

# Retention Protocol

# Outline

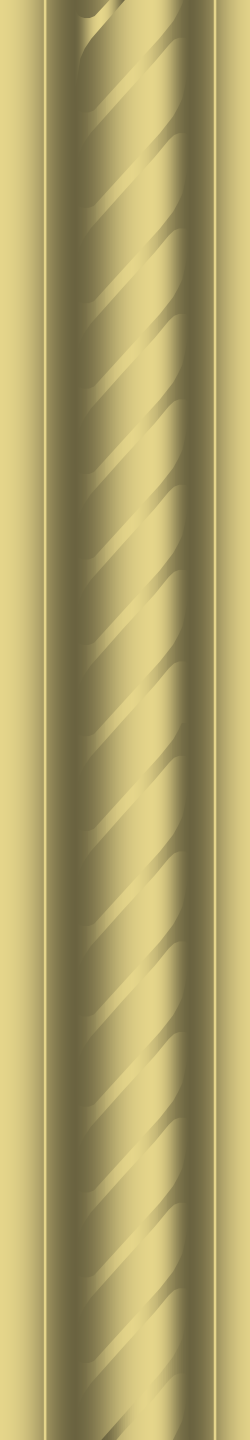
- **Definition**
- **Importance of retention**
- **Biology of tooth movement**
- **History of retention**
- **General considerations of retention**
- **Clinical applications**
- **Retention appliances**
- **Various malocclusions**



**Retainer- to hold**

**Oppenheim:**

**Retention is the most difficult  
problem in orthodontia, in fact it is  
the problem**

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- **Maintains teeth in corrected position**
  - **Most challenging**
  - **Angle: utmost skill of the orthodontist**
  - **Area of tolerance**
  - **Influence of PDL, occlusal, soft tissue, growth**
  - **Period of retention – controversy**
  - **2-3 weeks- permanent retention**



**Moyers- maintaining newly moved teeth in position long enough to aid in stabilizing their correction**

**Reidel- holding of teeth in ideal esthetic & functional position**



**Hellman:**

**Retention is not a separate problem in orthodontia, but continuation of t/t.**

**Easing up of strains and stresses, wean tissues .**

**Complete result should be accomplished before retention is applied.**

# Why is retention necessary?

- **Gingival & PDL tissues – reorganization**
- **Teeth in inherently unstable position – soft tissue pressure**
- **Growth**
- **Neuromuscular adaptation**

# Biology of tooth movement

- **Gingiva**
- **PDL**
- **Alveolar bone**
- **Cementum**

# Tooth movement

- **Physiologic tooth movement:**
  - **Eruption**
  - **Migration**
  - **Mastication**
  
- **Orthodontic tooth movement**

# **Biological basis of retention & relapse**

- **Changes in investing tissues**

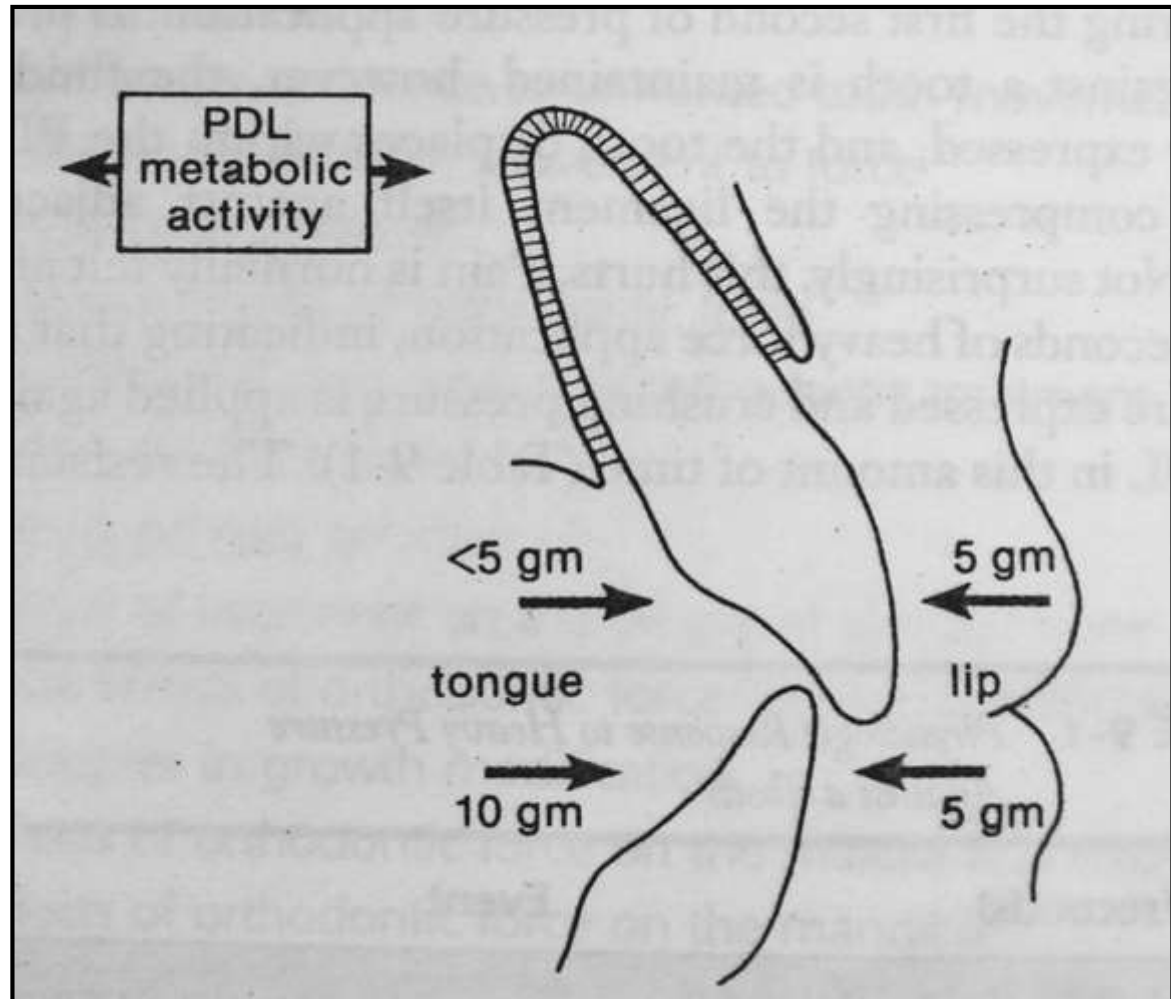
1. **Gingiva**

- **Reorganization of collagenous & elastic fibres – slow – 4 -6 months**
- **Slow turnover of cells**

2. **PDL**

- **Widening of PDL space**
- **Disruption of collagen fiber bundles**

- **Equilibrium of forces**
  - **PDL – shock absorber**
  - **Imbalance of forces of tongue- lip - cheek**
  - **Active stabilization**
  - **Orthodontic movement- eliminates active stabilization**
  - **Principle fibers- 8-9 weeks**



