
- Acrylic free palate : easy to fabricate
- No bands so less errors
- 2mm Poly vinyl wafer is used
- Disadv : Difficult to remove





Hilgers palatal expander

- The Hilgers Palatal Expander consists of two molar bands with soldered horizontal helices and an acrylic plate with embedded jackscrew
- The anterior extensions of the wire serve as **bonded** occlusal rests on either the first bicuspids or the first deciduous molars.
- The helices serve to rotate and distalize the upper molars, using the soft-tissue palate as anchorage.
- The jackscrew produces an orthopedic midpalatal disjunction.

ADVANTAGES

- The appliance is able to achieve changes in arch width and form
- Distal rotation and movement of the upper first molars.
- It also saves upper "E" space.
- Creates room for erupting cuspids.
- Anchors the molars during upper retraction.

Regime for screw rotation

- ***Timms*** prescribed it according to the age and expected resistance to separation.
- 3 categories of patients acc. to age
  - **Upto 15 yrs** : 180 degree daily divided to two activations of 90 deg →morning and night.
  - **Age 15 – 20 yrs** : 180 degrees daily divided into four activations of 45 deg.
  - **Age over 20 yrs** : 90 degrees daily in two activations →morning and night.
  - **Over 25 yrs** : surgical seperation may be required

Schedule by Issacson and Zimring

- **In young growing patients**, 180 degree daily for 4 -5 days and later 90 degrees daily till desired expansion achieved.

- **In non growing adult**, 180 degree daily for first two days, 90 degrees daily for next 5 -7 days and 90 degrees on alternate days till desired expansion achieved.

Rules and guidelines for screw positioning:

- It should be placed in the mid line oriented to median raphe when bi-lateral expansion is to be planned screw should lies on a imaginary line passing between the first and second premolar.

- In a narrow arch it should be positioned more posteriorly

- With the tag it should positioned with the arrow pointing in the right direction. wax should added to prevent its dislodgement.

- The screw should not placed parallel to the palatal vault, rather it should be turned about 45* forward so that child can activate it himself

- Pitch of the screw is set so that the tissue does not get harm during expansion. A complete turn of **360*** will produce a separation of **0.8 – 1mm** The screw when turned **90*** will produce separation of **0.2mm.**

- That means the periodontal ligaments gets narrower by **0.1mm on each side**, this reduction thus do not cause excessive hyalinization and also creates ideal orthodontic condition for the transformation of the bone.

Effects of RME

- RPE occurs when the force applied to the teeth and alveolar processes exceeds the limits needed for orthodontic tooth movement.
- 3 -10 *lb* with each turn

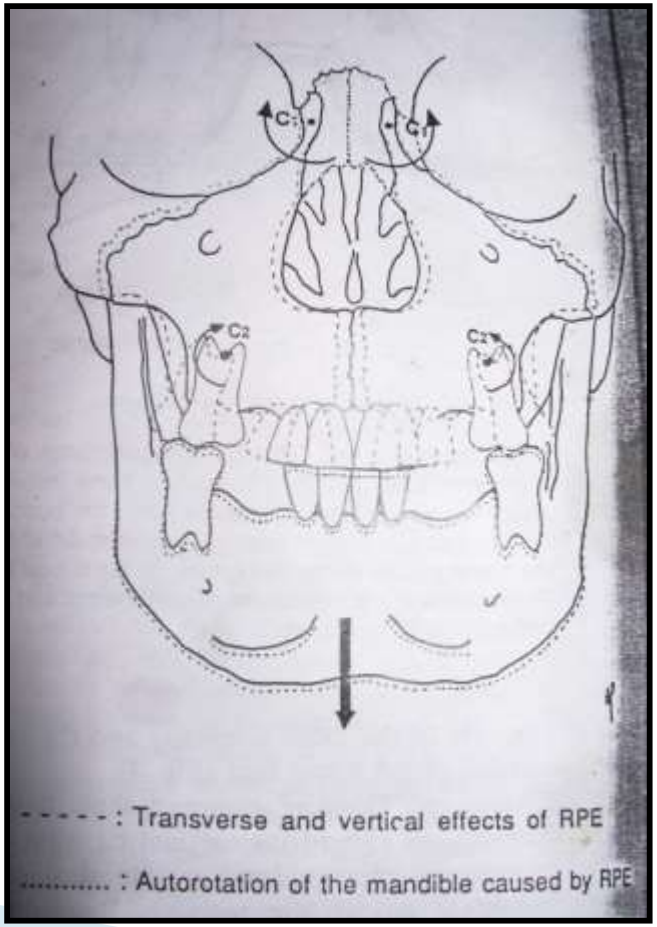
The appliance compresses the PDL

Bends the alveolar processes (microfractures within buccal cortical plate)

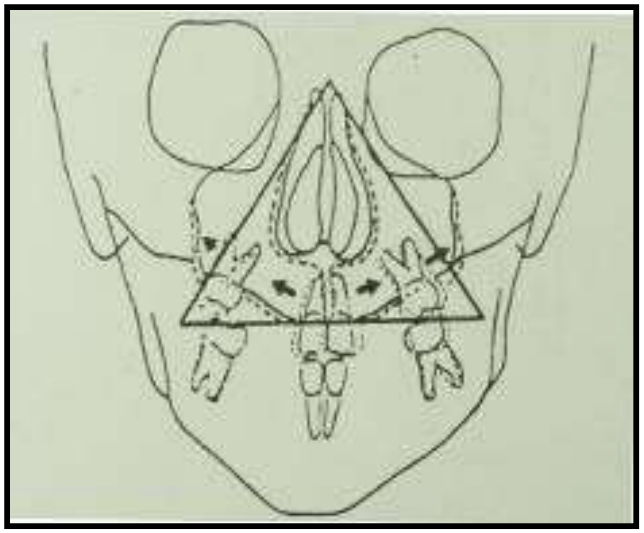
Buccal tipping of anchor teeth.

Gradually opens the midpalatal suture

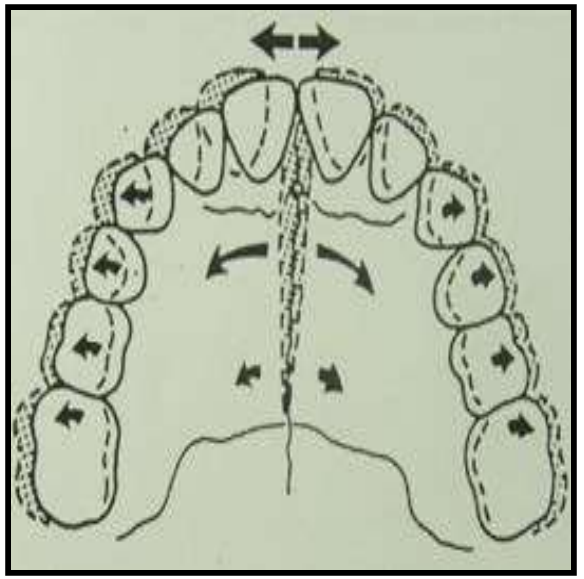
Pyramidal opening in vertical & transverse direction of the midpalatal suture



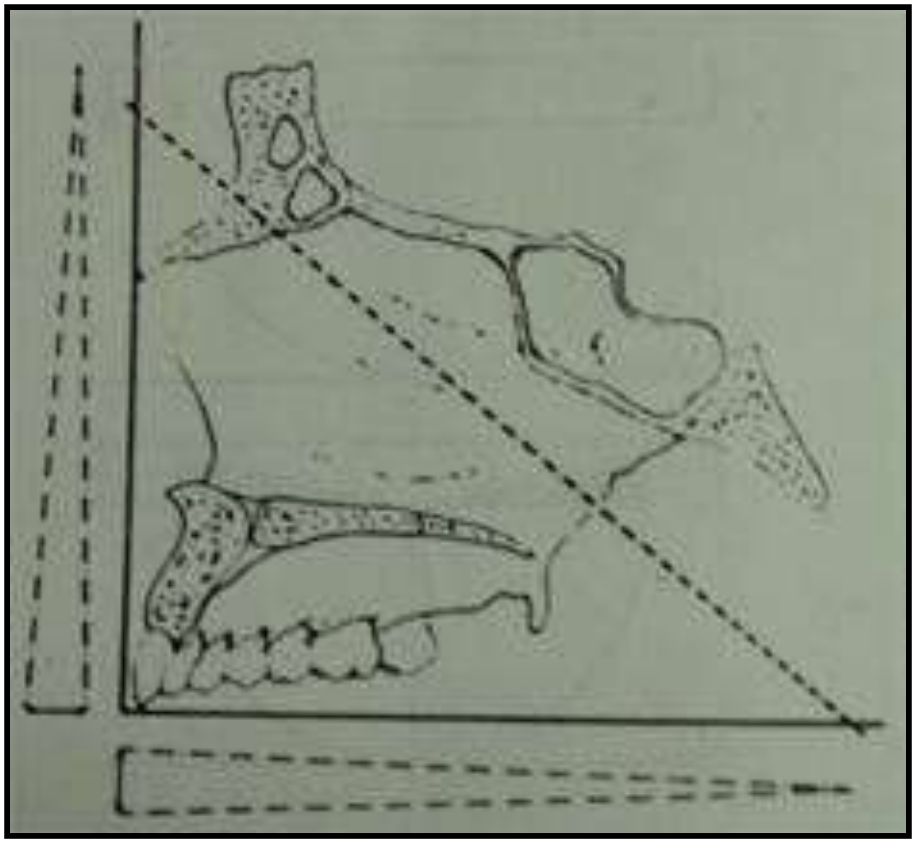
C1 centre of rotation of maxilla.
C2 centre of resistance of molars



vertical



Transverse

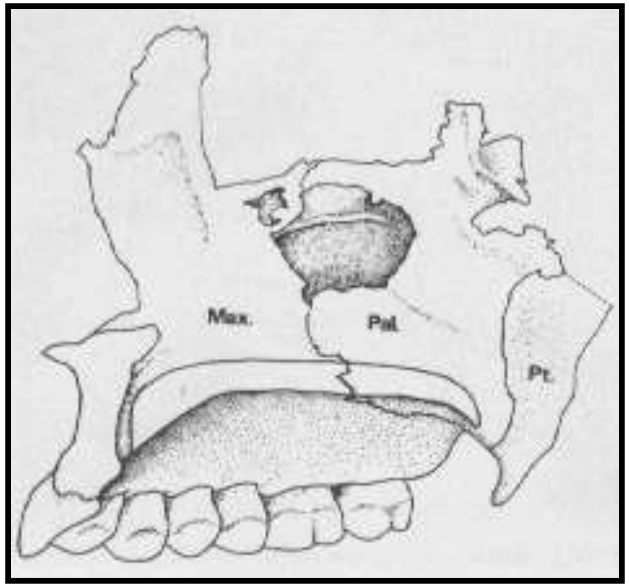


Depends on center rotation of maxilla

Center of rotation varies with–

- The configuration of circomaxillary sutures
- The interdigitation within midpalatine suture.
- Position of expansion device, and
- Age

- Configuration of circomaxillary sutures.



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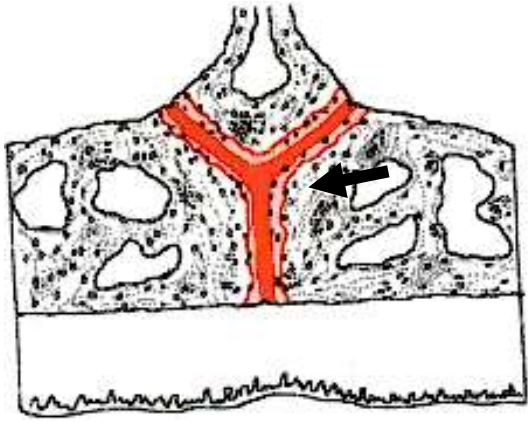
The Mid Palatal Suture



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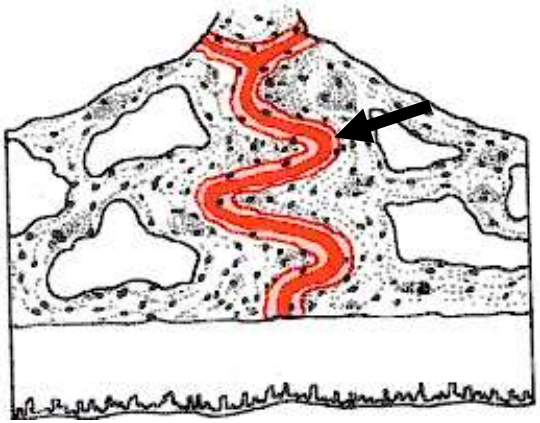

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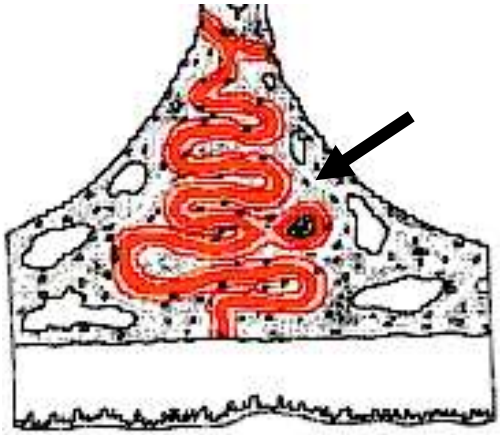
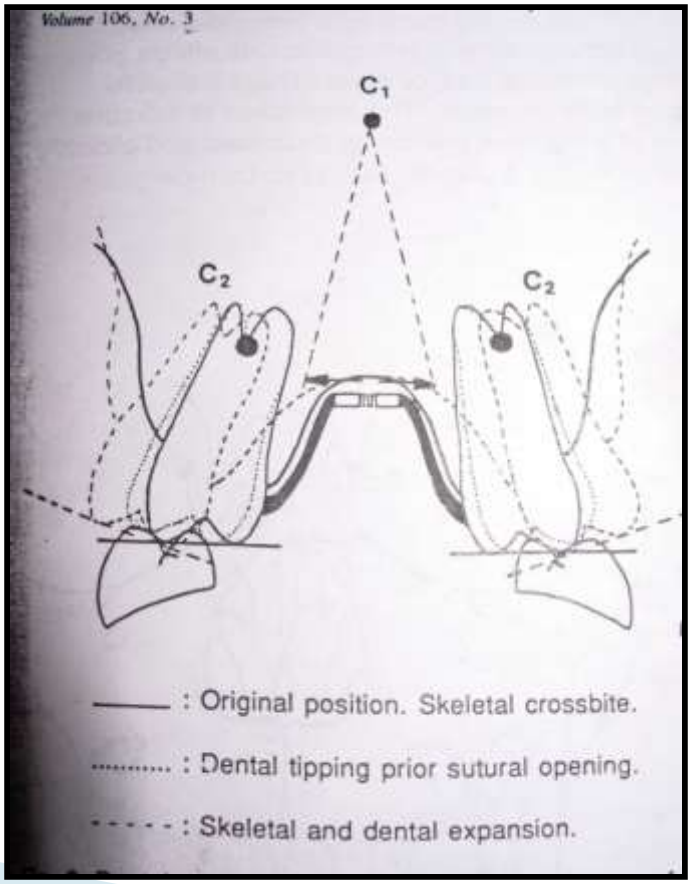


By adolescence, suture may become densely interdigitated as a jigsaw puzzle

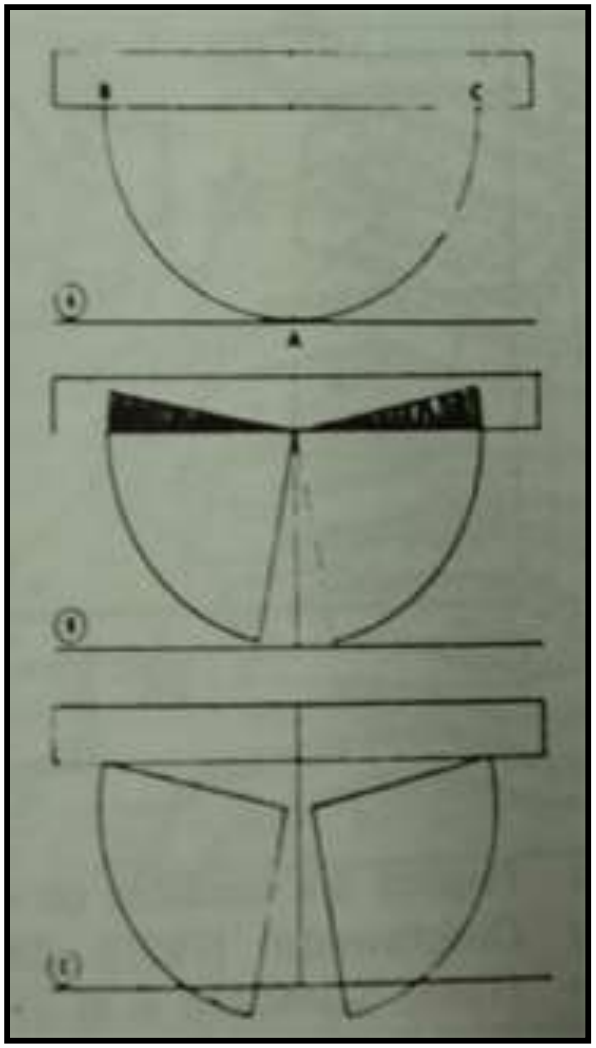
Persson et al (1977) have reported earliest closure in 15 yr old girl and oldest unossified suture in 27 yr old woman

Lateral tipping & extrusion of lingual cusps of posterior teeth



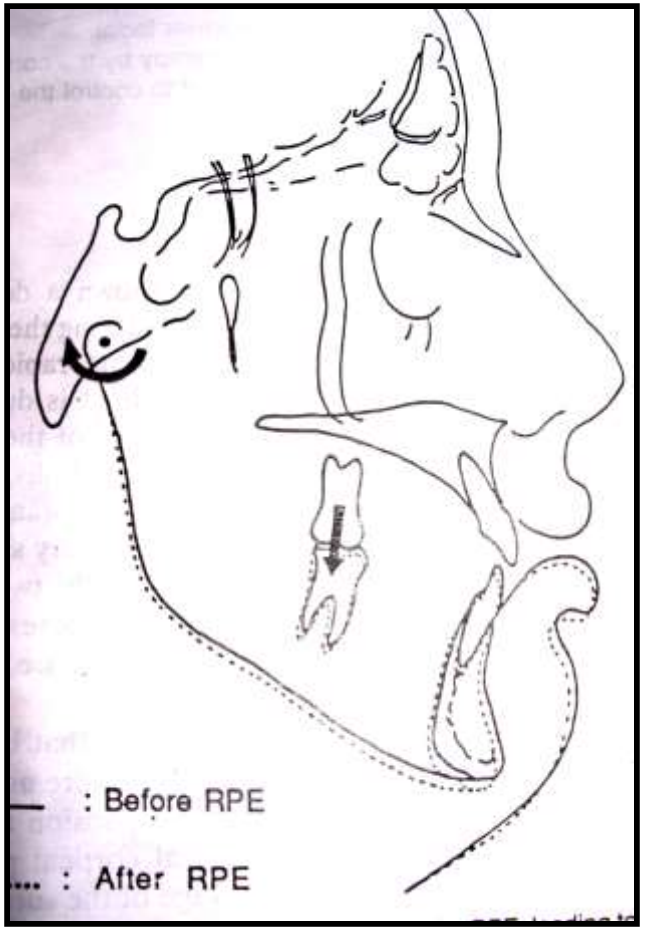
Downward & forward movement of maxillae

- There is general downward and forward movement of the maxilla due to the zygomatic buttressing.



Autorotation of mandible

- Downward & backward
- Increase facial convexity
- Increase lower ant.
  face ht.



- Splaying of the hamular processes of the sphenoid bone is seen. (Timms et al)
- Arch perimeter increase is 0.7 times the intermolar width increase. (Nanda et al)
- Palatal depth is found to increase due to over eruption of posterior segments.
  (Ladner et al 1995)
- Mandibular arch expansion is also seen with RME : upto 1.1mm increase in intercanine width and 2.5 mm in intermolar width. (Sandstorm et al. 1988)

SIDE EFFECTS OF RPE

- Lateral tipping
- extrusion of lingual cusps of posterior teeth.
- increase vertical dimension in the posterior region.

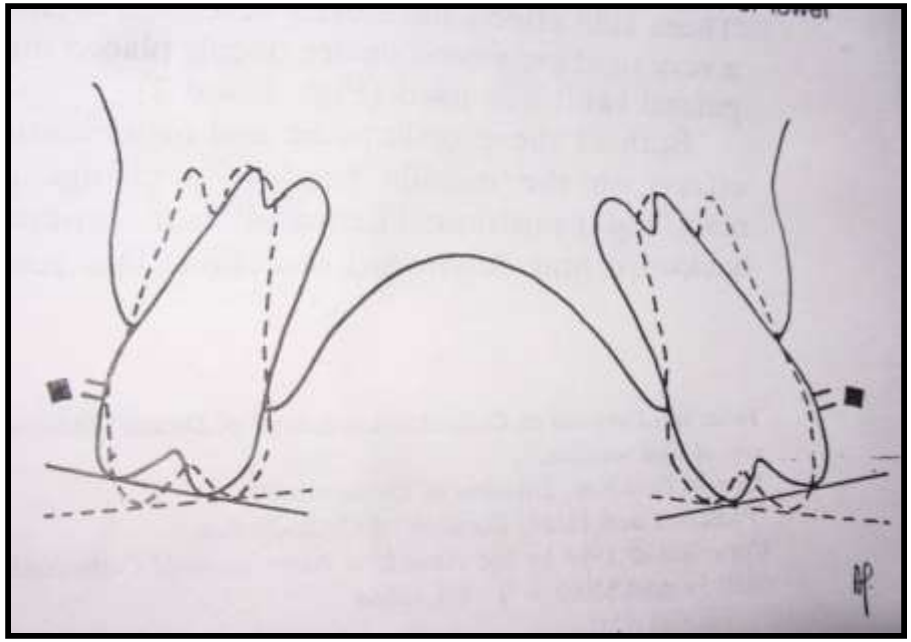
BIOMECHANICS OF PREVENSION OF SIDE EFFECTS

1, Lateral tipping & extrusion of lingual cusps of posterior teeth

Corrected by placing buccal root torque into continuous wire

Effect of buccal root torque…

- Buccal cusps move downward
- Lingual cusps remain extruded

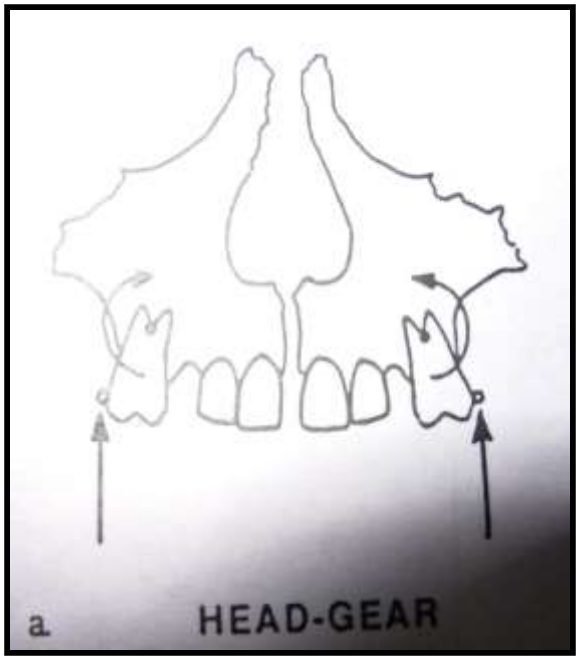


2, increase vertical dimension in the posterior region.

Haas (1965) indicated that a high-pull headgear or a vertical pull chincap may be used, coincident with RPE

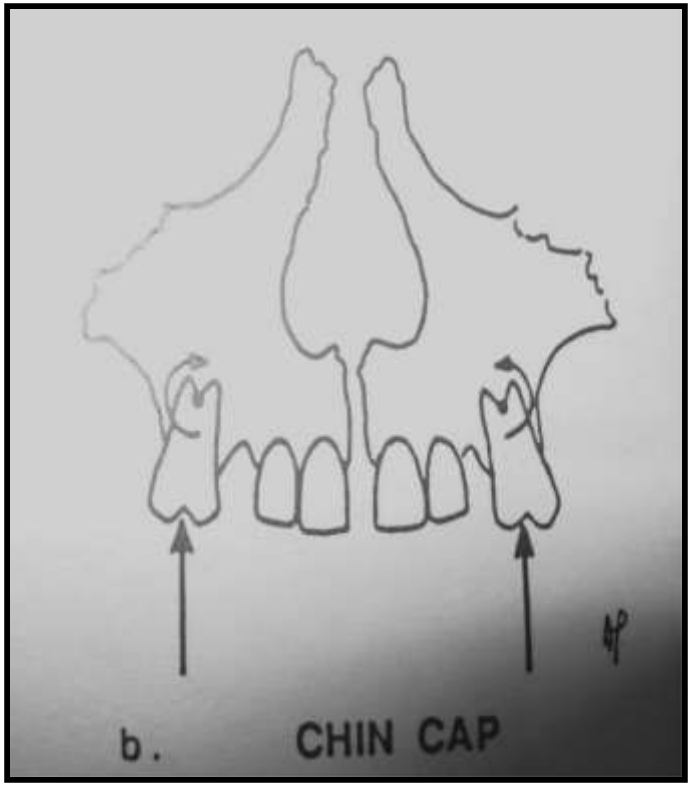
Force system by high-pull headgear…

- Point of force application being buccal to centre of resistance of molars, *will produce a moment that will tip the maxillary more buccally*



Force system by high-pull chincap…

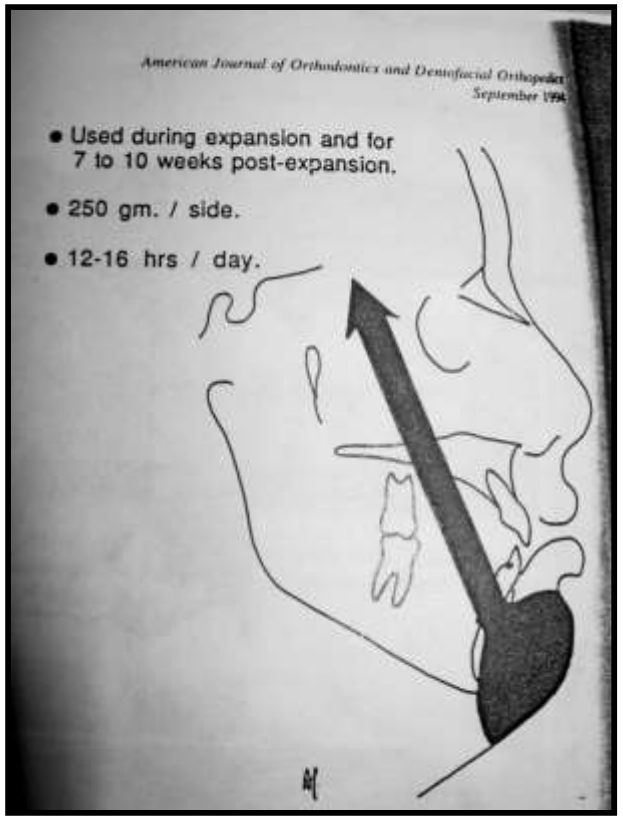
- Point of force application more near to centre of resistance of molars, *leads intrusion force at lingual cusps*