### **3. Alveolar bone**

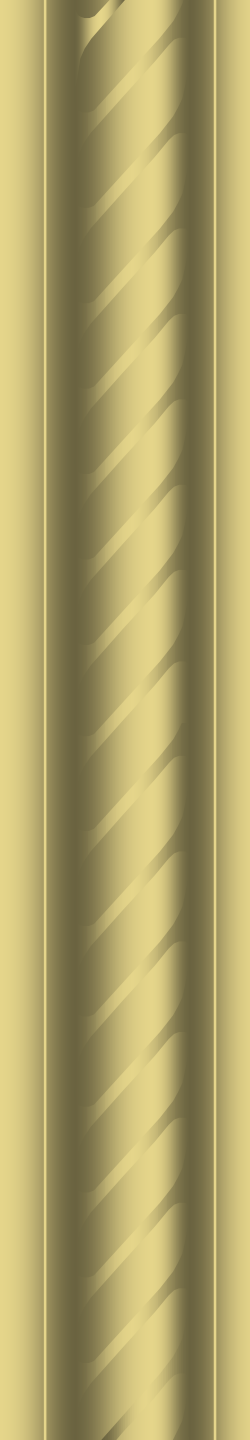
**Bone deposition- tension**

**Retention period- decrease in cell number**

**Bone- PDL arrangement- 2-3 months**

### **4. Neuromuscular adaptation**

**Strang- intercanine & intermolar width**

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- **Brodie – equilibrium between tongue, lips, cheeks**
  - **Moyers, Graber, Ballard, Muller**

## **5. Growth changes**

- **Most patients continue in their original growth pattern**
- **Slow growth throughout life**

# History of retention

- **Hellman- 1944 - We are in almost complete ignorance of specific factors causing relapse**
- **Schools of thought:**
  1. **Occlusion school – Norman Kingsley- 1880**  
**Calvin Case – retention appliances needed**

**2. Apical base school – Lundstrom**

**McCauley – 1944 – intercanine & intermolar width**

**Strang – 1949- mandibular intercanine & intermolar width- muscle balance**

**Changes in the method of space gaining**

**Pin & Tube, Ribbon arch, Edgewise**

### **3. Mandibular incisor school**

**Grieve & Tweed – 1944**

**Tweed – FMIPA – 20 or less, IMPA < 94**

**If FMIPA > 25, IMPA < 1 degree**

**Tweed's headplate correction**

## **4. Musculature school**

**Brodie- 1953, Graber**

**Fischer 1957**

**Moyers – 1958**

**Brodie – tonicity of muscles,  
disagreed with inviolability of  
original arch dimensions**

# General considerations of retention

## Reidel – 1960

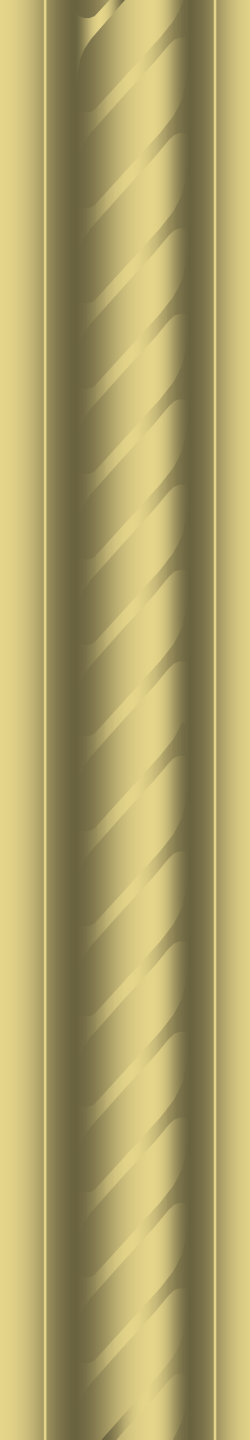
- Theorem 1- Teeth that have been moved tend to return to their original position

Musculature, apical base, transseptal fibres, bone

Tweed – 5 years retention

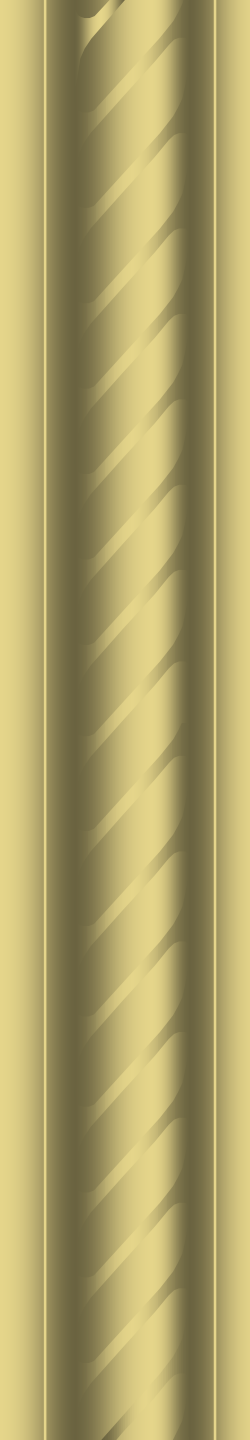
- **Theorem 2 : elimination of cause**
  - **Habits**
  - **Heredity – 75%**
  - **Local causes**
    - .. **Over retained deciduous teeth**
    - .. **Nasopharyngeal obstruction**
  - **Congenital – 2%**

- **Theorem 3 – Overcorrection**
- **Theorem 4 – Proper occlusion**  
**Static and Functional**
- **Theorem 5 – Bone & adjacent tissues must be allowed time to reorganize**
  - Principle fibers of PDL- 8-9 weeks**
  - Gingival – 4-6 months**
  - Bone- 2-3 months**

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- **Theorem 6- if lower incisors are upright, they are more likely to remain in good alignment**

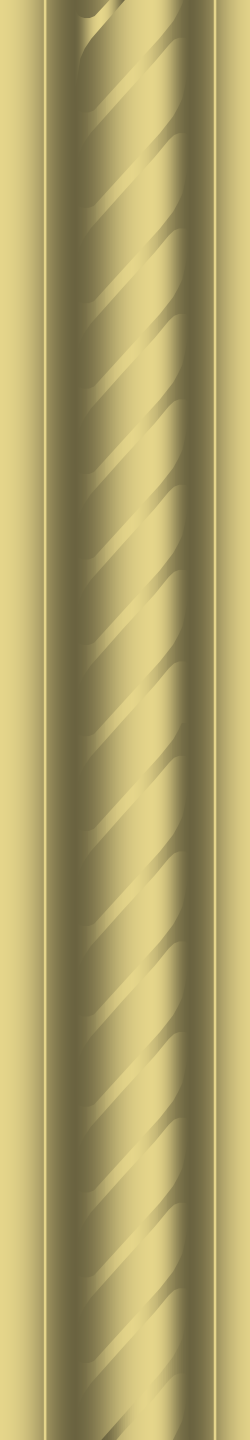
**Basal bone- alveolar process, jaw bone**

**Lingually placed teeth better**

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- **Theorem 7- Corrections carried out during growth- less likely to relapse**
  - **Theorem 8- Further the teeth have been moved, less likelihood of relapse**
  - **Theorem 9- Arch form (mandible)- cannot be permanently altered**

## **Reidel:**

- **Non- extraction:**
  - .. **0.9 mm increase in intercanine**
  - .. **1.3 mm intermolar**
- **Extraction:**
  - .. **Gingival area – intercanine increase by 1mm**
  - .. **Molar area- narrowing – 0.4mm**