- *Other factors in successful control of side effects*

✓ Timing

✓ Force application of high-pull chincup



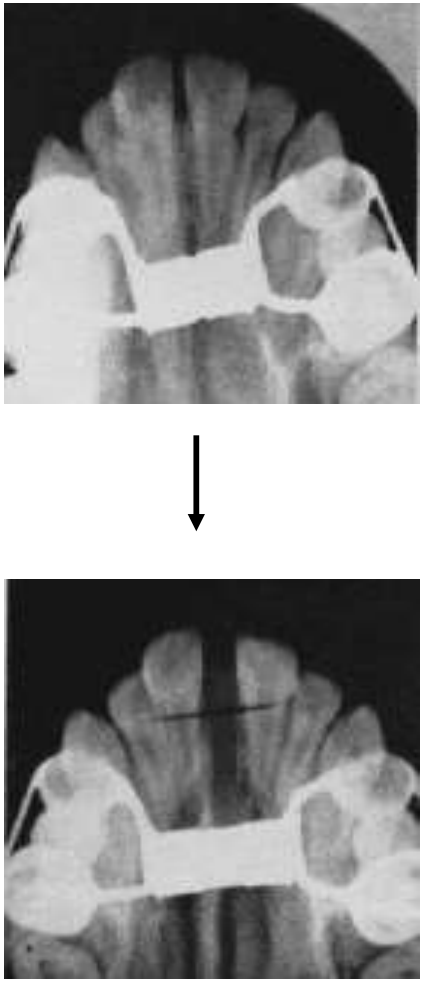
- Thus, the use of high-pull headgear to control buccolingual tipping *much less effective* when compared with high-pull chincap

Histological changes

- After a period of initial hyperemia, there is osteoblast activity with new bone apearing at the edges of the fibre bundles.
- The defect is invaded by bone cells, osteoid first and later haversian system.
- In adult patients , bone filling is more complex, with bone islands & resorption areas

Radiographic changes

- Occlusal films will show midline diastema
- Triangular shaped midpalatal opening.
- Lateral ceph will show downward rotation of maxilla
- Opening of the mandibular plane
- Extrusion of posterior teeth.
- Increase in ANB.



Root resorption and RME :

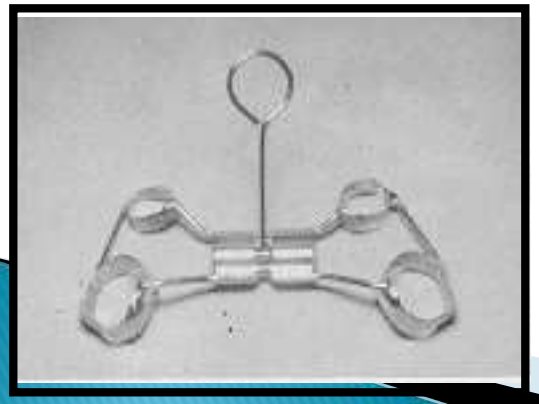
Barber & Sims in 1981, found that significant resorption is seen with RME on the cervical and middle third of buccal surface of the anchor teeth.

These are most prominent imme. after expansion but the repair process also start simultaneously and continues upto 24 to 36 months.

No clinical or radiographic evidence present for these and teeth remain normal.

Expansion in Cleft Palate Patients

- Severe maxillary deficiency may be seen in cleft lip and palate pts.
- Here usually the anterior arch is more collapsed than the molar segments.
- Differential expansion may be obtained early in childhood with Quad helix, W arch. RPE may also be carried out.
- But in mature patients RPE has to be carried out.



CLINICAL MANAGEMENT OF RPE PATIENT

- Pain is not usually present in juveniles, adults may complain.
- Pain if present, it is usually at the time of activation.
- Midline diastema is the most important proof of separation, if not present then expansion not occuring.

- Petechie may be present on the palatal mucosa which will spotaneously resolve in a week or two.
- Occlusal interferences are seen.
- Patient report inability to masticate from back teeth.

- Overexpansion is advised till lingual cusps of upper molars occlude with lingual inclines of lower buccal cusps.

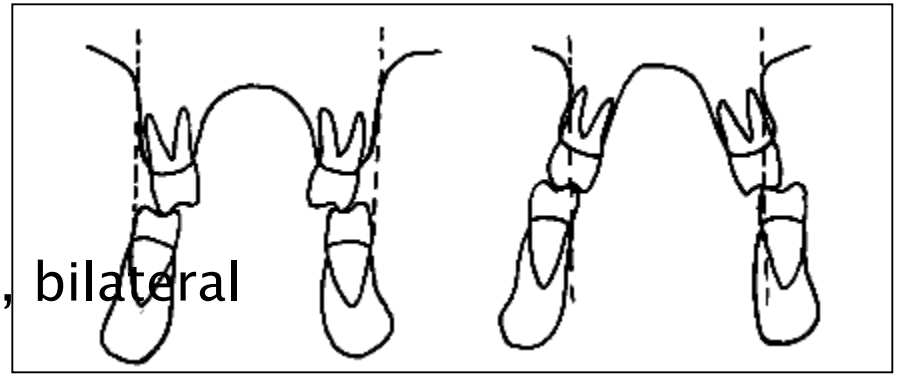
Stability and Relapse

- Proponents of RPE claim that the more the skeletal effect is achieved more stable it is. There should be minimal tipping of teeth during RPE
- Timms et al say that ½ to 1/3 of RPE is lost in relapse
- Skieller has also shown thru implant studies that skeletal changes are maintained, nasal width increase is also maintained. It is the dental component that relapses.
- Slow expansion changes are claimed to be more stable than RPE by Bell in 1982 as they are physiologic.
- Intermolar width is more easily maintained than intercanine width increase.
- Maxillary increase are more stable than mandibular.

- The concept of **over expansion** has been recommended by Haas.
- 2 -3 mm overexpansion to allow for relapse.
- Early treatment → lesser forces (SPE) → short retention needed.
- Same expansion appliance has recommended to be used for retention for at least 3 months which is most critical.
- Acc. To Hicks, relapse in SPE, when retention is
  fixed → 10 – 23 %
  removable → 22 -25 %
  None → 45 %
- Stockfish is of the view that fixed retention for 3 months and followed by upto 2 years of removable appl. Will give stable results

Which appliance and when ??

- **Clinical examination**
  - Intermaxillary relationship
  - Inclination of buccal teeth
  - Maxillary arch narrowness
  - Functional cross bite : unilateral, bilateral



- **Model analysis** :Pont's index
- **Radiographic analysis** → PA view (distance bet the vertical planes through the coronoid process and most buccal aspect of molar on each side)
- **Age**

  Deciduous, mixed and early permanent : SPE

  Late adolescent and adult patient : RPE with or with out Surgery

  Early cleft palate : SPE

  Mature cleft palate : RPE

  Severe Class III with maxillary protraction : RPE

- SME ⇒ More expansion period and less retention phase
- RME ⇒ Less expansion period and more retention phase.
- Ultimately appliance remains in the mouth for same length of time.

(contemporary orthdontics 4th edi : William Proffit)

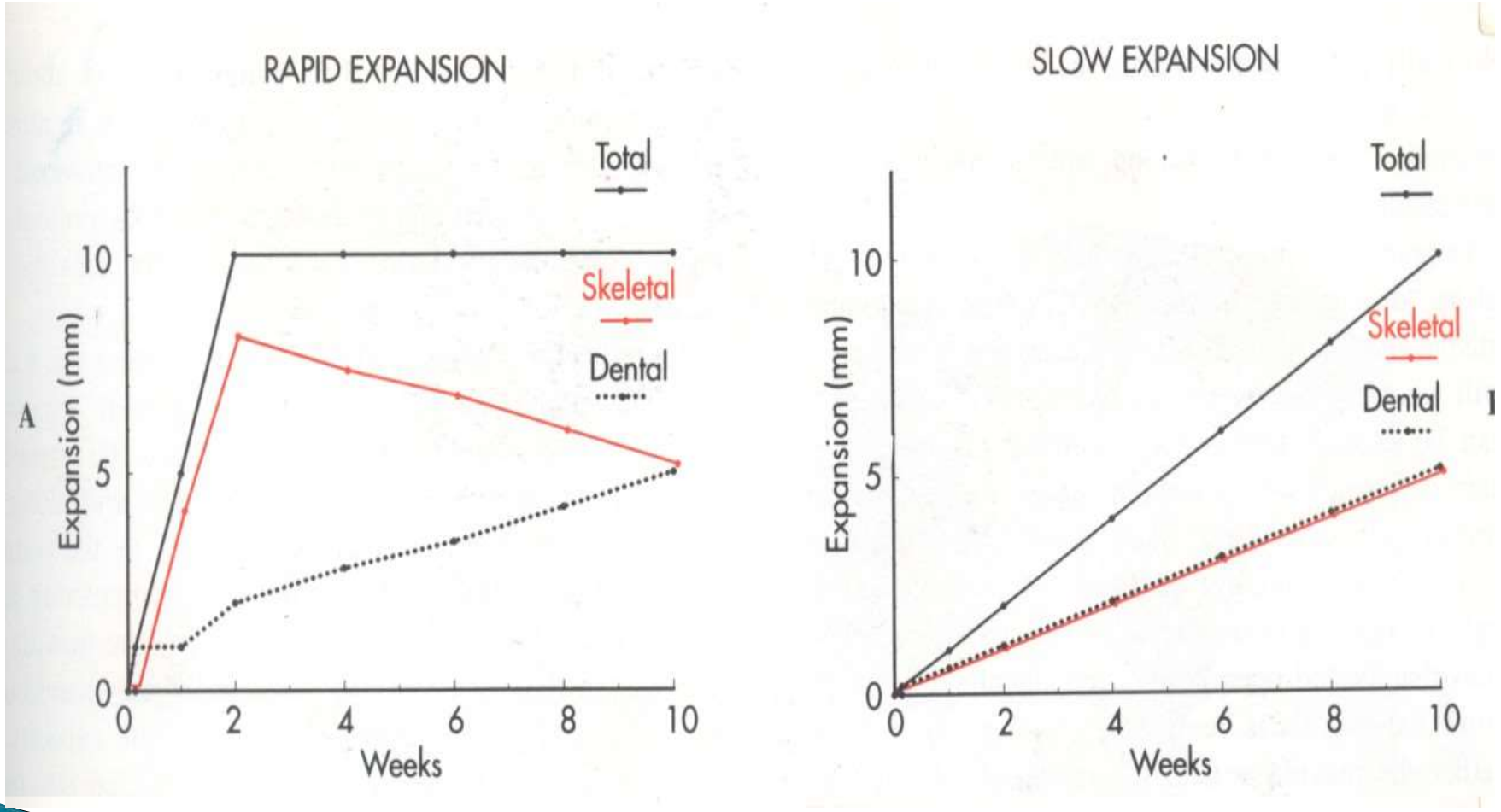
SLOW vs RAPID EXPANSION

Slow expansion	Rapid expansion
Both skeletal and dental changes seen from beginning (1:1)	Predominantly Skeletal changes initially (8:2). Later on Dental changes take place with skeletal relpse.
Both removable and fixed appliances can be used.	Only fixed appliances can be used.
Force level : 2 to 4 lbs Activation : upto1 mm/week	Force level : 10 to 20 lbs Activation : 0.5 to 1 mm/ day
More physiologic to tissues	More traumatic to tissues

CONCLUSION

Thank you

RAPID vs SLOW EXPANSION



SLOW PALATAL EXPANSION

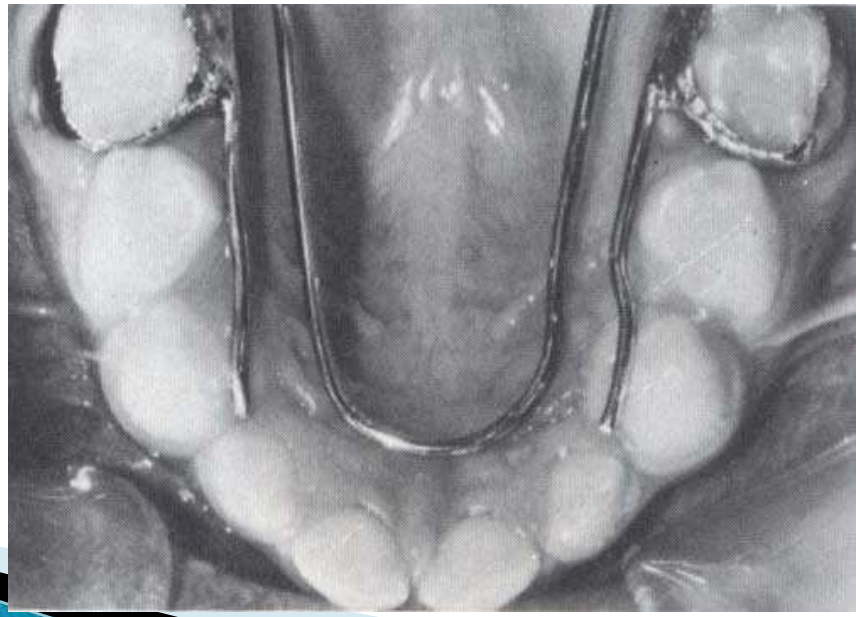
- More physiologic forces are applied to the maxilla vie the teeth. (2 to 4 lbs)
- Produces approx. 1 : 1 = skeletal : dental changes