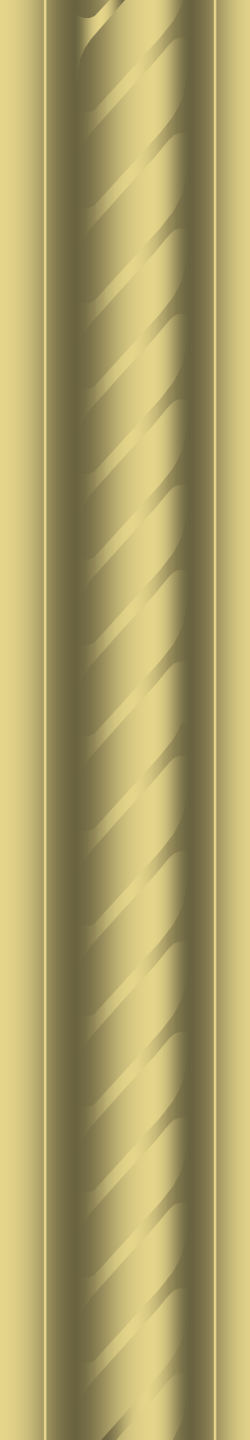
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- **Theorem 10- many treated malocclusions require permanent retention**
    - **Arch expansion**
    - **Generalized spacings**
    - **Severe rotations**
    - **Midline diastema**

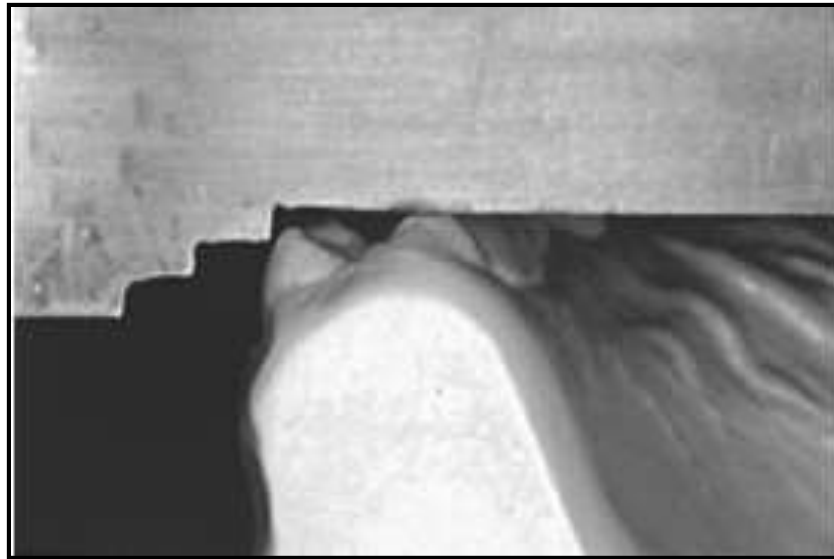
# Clinical applications

## A. When should the retention begin?

### 1. Keys to optimal occlusion

- Interarch relationships
- Crown angulation
- Crown inclinations
- Rotations
- Tight contacts
- Curve of Spee

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- **ABO criteria – 1998**
    - **Alignment**
    - **Marginal ridges**
    - **Buccolingual inclinations**
    - **Occlusal relationships**
    - **Occlusal contacts**
    - **Overjet**
    - **Interproximal contacts**
    - **Root angulations**





- **Other occlusal keys**

**Okeson, Roth- mutually protected occlusion**

## **B. Retention planning**

- **Kingsley- 1880- 2-3 years**
- **Guildford – 1893- not less than 6 months**
- **Angle – 1907- varies according to case**

## **C. Duration of retention**

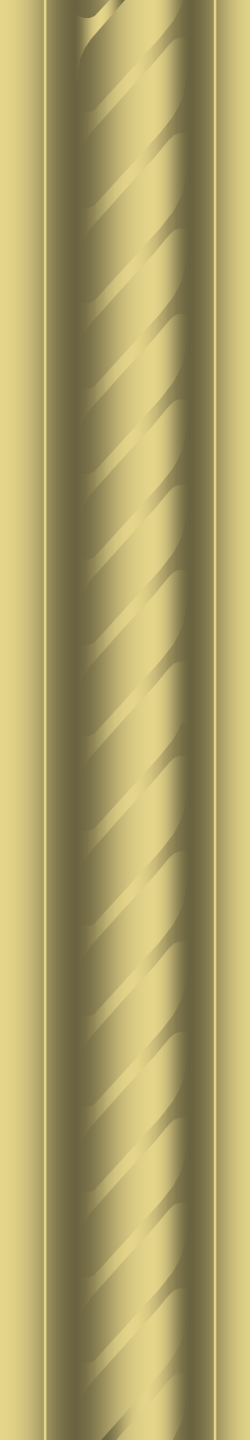
### **Reidel**

#### **No retention:**

- **Corrected crossbites**
- **Extraction cases with high placed canines**
- **Serial extractions**
- **Space gained for 2<sup>nd</sup> bicuspids**
- **Headgear cases**

## **Limited retention:**

- **Class I non- extraction**
- **Class I or II extraction**
- **Corrected deep bites**
- .. **Incisor intrusion- bite plate – 4-6 months**
- **Early rotation correction**
- .. **Before root formation**

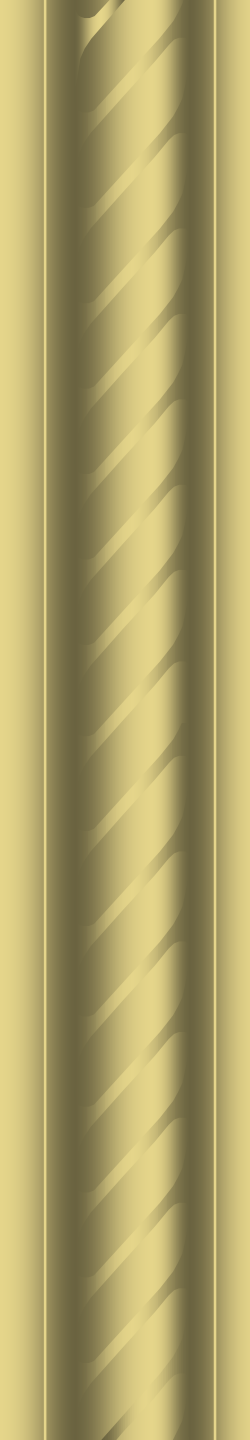
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- **Ectopic tooth eruption/  
supernumerary teeth**
  - **Corrected Class II div 2 – increase  
in mandibular intercanine width-  
Shapiro**
  - **Class III corrections with  
orthognathic surgery**

## **Permanent retention**

- **Expansion**
- **Severe rotations**
- **Midline diastema**
- **Generalized spacings**

# Retention sequence

- **2-3 months before debonding- CSF**
- **1 month before debonding – impressions- positioners**
- **1 week- anterior ligature wire- occlusion settling**
- **After removal- positioner- full time for 1 day, maximum time for 5 days, 4 hours day and night time for 6 weeks**

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- **2 weeks recall- fit of positioner checked**
  - **4 weeks – invisible, change 6- 8 weeks**
  - **Long term- Hawley or Ricketts retainer**

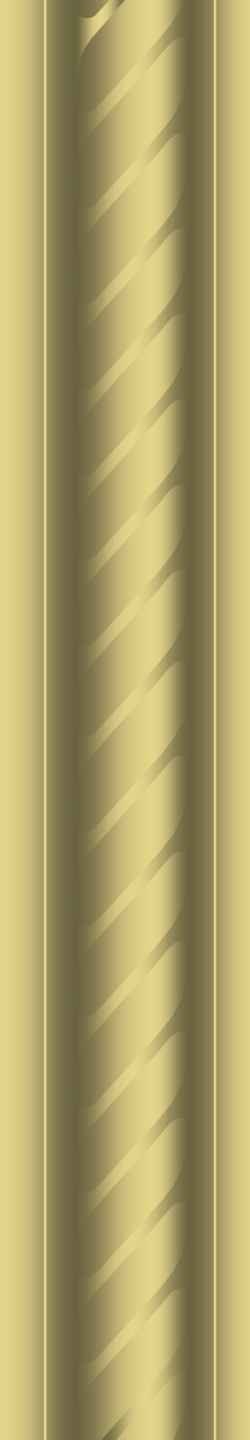
## **Retention period**

- **Full time – 3- 4 months, remove during meals**
- **Part time – 1 year**
- **If growth remains**