Appliances

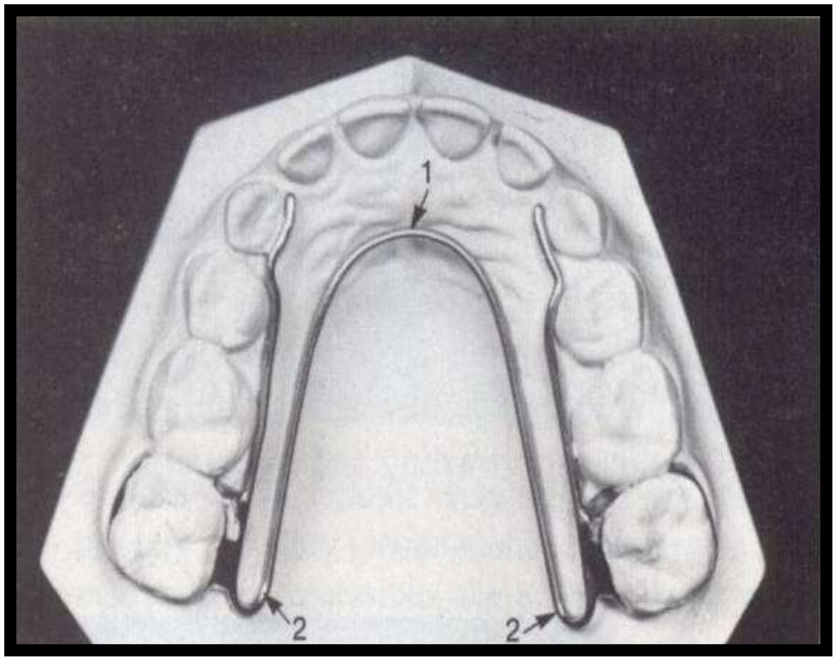
- Fixed
  - W arch
  - Quad Helix
  - Ni-Ti arch wires
- Semifixed
  - Ni-Ti palatal expanders

W – Arch

- A fixed type modification of the Coffin spring.
- First used by Ricketts in cleft palate cases.
- Preferred in primary and mixed dentition where mild to moderate expansion needed.

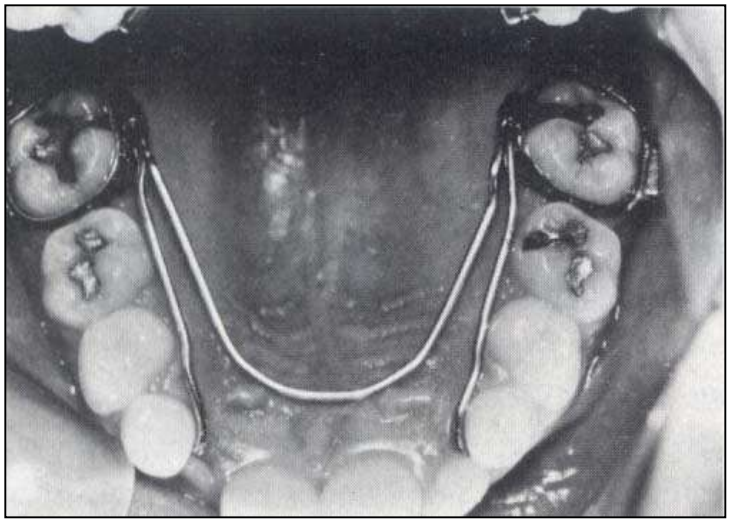


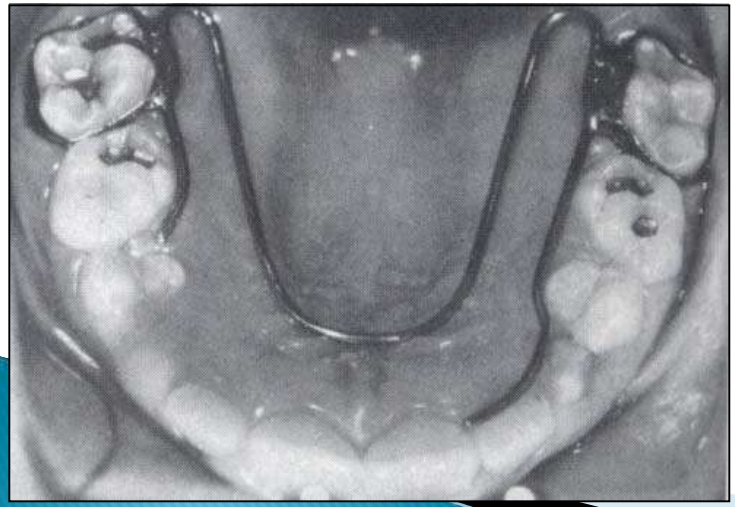
Fabrication of W – arch



- Made in 36 mil SS wire.
- Wire should contact the teeth in crossbite .
- Extend not more than 1 to 2 mm beyond molar bands.
- Wire is away form marginal gingiva and palatal tissue by 1 to 1.5 mm.

Activation of W – arch





- Can be opened anteriorly at the curve as well as at the posterior apices.
- Opened 3 to 4 mm wider than passive width.
- Expansion done at the rate of 2 mm per month.
- Unequal arm lengths can kept in true unilateral crossbite cases.
- Overtreatment done.
- Later on kept as retainer for 3-4 months.

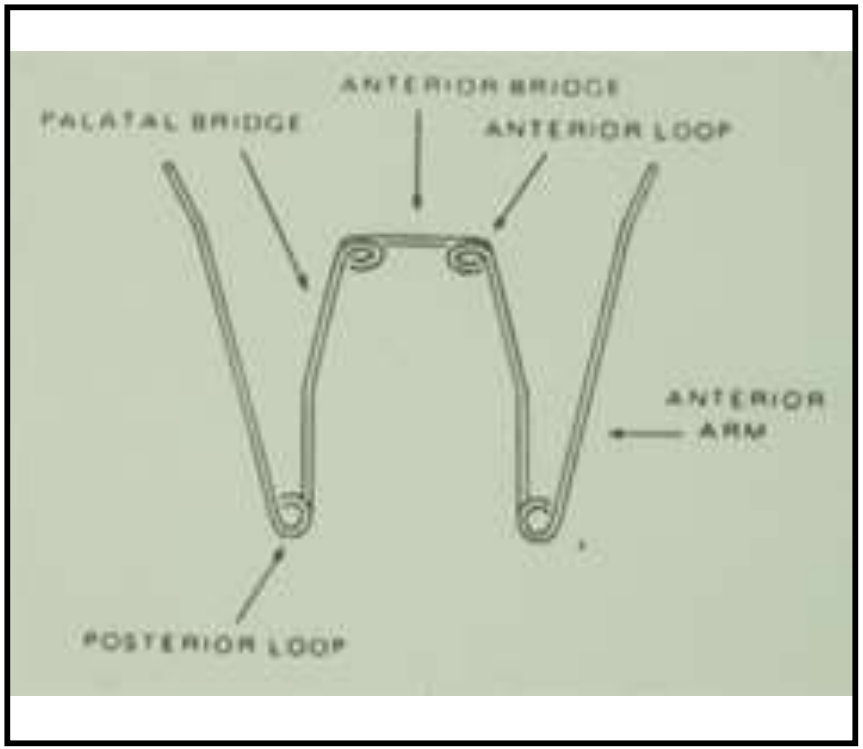
QUAD HELIX

- Introduced by Dr. Robert Ricketts in 1975
- W-arch was its forerunner.

Indications

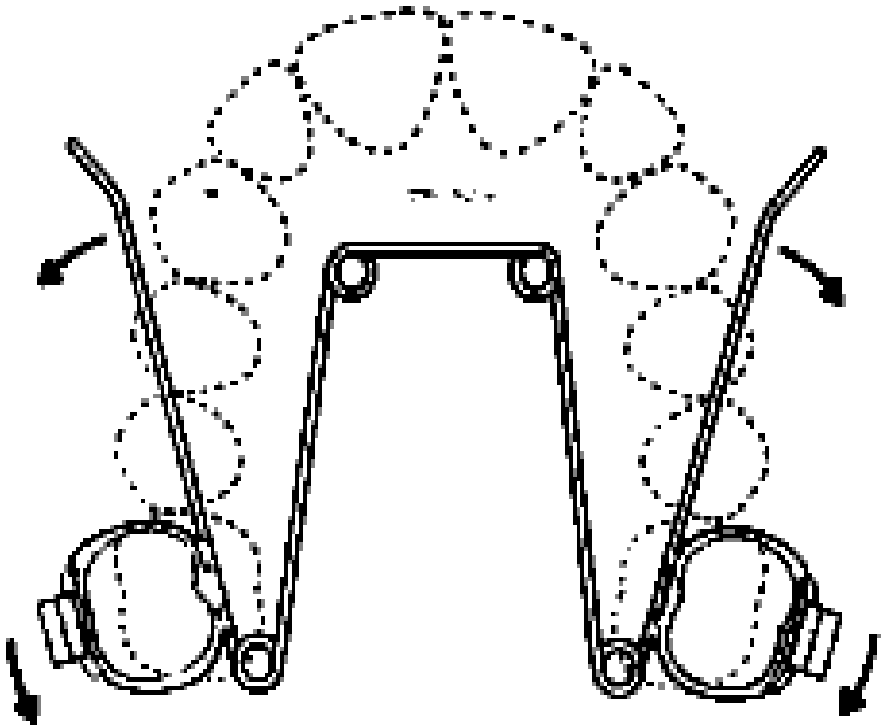
- *All crossbites needing upper arch expansion.*
- *Crowding cases needing mild expansion.*
- *Class II cases needing molar distal rotation.*
- *Class III cases with constricted maxillary arch.*
- *Tongue thrusting cases*
- *Cleft lip with cleft palate conditions – early treatment.*

Fabrication of Quad Helix



- Made of .038" Elgiloy (preformed). No.4 Gold, 1 mm S.S.
- Anterior bridge at the level of distal surfaces of canines
- Anterior helices are towards the palate.
- Posterior helices are placed distal to the first molars. **These are sloped parallel to the palatal surface.**
- Activation is done before cementation.
- 1:6 = orthopedic : orthodontic expansion in 10 yr old
- 8mm activation provided 400 gm in 0.038" Elgiloy

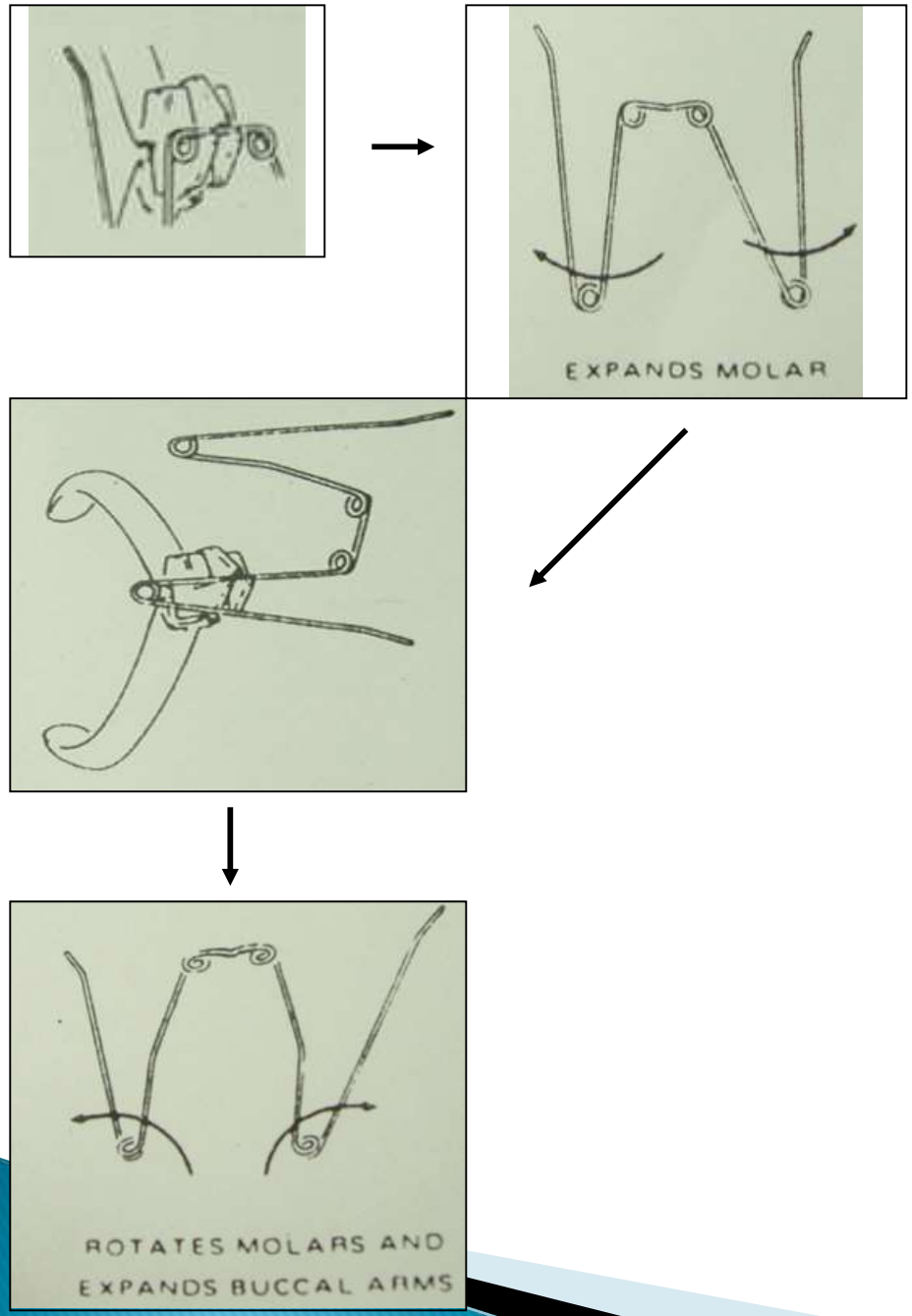
Activation of Quad helix



Ricketts prescribes 500 gm force to separate MPS

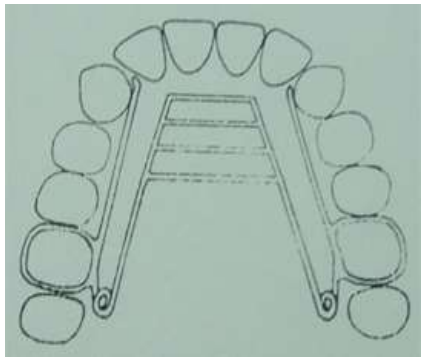
- A six weeks interval is observed before further activation.
- **Extra oral** : *Preferred* 1 cm each side in molar region & 1.5 mm anteriorly.