# Retention Appliances

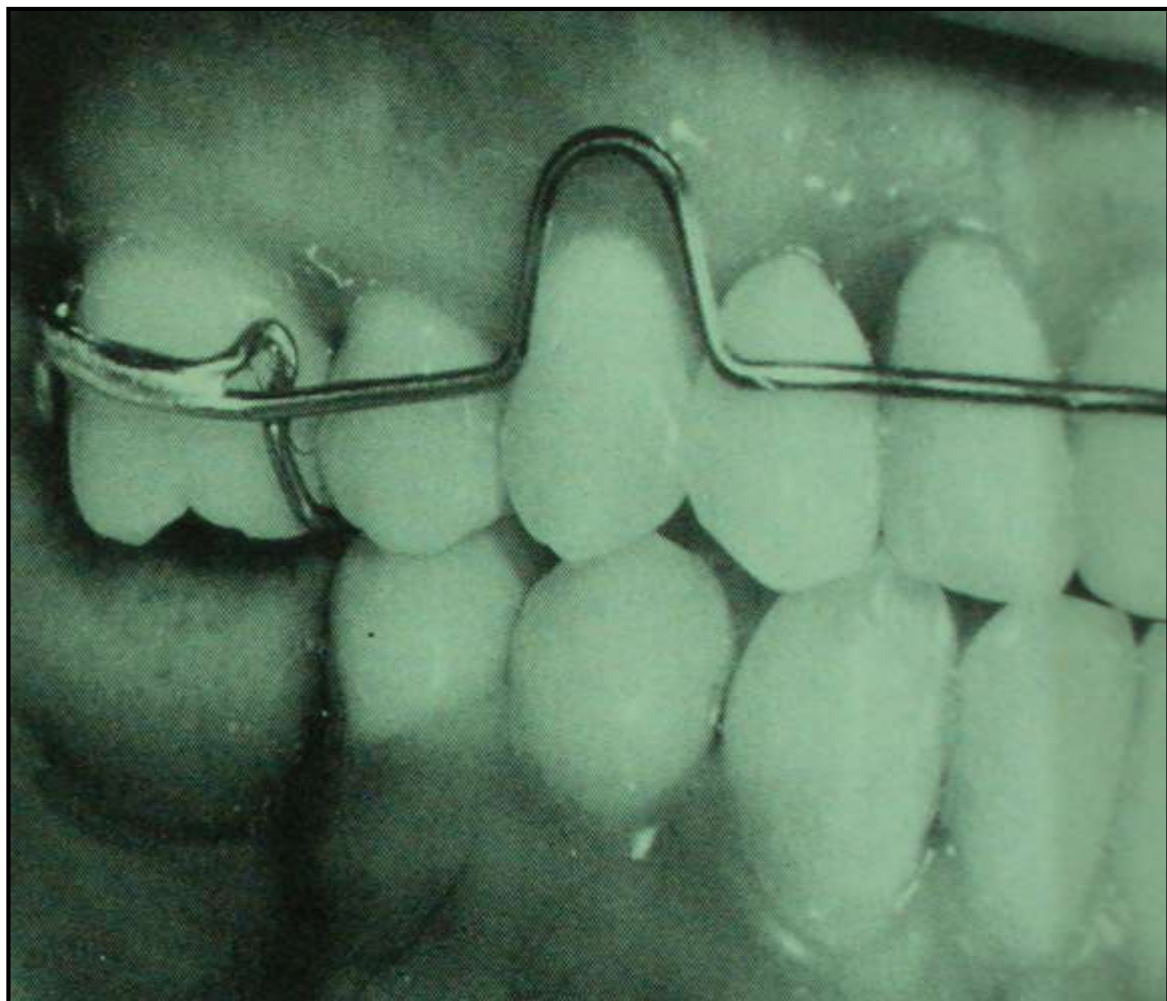
- **Passive orthodontic appliances that help in maintaining and stabilizing position of teeth long enough to permit reorganization of the supporting structures after the active phase of orthodontic T/t**

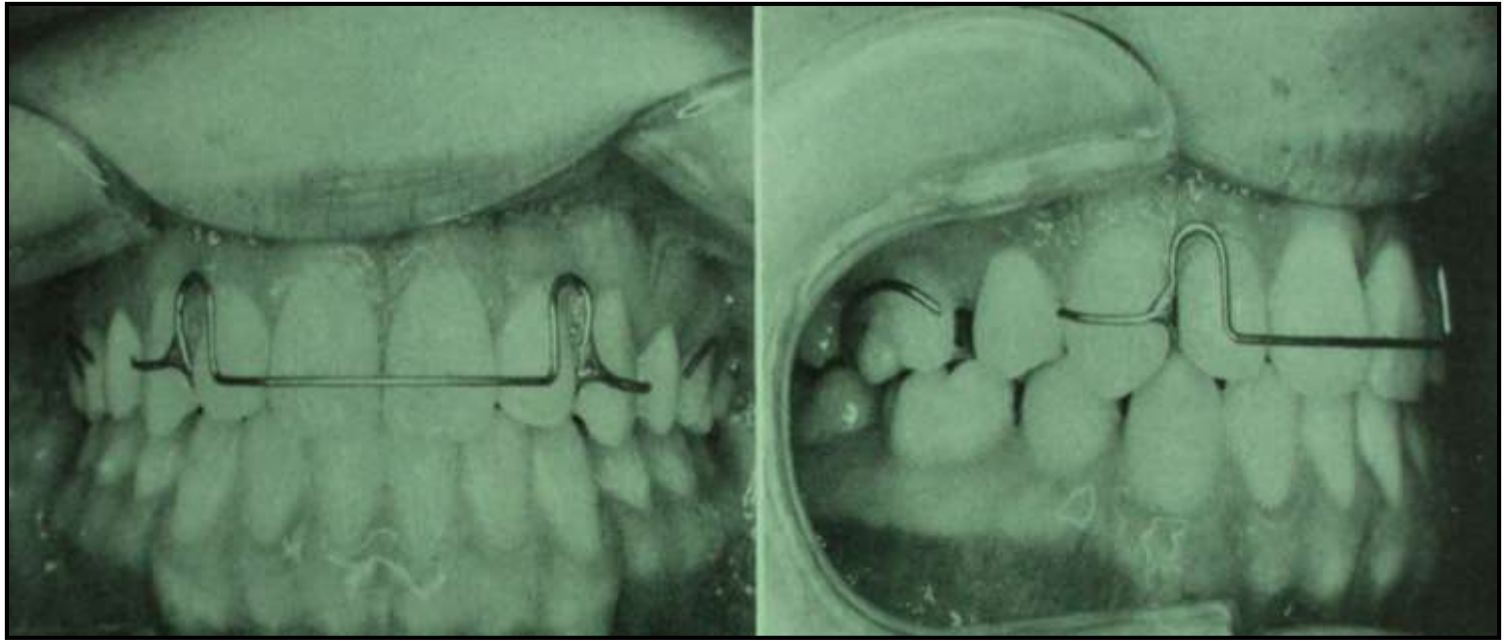
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- **Removable**
  - **Fixed**
    - **Bonded**
    - **Banded**

- 
- **Graber's criteria:**
    - **Restrain each tooth**
    - **Functional forces**
    - **Self cleansing**
    - **Inconspicuous**
    - **Strength**

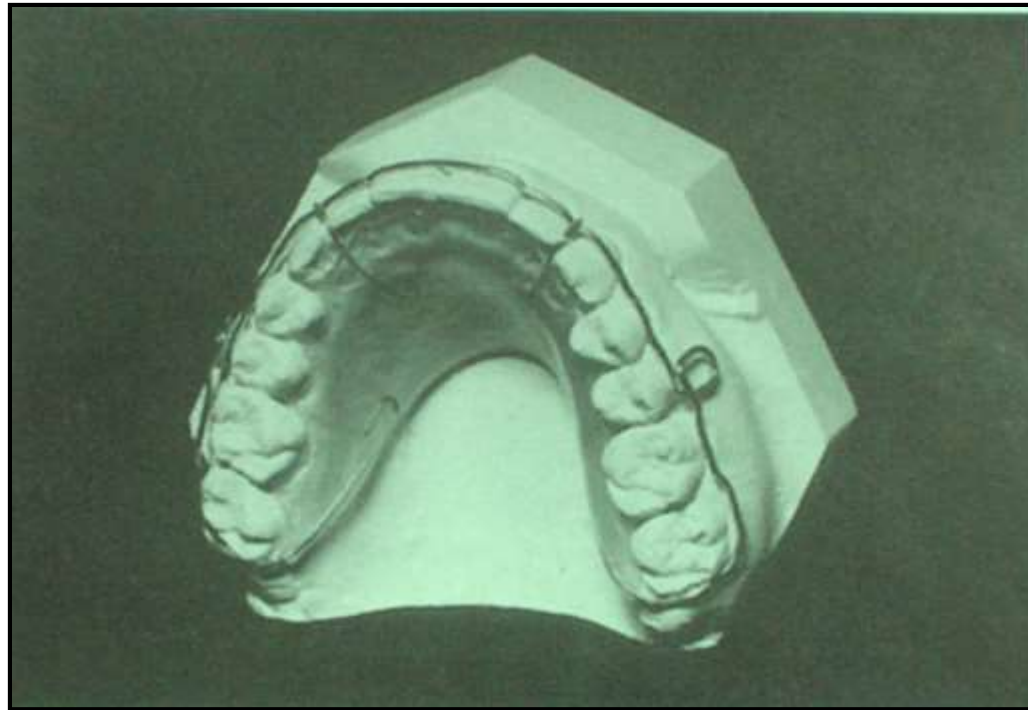
- **Hawley retainers- 1920- Charles Hawley**



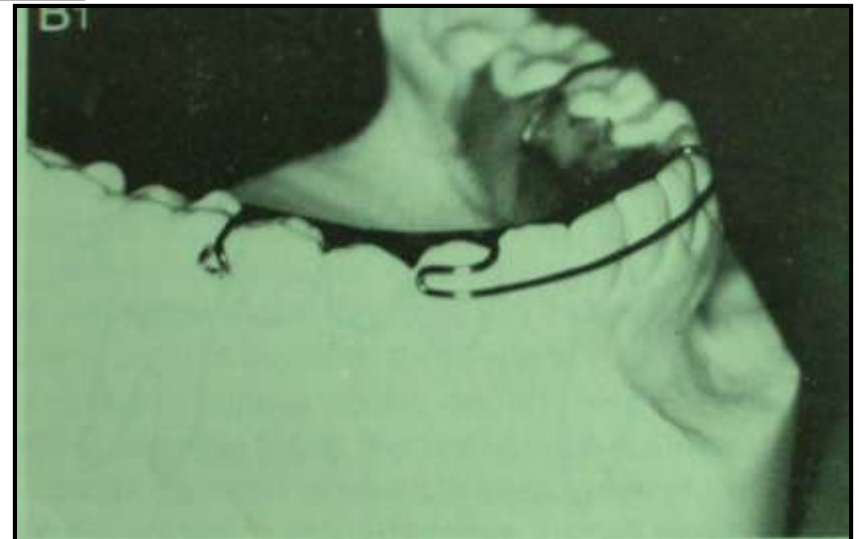




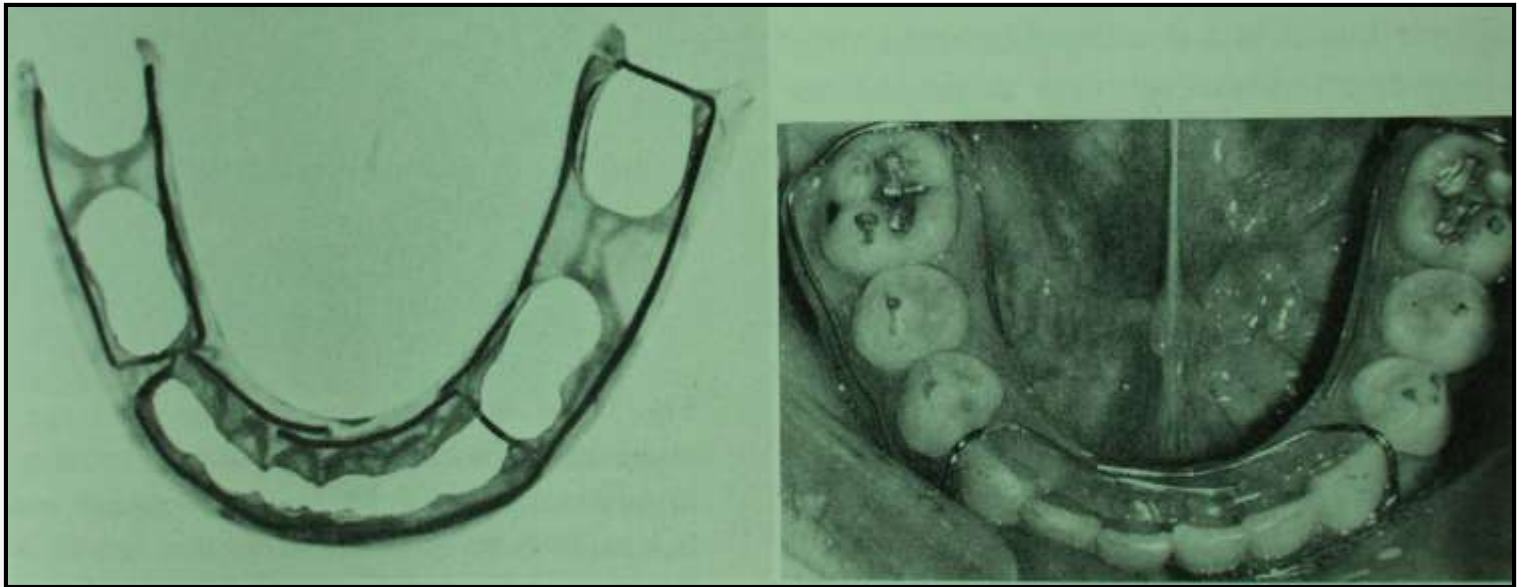
- **Circumferential retainers- full banding cases**