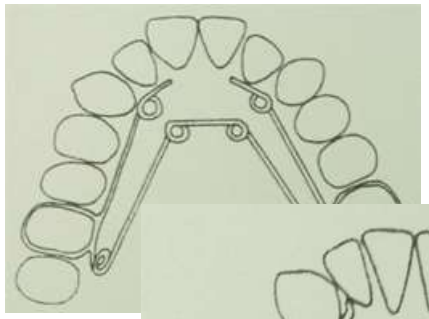
  Anterior helices opened for intermolar expansion then posterior helices adjusted to counteract mesial molar rotation.

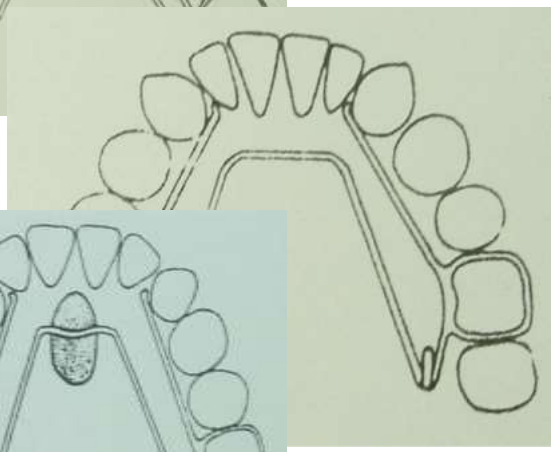


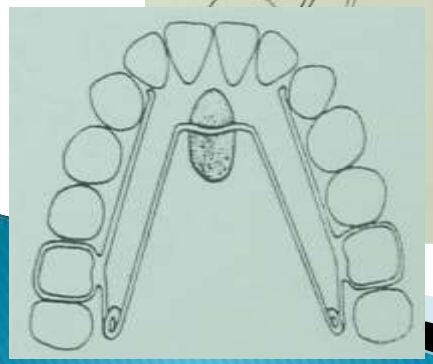
- **Intra oral activation**
  A *Triple beak plier* is used.
- 1st bend: Anterior bridge is bent by keeping single beak anteriorly – intermolar expansion.
- 2nd and 3rd bends are on the palatal bridges to expand lateral arms and counteract mesial molar rotation
- Overtreatment done.
- Expansion is usually over in 3 months and later it is made passive and kept for 3 months.

Modifications of Quad Helix







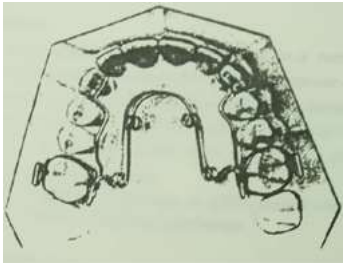


1. Habit breaking type
   - *3 in 1*
   - *Tongue spurs*
2. Only for molar rotation correction
3. Addition of anterior loops and arms for incisor correction.
4. Mandibular quad helix.

RECENT MODIFICATIONS...

- MOBILE INTRAORAL ARCH SYSTEM
- MODULAR 3-D QUAD HELIX

MOBILE INTRAORAL ARCH SYSTEM

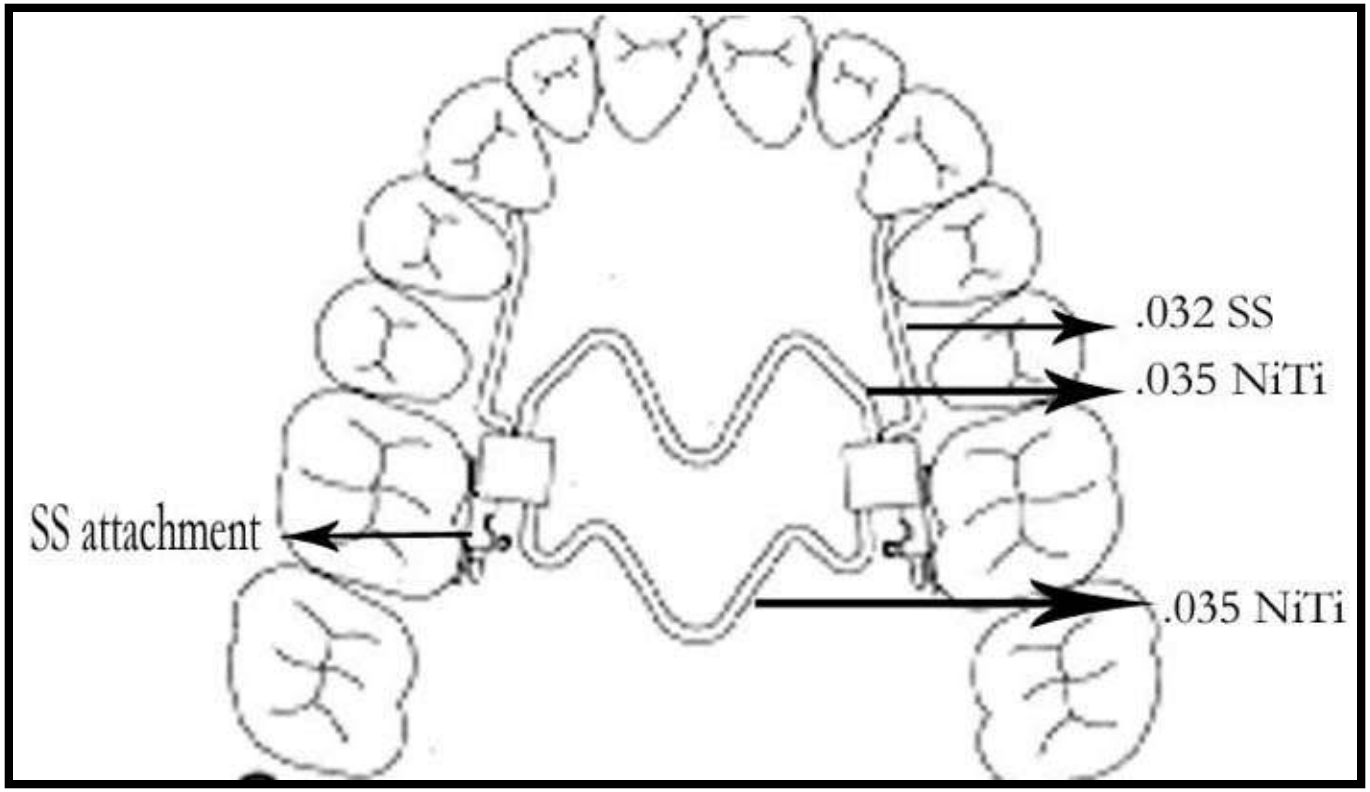


- A semi fixed variety.
- Described by Dr. Bartel in West Germany
- It consists of curved retention loops which fit precisely into similar curved lingual sheaths welded on molar bands.
- Available in 3 sizes.

ADVANTAGES :

- ✓ Debanding and recementation avoided.
- ✓ Activation is extraoral: controlled and precise.
- ✓ Buccal root torque can be applied to 1st molars.

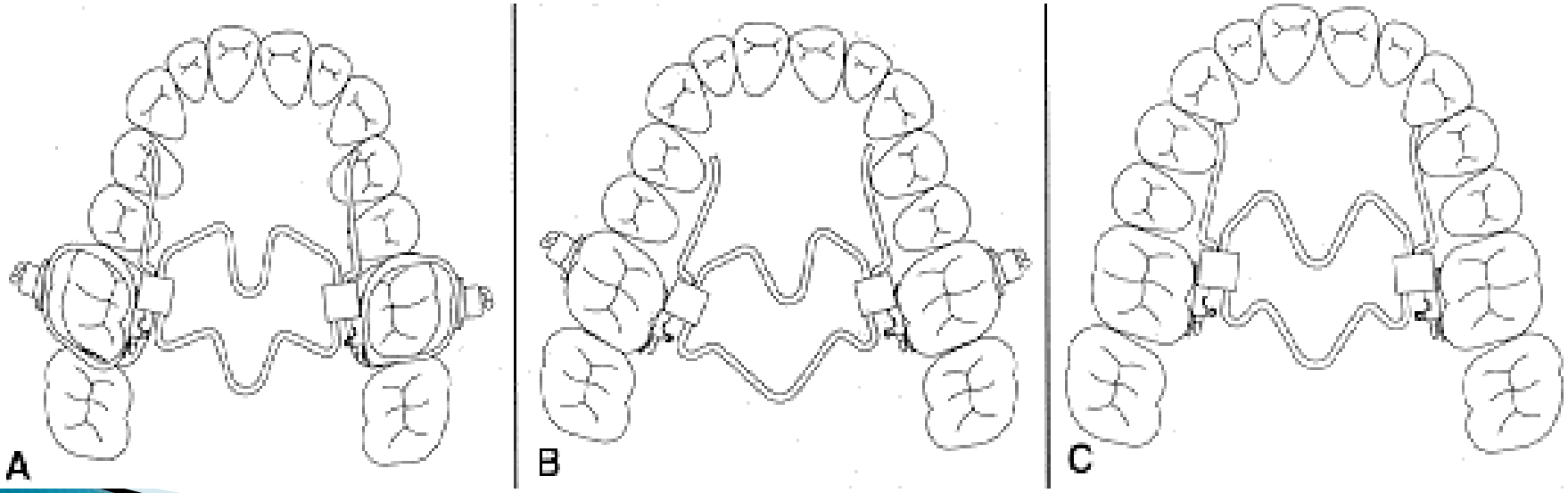
Ni Ti palatal expanders



- Introduced by Wendell Arndt in 1993.
- A fixed – removable appliance.
- Depends on shape memory and superelascticity of NiTi.
- Transition temperature 94 ^{o}F.
- Continuous force levels between 230 gm to 300 gms

Adjustment of NiTi expanders

- Available in 8 intermolar widths: 26 – 47 mm
- 26 – 32 mm width appliances are of softer wires for younger patients.
- 3mm overcorrection is added after determining the required activation.
- Freeze gel packs can be used to make appl. flexible for insertion.



Passive state

Activated for expansion and molar rotation

Expansion and rotation correction

Advantages of NiTi Expander

- Self activated
- Light continuous forces
- Easily adaptable in inactivated state
- Automatically expands to a predetermined shape.
- Requires little manipulation by clinician.
- Inbuilt safety system.
- Patient can mitigate pressure responses.

Dentoalveolar Expansion

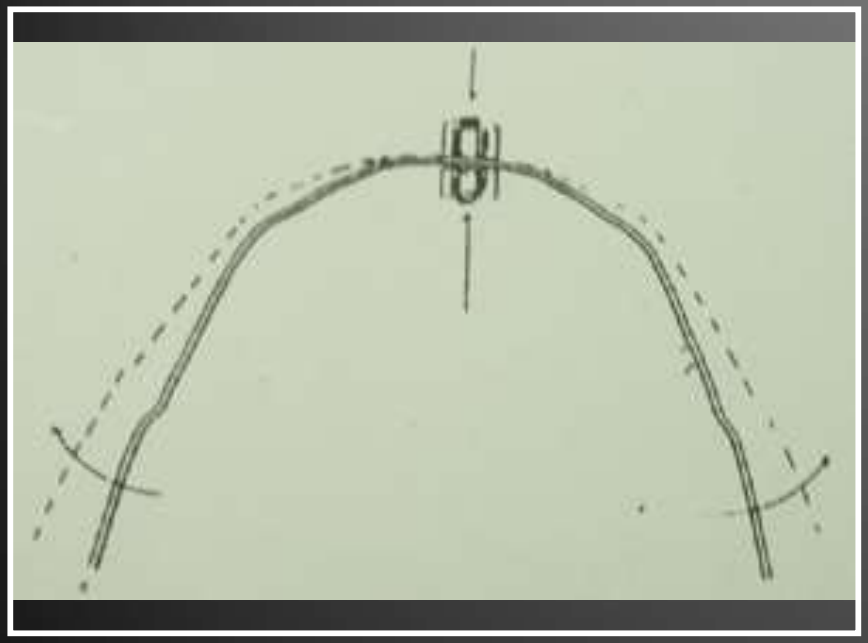
- Conventional fixed appliances
  - Over expanded arch wires
  - Expansion with vertical helical loops
  - Ni-Ti arch wires
- TPA
- Lingual arches
- Dentoalveolar expansion appliance
- Semi Fixed Appliances
  - 3D Modular appliances
  - Precision Arches

Conventional fixed appliances

- In 1728, Pierre Fauchard developed the expansion arch which was a flat piece of metal scalloped out for ideal position of teeth. The teeth were ligated towards this position.

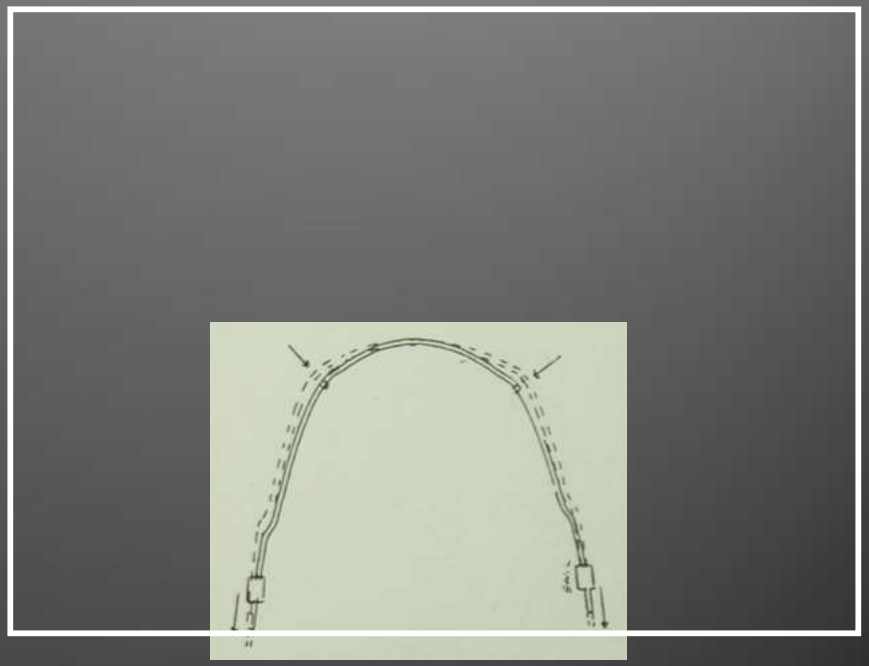
- In 1887, Dr. Angle introduced the “E arch” i.e. the expansion archin which the labial wire was supported by clamp bands on molar teeth. This arch was expanded and teeth were ligated to it. Later molar bands were added.

OVER EXPANDED ARCH WIRES



Molar region

Mx : 5 mm
Md : 1 cm



Canine region

Arch expansion is a mass buccal movement in which the arch wire moves both buccal segments buccally and at the same time change the anterior curvature.

Nickel Titanium archwires

- NiTi arch wires are available in preformed arch forms.
- An over expanded arch form is selected.
- Because of its ***Shape Memory and Superelasticity*** features, a slow continuous force is applied which causes expansion to the original shape of wire.

Expansion arches with vertical helical loops

- Suggested by Jarabak in Light wire edgewise technique.
- It can be used in areas where expansion is required in a small segment. The vertical loops accomplish the following :

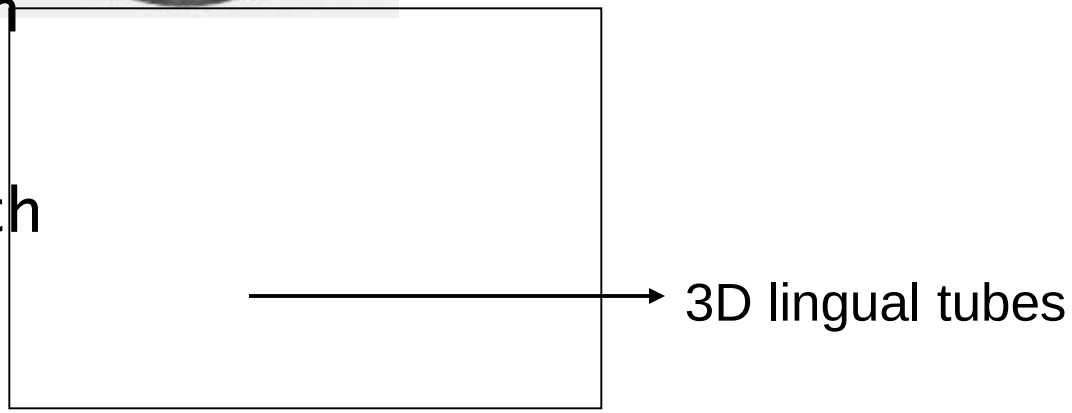
  - Buccal tipping of small segments.
  - Distal drving of small segments.
  - Increase the intercanine width to alleviate mild lower anterior crowding.

Dentoalveolar expansion appliance

- Jack Perlow in 1977 developed an appliance for dentoalveolar expansion
- .050 SS wire is adapted along the bands with a open butt joint near the distal of the upper left first molar.
- A piece of .050 (I.D.) tubing ½" – 3/8" in length is slipped over the short end at the butt joint.
- A length of .014 open coil spring sufficient to produce 3 pounds of force when compressed into position on the completed appliance is slipped into place over the longer posterior end of the appliance.

3 D MODULAR APPLIANCES

- Dr. William Wilson and Robert Wilson introduced a new *'convertible'* appliance system in which many appliances can be fitted through a single attachment.
- **3D Modular lingual tube** is the key element.
- It is a dual vertical tube which provides good control over molar tip, torque and rotation.
- There are 5 different modules of designs that can be fitted precisely into these tubes →
  - 3D Quad Helix
  - 3D Palatal Arch
  - 3D Adapter
  - 3D Sectional
  - 3D Lingual Arch



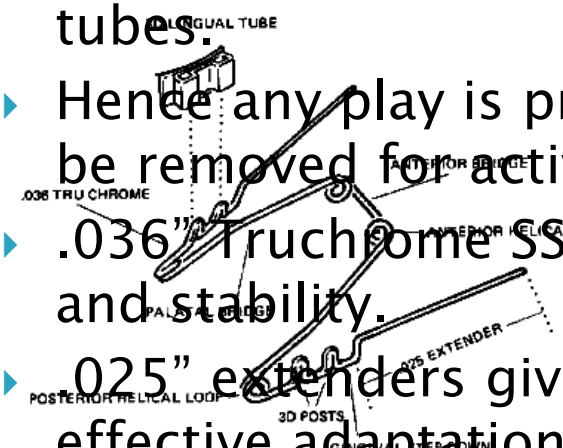
3 D Quad Helix

Functions

- Molar control
- Bilateral molar expansion
- Bilateral quadrant expansion
- Unilateral molar expansion
- Unilateral quadrant expansion
- Molar rotation
- Molar buccal crown tip
- Molar lingual crown tip
- Molar buccal root torque
- Molar lingual root torque
- Selective cuspid or bicuspid expansion
- Lateral advancer

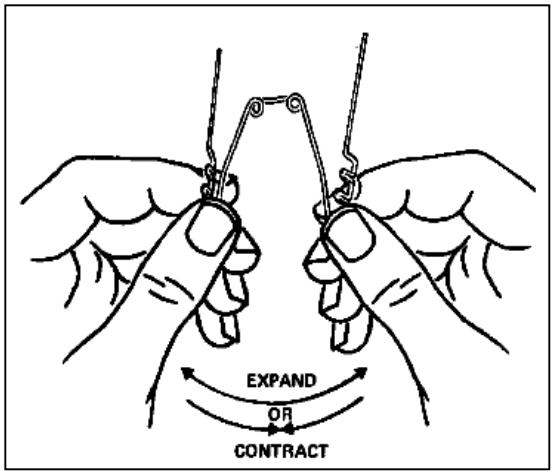
Construction

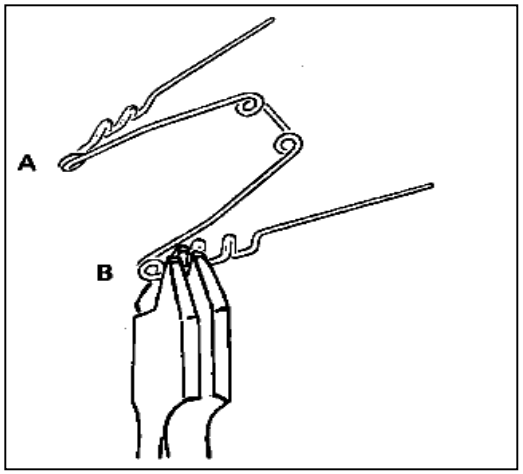
- The 3D Quad helix has 2 twin posts which produce friction lock security with the plugs of a 3D adapter tubes.
- Hence any play is prevented and also the appliance can be removed for activation.
- .036” Truchrome SS construction gives both flexibility and stability.
- .025” extenders give the needed flexibilty and more effective adaptation.