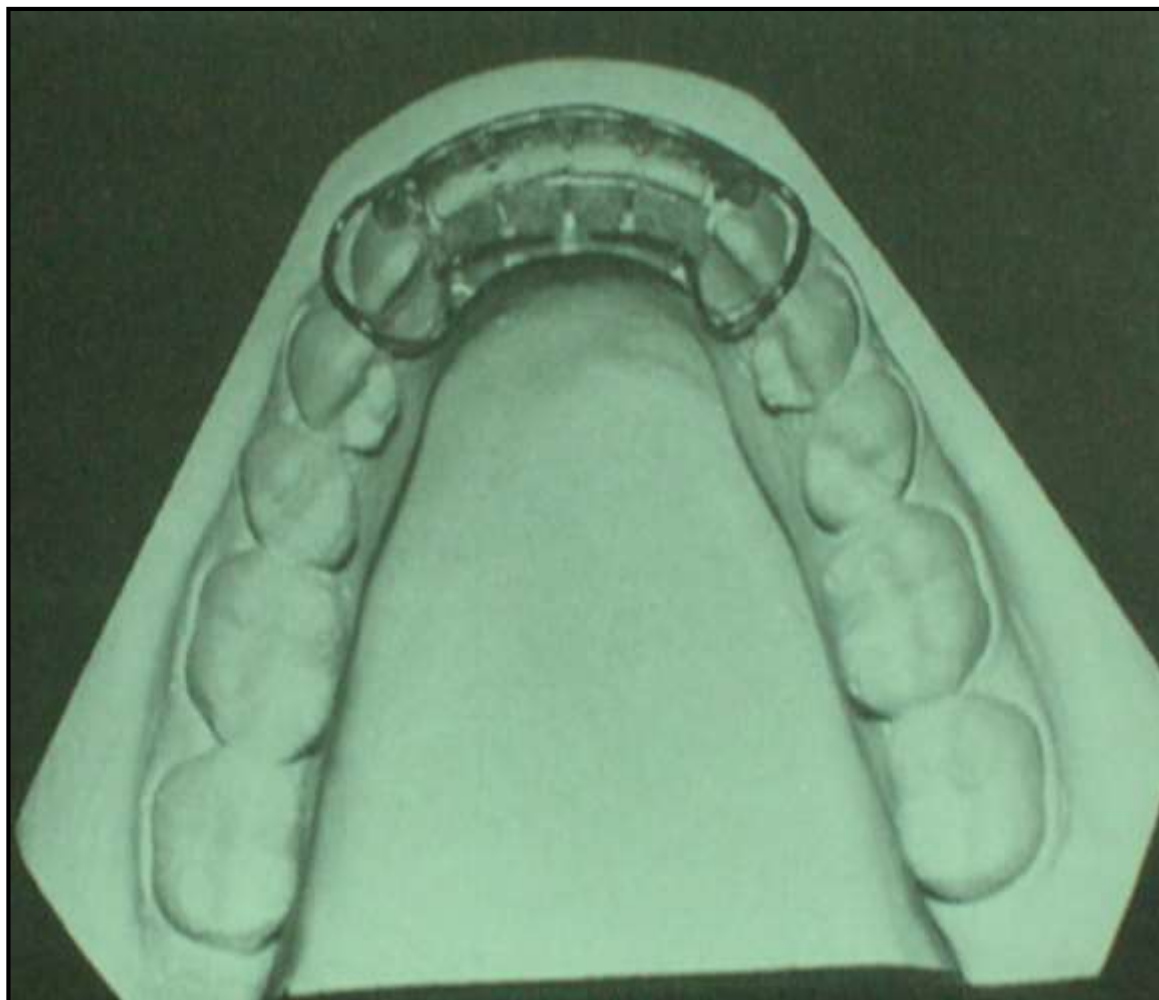


- **Ricketts retainer**

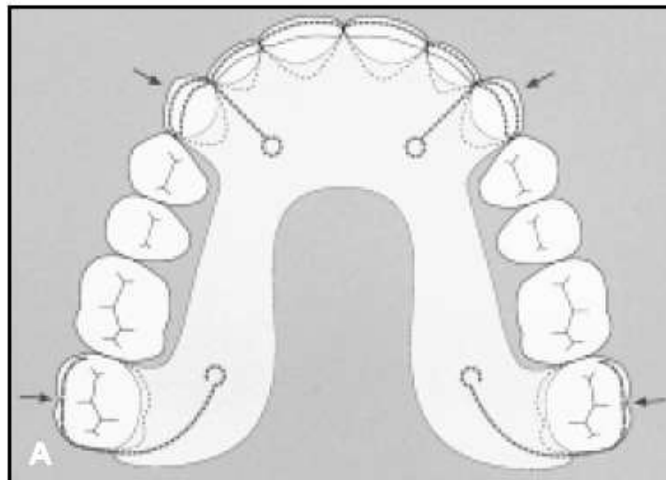


- **Wraparound or clip- on retainer**



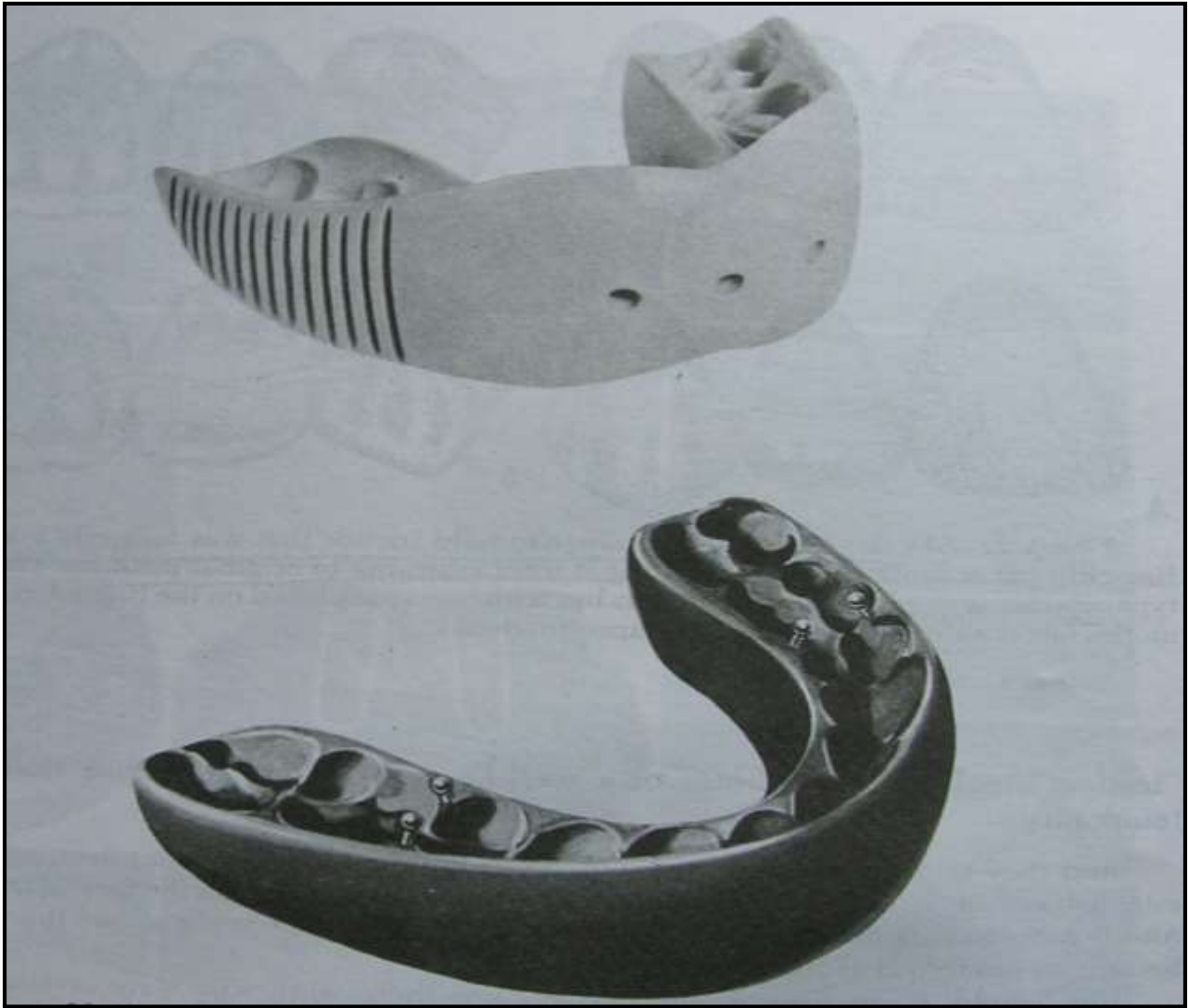


- **Van der Linden retainer**



# Positioners

- **Kesling – tooth positioner appliance – finishing device- 1945**
- **Envisioned wider range of use- insufficient elasticity of rubber**





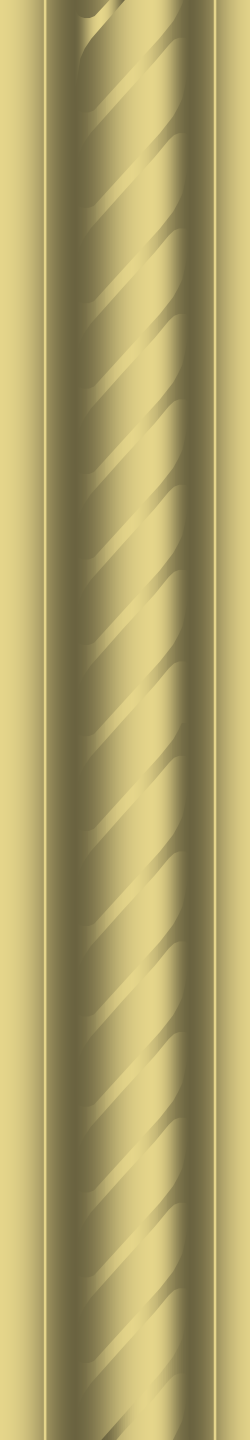


- **Drawbacks:**

- **Bulk**
- **Do not retain irregularities, rotations**
- **Increase in overbite**
- **Complicated procedure**

- **Invisible retainers**
  - **Henry Nahoum – 1950**
  - **Robert Ponitz- 1971**



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- **Permanent retention**
  - **Transitional retainers**
  - **Minor tooth movements**

- **Essix retainers**
  - **Clear, thin, cuspid- cuspid**
  - **Essix plastic sheet**
  - **Flex memory – minor tooth movements**
  - **Retreating minor anterior relapse**

# Fixed retainers

- Lower incisor position – growth
- Diastema closure
- Pontic space
- Extraction spaces in adults



- **Direct Bonded**

- **Zachrisson – 1977**

- **Multistranded wires- most common**

- .. **Flexible**

- ..**Increase retention**

- **Canine- canine bonded- 0.032**

- **Flexible wire bonded – 0.0175**



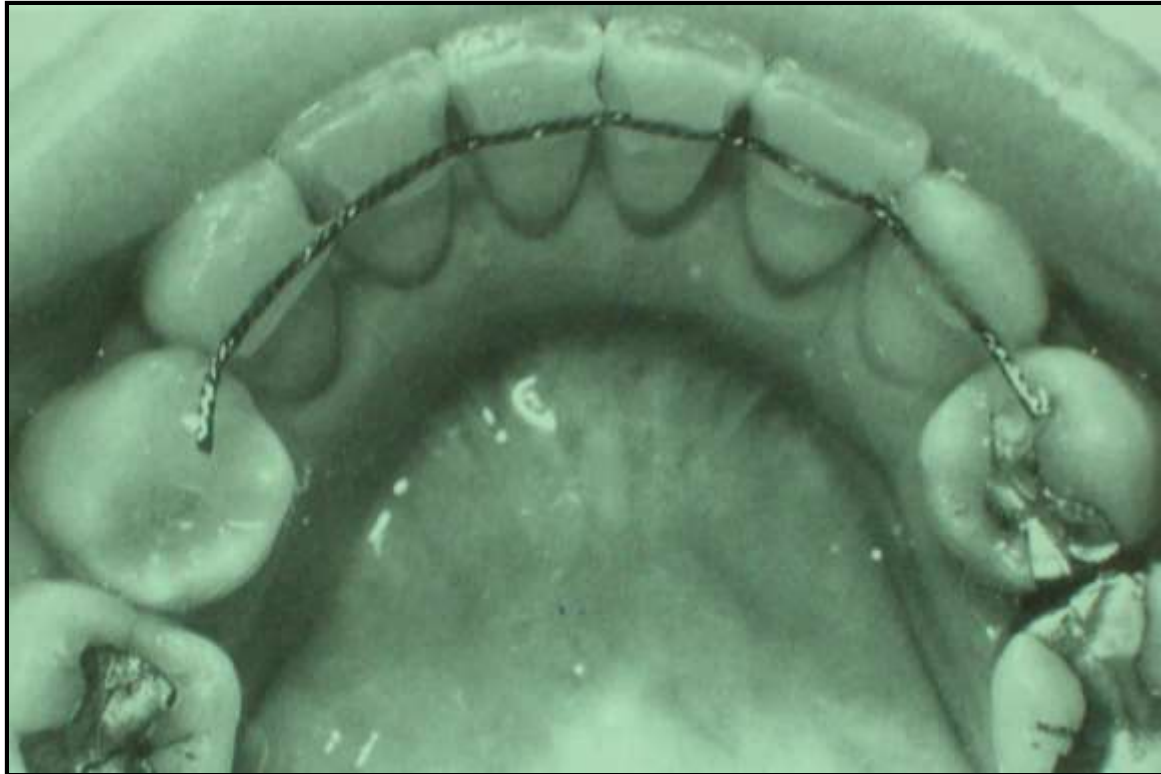
- **Bonded 3-3 retainers**

**Lee – 1981:**

- **Severe pre- t/t lower incisor crowding**
- **Change in intercanine width**
- **Advancement of lower incisors**
- **Non- extraction**
- **Deep bite**

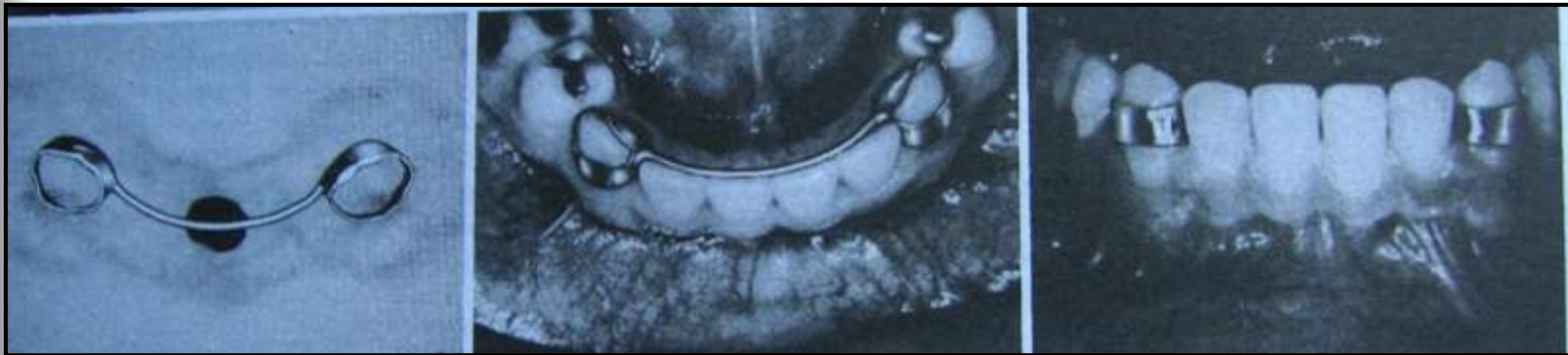


- 
- **FSW retainers**
    - **Space reopening**
      - .. **Midline diastema**
      - .. **Spacing**
      - .. **Periodontally compromised**
      - .. **Mandibular incisor extractions**
    - **Holding individual teeth**
      - .. **Rotations**
      - .. **Palatally impacted canines**