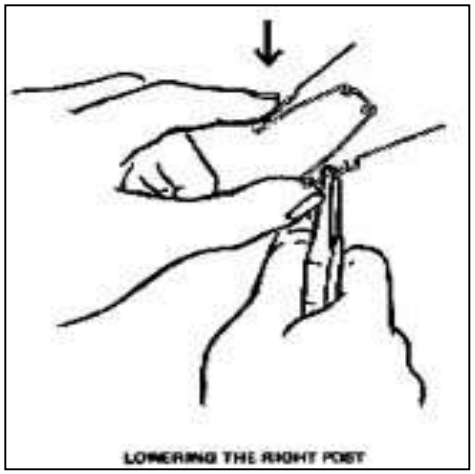
Adaptation of 3D quad helix

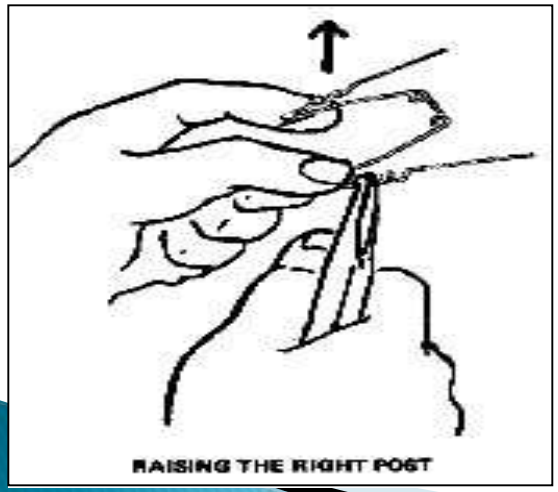
- Available in 3 sizes

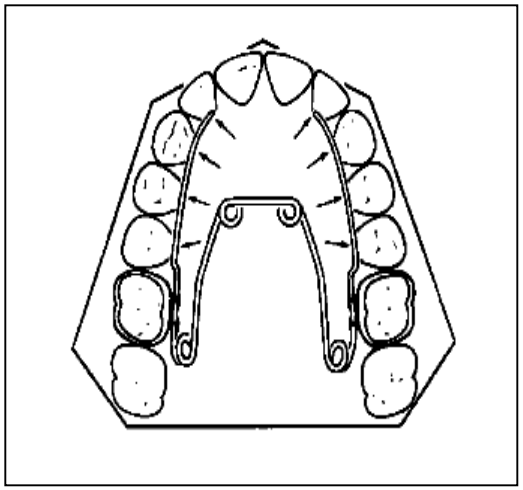


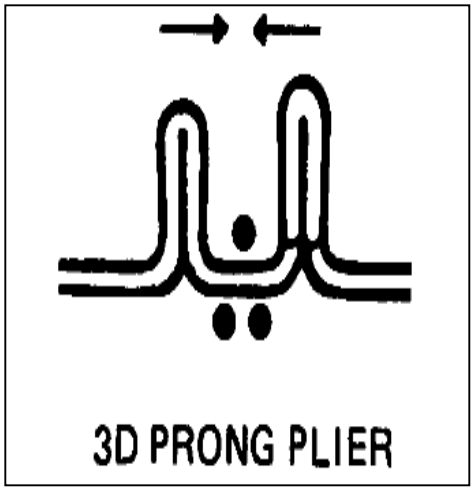


Molar rotation



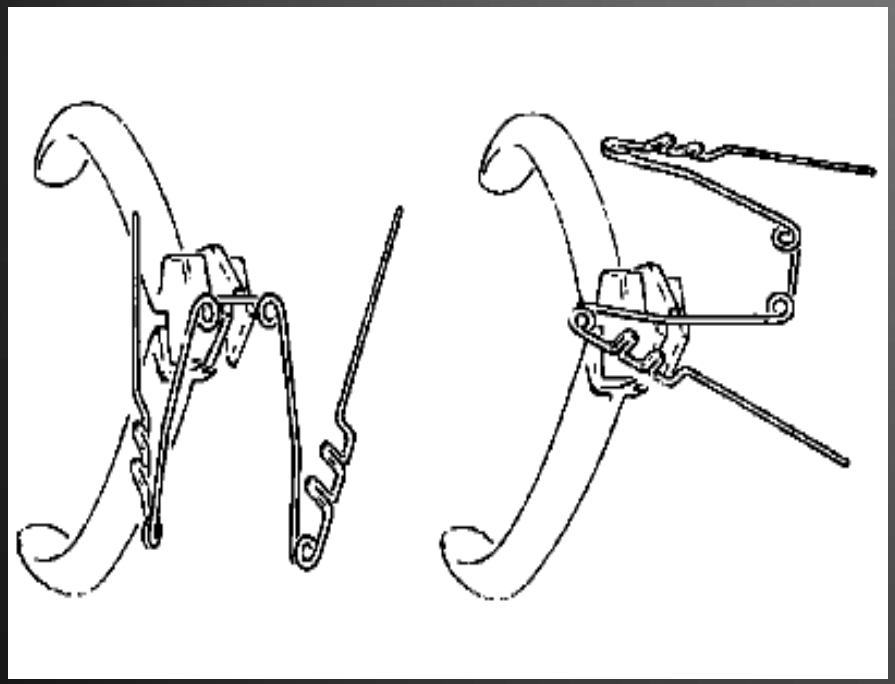




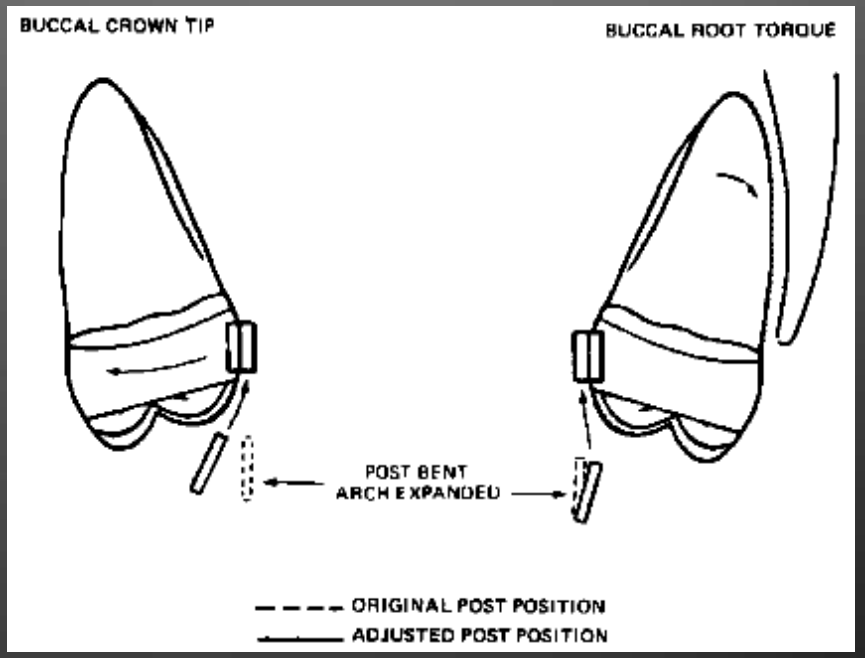


Tightening the posts

Activation

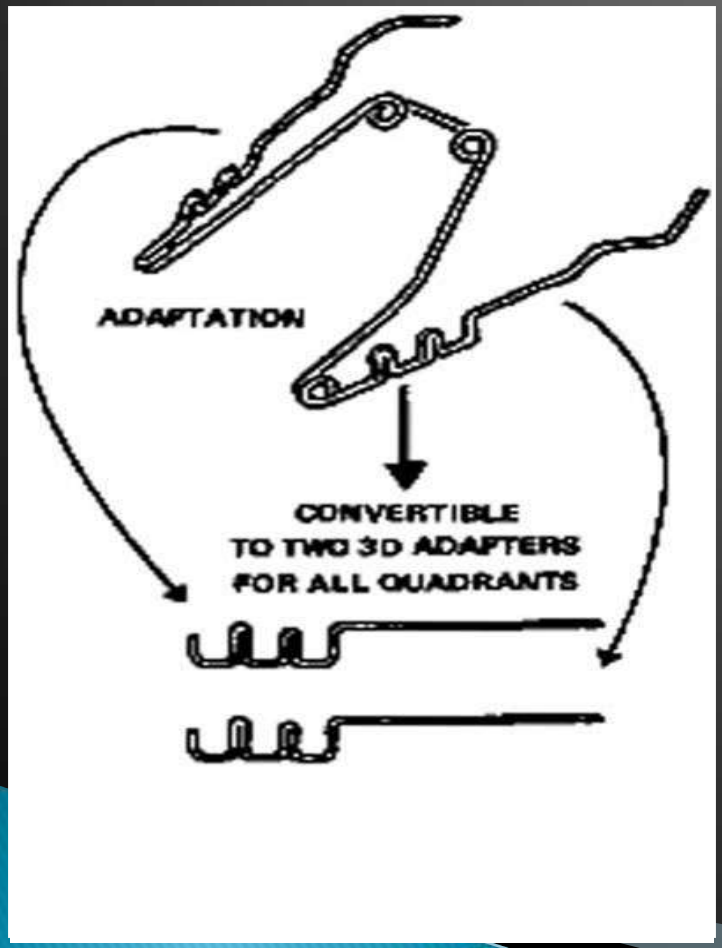


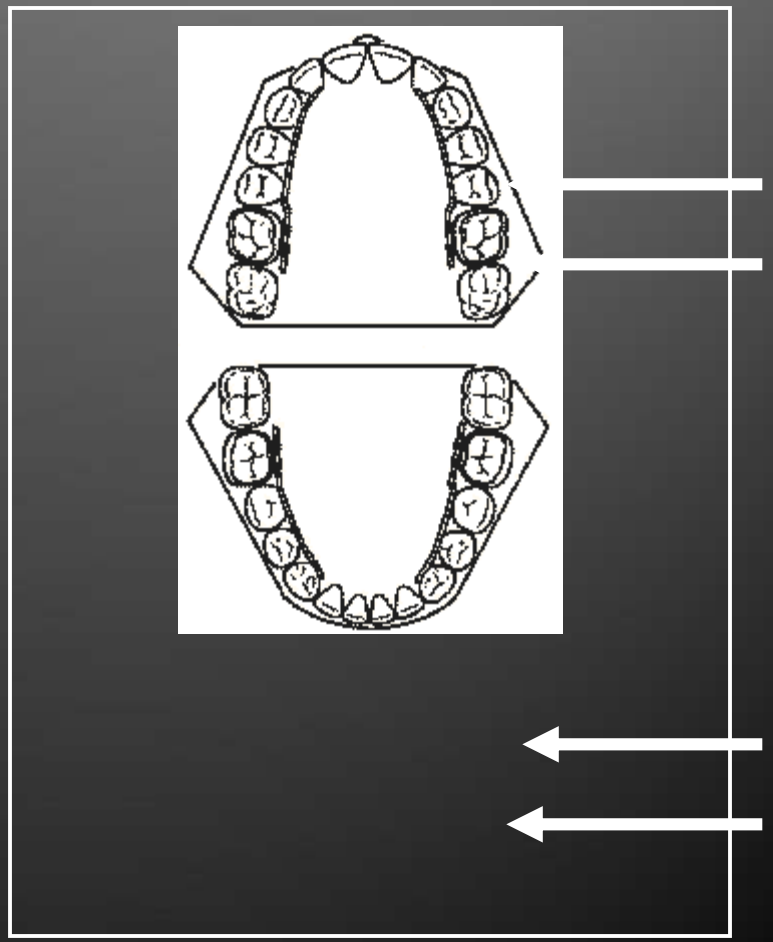
Molar control



3D ADAPTOR

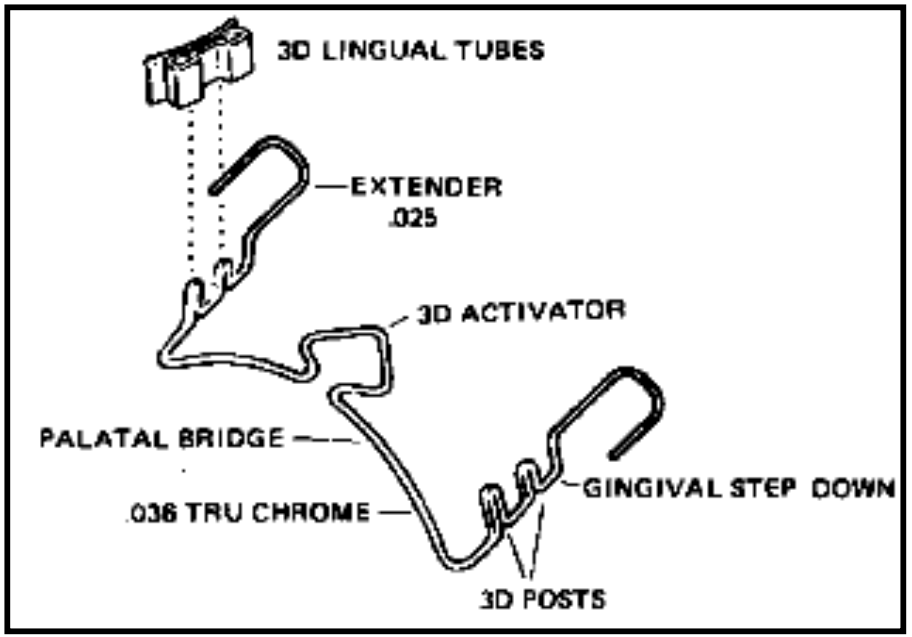
- After use 3D Quad Helix can be cut between the helices and posts to give 3D ADAPTOR
- This can be used as BUCCAL EXPANDER for Cuspid amd Bicuspid expansion
- Resiliency of the wire reduces countermoment reaction of molars

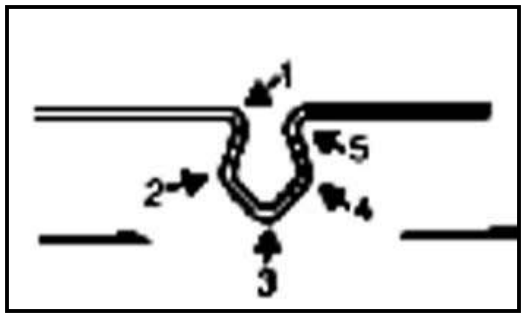


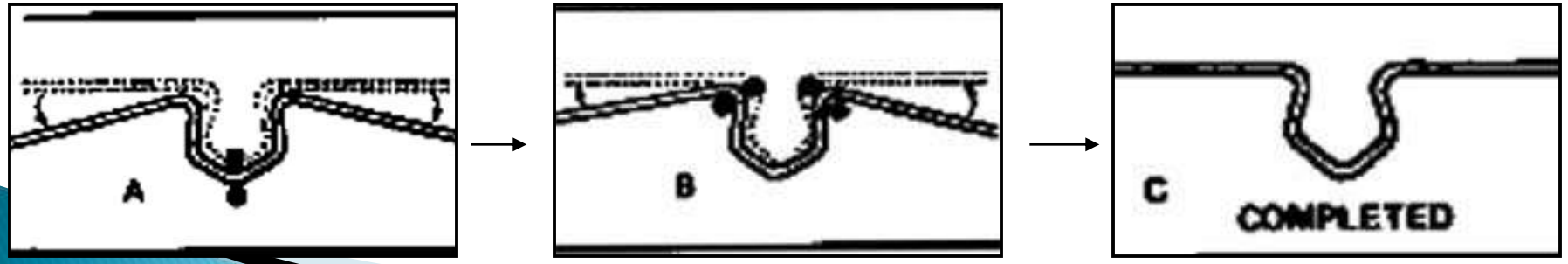


3D PALATAL ARCH

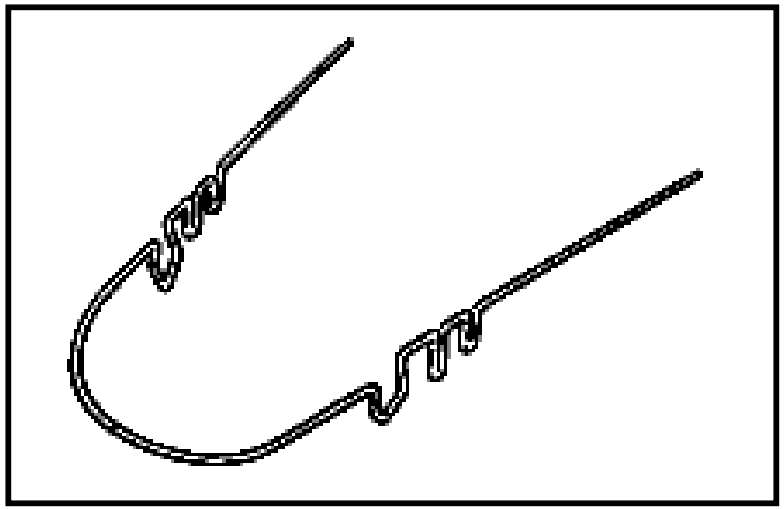
- It is an advanced design with more functions.
- As an expansion appliance it is used for both bilateral and unilateral expansion.