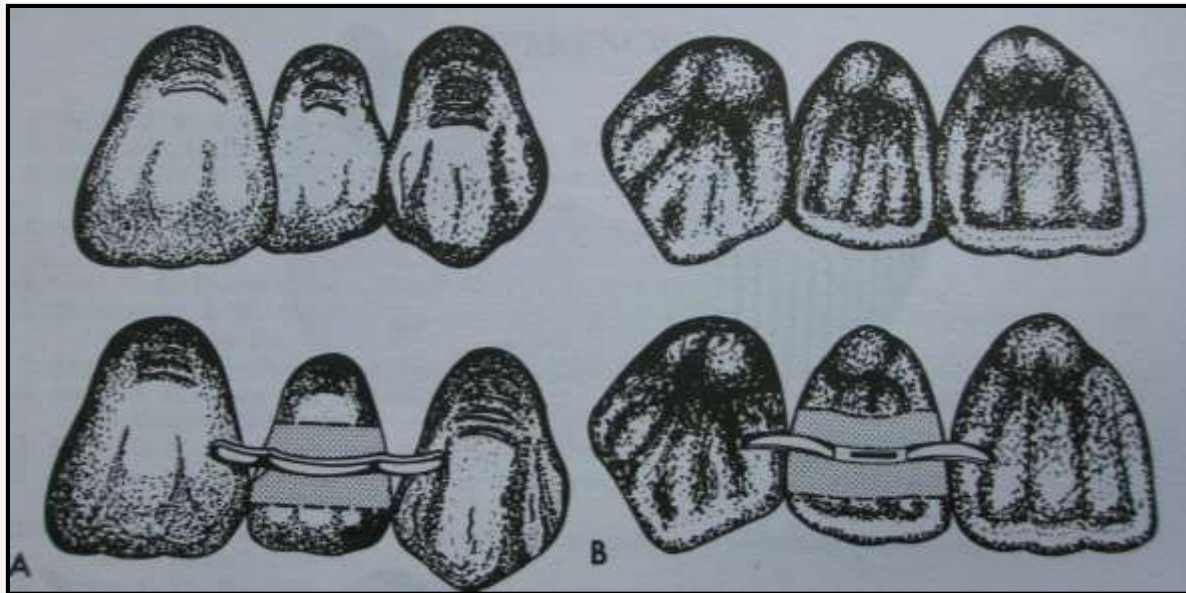


# Banded retainers

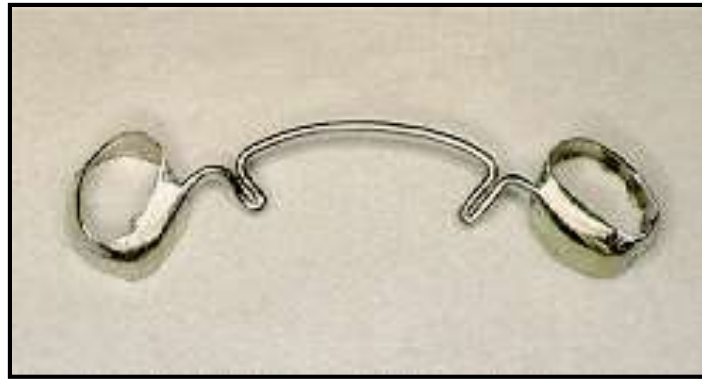
## 1. Banded lingual 3-3 retainer



## 2. Band & spur retainer



### **3. Banded Mandibular Adjustable retainer – Jack Balenseifen**



# Retention in various malocclusions

## 1. Class II correction

### Relapse:

- Tooth movement
- Differential jaw growth

### Occlusion retention:

- Proffit – overcorrection
- Lower incisors not too far forward
- Permanent retention if LI forward > 2mm

- **Skeletal retention**
  - **Headgear- night time wear**
  - **Watson- headgear with Hawley retainer**
  
  - **Functional appliance- FA without advancement**
  - **Severe skeletal – night time FA, daytime retainer**
  - **Mild- Only retainers**

# Class III correction

- **Mandibular prognathism- Chin cup**
- **Maxillary deficiency:**
  - **Face mask- night time**
  - **Palatal stabilization plate after RME**
  - **FR III**

# Deep bite correction

- **Bite plane in maxillary retainer**
- **No posterior teeth separation**
- **Wear till vertical growth is complete**
- **Night time wear**

# Open bite

- **Depression of incisors**
- **Elongation of molars**
- **Habits:**
  - **Thumb sucking**
  - **Tongue thrusting**

- **High pull headgear with standard retainer**
- **Bite block appliances- open bite activator**
- **Severe cases- conventional retainers- day time, bite blocks at night**
- **Permanent multistranded retainers in maxilla and mandible**
- **Habit breaking**

# Lower incisor alignment

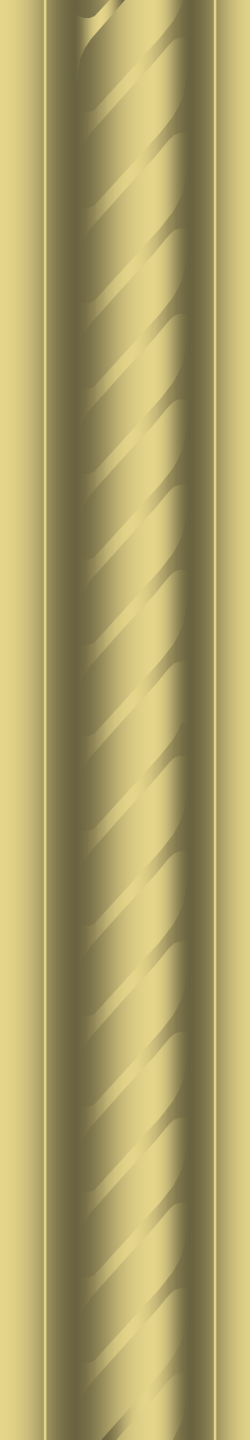
- **Mandibular growth- crowding- lip pressure**
- **Class III – LI crowding**
- **Skeletal open bite- incisor crowding – downward and backward rotation**
- **Retention:**
  - **Hawley retainer**
  - **Positioners, Essix retainers**
  - **FSW**

# Conclusion

- Lower arch form should be maintained
- Lower intercanine width
- Mandibular arch length increases with time
- No advancement of LI
- Fiberotomy- rotations
- Lower anterior ARS
- Growth status



**Success index= Improvement/  
Relapse**



**Retention holds the key to the doors  
of success of orthodontic t/t over a  
long period which plays a vital role  
in achieving increased patient  
satisfaction**



**THANK YOU**