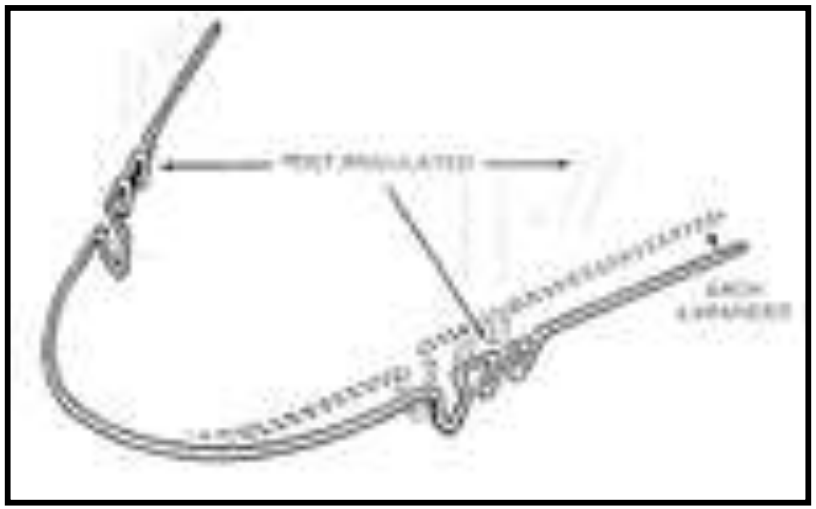




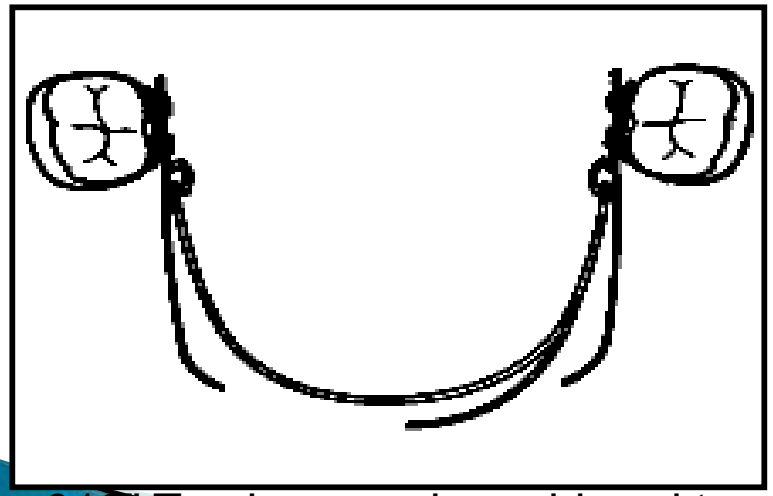


3D LINGUAL ARCH

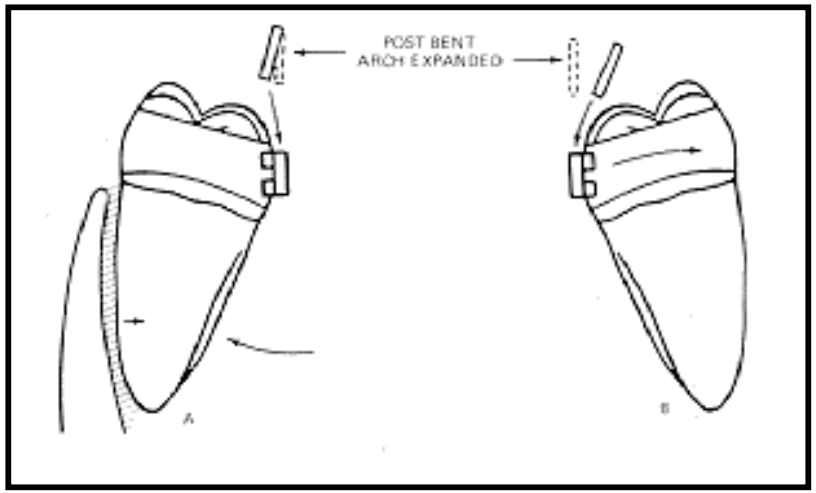




Unilateral molar expansion



.018" Truchrome wire soldered to lingual arch for buccal / anterior segment expansion

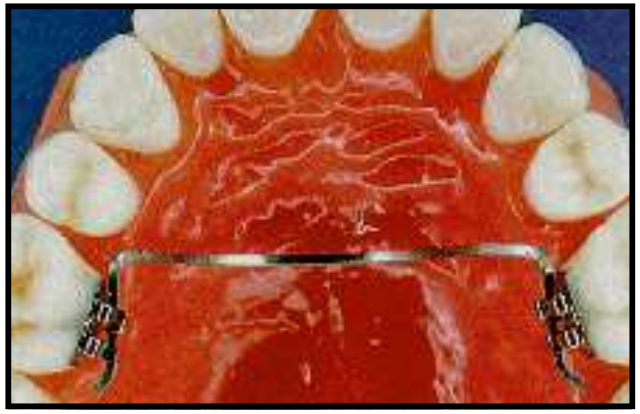


Buccal root torque on non movement side along with buccal crown tip on expansion side

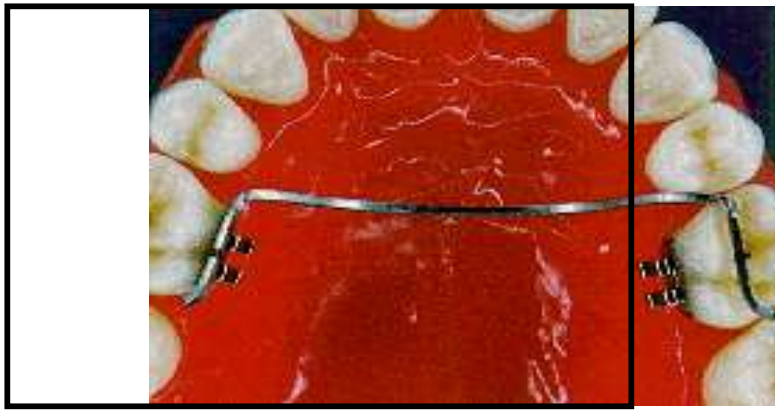
Precision Arches

- Introduced by CJ Burstone in late 80s.
- These arches are made of .032" x '032" TMA or SS wires.
- These are arches may be in the form of
  - *TPA*
  - *Horse shoe shaped lingual arch*
  - *W arch.*
- He replaced the lingual sheaths by lingual brackets.
- These arches may be ligated to the lingual brackets or a **Hinge cap** attachment may be used.

Precision TPA



Passive

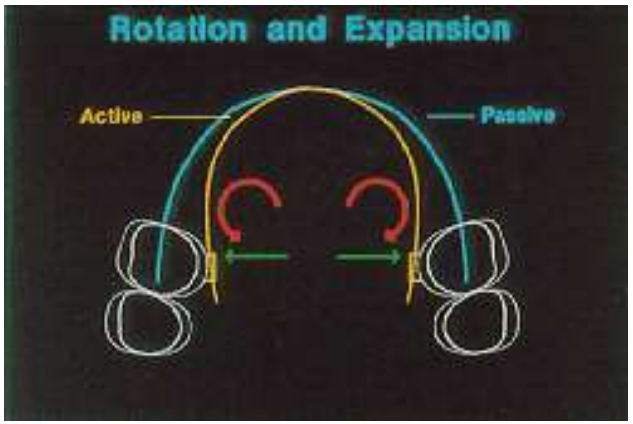


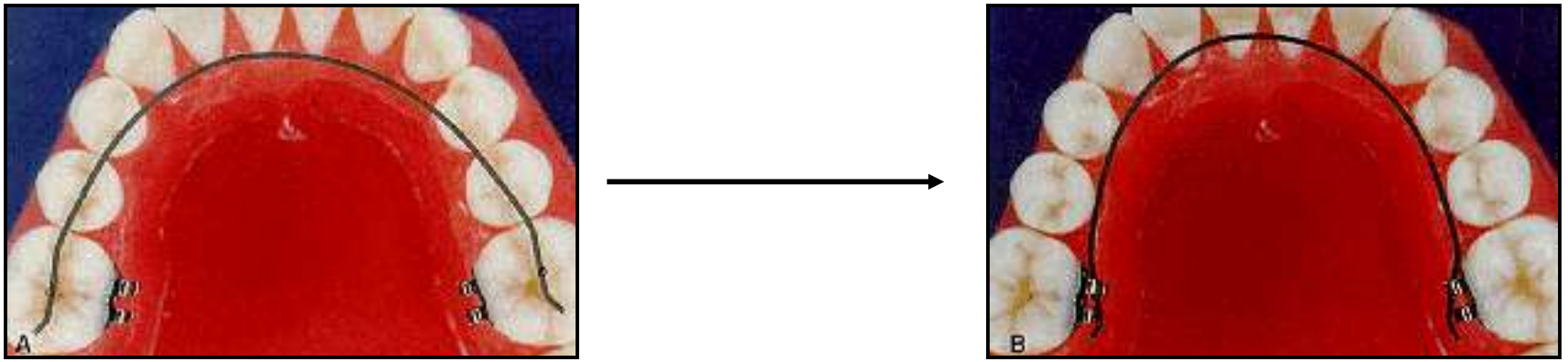
Activated for expansion

- Made of .032” x .032” TMA or SS wire
- To check the symmetry the TPA is placed into the bracket on one side and observed for parallelism with the brackets

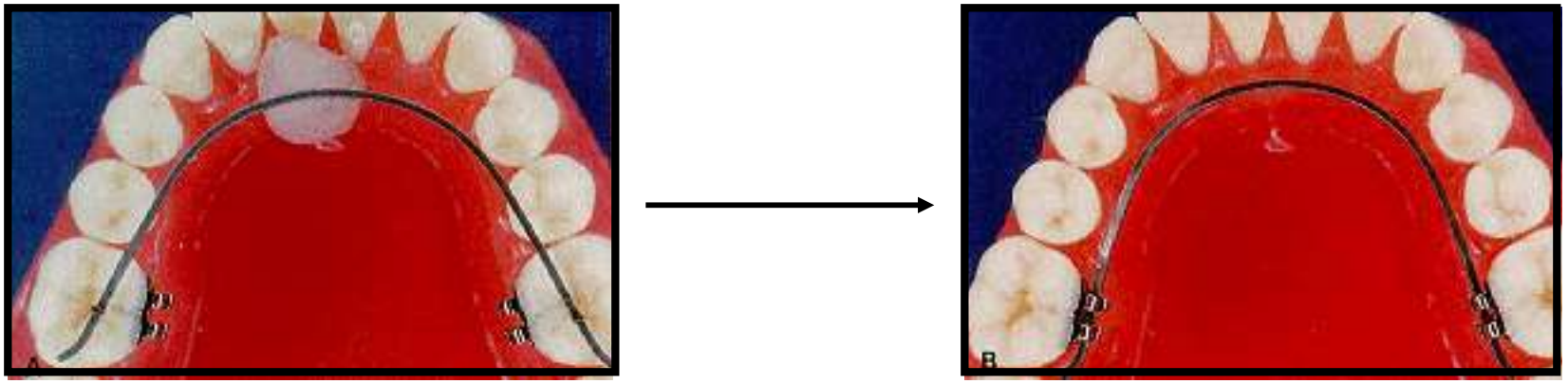
Precision Lingual Arches

- These are made of .021” x .025” or .032” x .032.” TMA.
- Unlike TPA molar rotation & expansion are not independent inherently.





.021” x .025” TMA is used for both expansion and rotation.
The arch is parallel to the bracket and Ist order bends are placed to engage the brackets



- Lingual arch for only expansion
- It is made of .032” x .032” TMA .
- The arch is not kept parallel to the bracket.
- No need for placing Ist order bends.

Precision W-arches

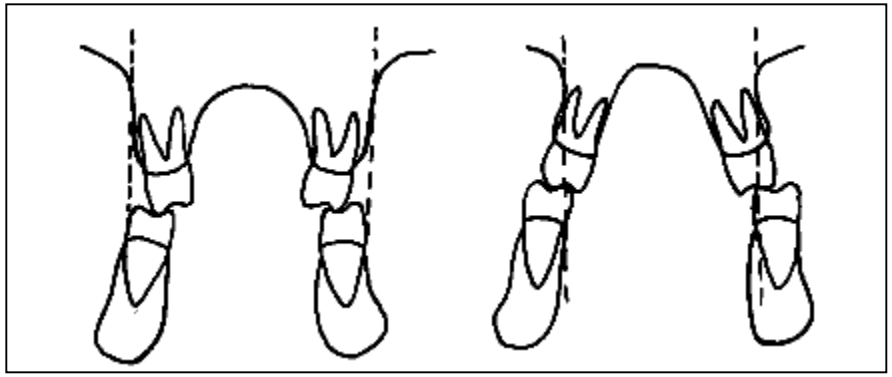
- These are used in severe cross bite cases.
- Since the arms are straight and parallel to the brackets, simply widening the arch will do expansion.

Stability and Relapse

- Proponents of RPE claim that the more the skeletal effect is achieved more stable it is. There should be minimal tipping of teeth during RPE
- Timms et al say tha ½ to 1/3 of RPE is lost in relapse
- But Haas maintains that relapse is in the 10 – 23 %.
- Skieller has also shown thru implant studies that skeletal changes are maintained, nasal width increase is also maintained. It is the dental component that relapses.
- Mcnamara has pointed out that Timms has higher relapse figures than Haas because he had used an all metal applia. That had more chances of buccal tipping.
- Slow expansion changes are claimed to be more stable than RPE by Bell in 1982 as they are physiologic.
- Intermolar width is more easily maintained than intercanine width increase.
- Maxillary increase are more stable than mandibular.

- The concept of **over expansion** has been recommended by Haas.
- 2 -3 mm overexpansion to allow for relapse.
- Early treatment → lesser forces (SPE) → short retention needed.
- Same expansion appliance has recommended to be used for retention for at least 3 months which is most critical.
- Acc. To Hicks, relapse in SPE, when retention is
  fixed → 10 – 23 %
  removable → 22 -25 %
  None → 45 %
- Stockfish is of the view that fixed retention for 3 months and followed by upto 2 years of removable appl. Will give stable results

Which appliance and when ??



- **Clinical examination**
  - Intermaxillary relationship
  - Inclination of buccal teeth
  - Maxillary arch narrowness
  - Functional cross bite : unilateral, bilateral
- **Model analysis** : Linder Hearth , Chadha's
- **Radiographic analysis** → PA view
- **Age**

  Deciduous, mixed and early permanent : SPE

  Late adolescent and adult patient : RPE with or with out Surgery

  Early cleft palate : SPE

  Mature cleft palate : RPE

  Severe Class III with maxillary protraction : RPE

THANK YOU