

# Retention and relapse

# Why is retention needed?

The sentence that orthodontists hate: „Doctor, my teeth started to move back” ...!

- \* Gingival and periodontal tissue require time post-treatment to reorganize
- \* Soft tissue pressures are likely to cause relapse if teeth are placed in an unstable position
- \* Growth post-treatment may cause relapse



# Timing of Tissue Reorganization

- \* Once teeth are able to move individually from one another during mastication, reorganization of tissues can begin:
  - \* PDL: 3-4 months
  - \* Collagenous gingival fibers: 4-6 months
  - \* **Elastic supracrestal fibers: 1 year**
- \* In cases of severe initial rotations: supracrestal fibrotomies are recommended at or just before appliance removal to prevent relapse

# Retention = we have to save the result of the orthodontic treatment

- \* *There is only one way to completely avoid relapse. At the end of treatment, remove the braces, polish the teeth, make study models and take photographs. And then take the patient out the back door of the office and shoot him. (Dr. Tom Graber DMD, South African Dental Congress. August 1992.)*

# Retention and relapse

Who is responsible ?

Orthodontist

Patient

Objective reasons

??

Wisdom teeth ?



# The frequency of the relapse

- Difficult to determine because a lot of relapsed case are hidden
- In the lower front area less 20 % of the cases maintain proper

Marielle Blake, Kathryn Bibby

Retention and stability: A review of the literature

American Journal of Orthodontics & Dentofacial Orthopedics

September 1998

# Basic Theories of Relapse and Retention: length of the retention

## 8. Corrected teeth tend to return to their original position

- \* Due to musculature, apical bases, transseptal fibers, and bone morphology
- \* Teeth should be held in corrected positions for an extended period of time to prevent relapse

# The length of the retention

- \* The length of the retention should be twice longer than the active treatment
- \* In the first 6-8 months the retainers should be worn 20-22 hours to avoid „jiggling”
- \* Later (12-14 hours) daily wearing is necessary
- \* The retainers have to be left by degrees (every 2. day, twice a week etc.)
- \* The fixed retainers can be used for longer time (many years)



# Extraction versus nonextraction

- \* If the treatment plane and leading of the treatment are proper, there is no difference related to the relapse



**Erdinc A., E., Nanda R., S., Işıksal E.: Relapse of anterior crowding in patients treated with extraction and nonextraction of premolars  
American Journal of Orthodontics & Dentofacial Orthopedics June 2006**

# Basic Theories of Relapse and Retention:

## 1. Relapse is less likely if corrections are made during time of growth

- \* Influence of growth of the maxilla and mandible can only occur in growing patients
- \* Advantages of early treatment:
  - \* Interception prior to dental compensation
  - \* Possible correction of skeletal malocclusion while sutures are still open
  - \* Prevent irreversible soft tissue or bony changes

*Kloehn, ADO DO, 1955*

*Ochsenbein, J Dent Child, 1974*

- \* *Litowitz* found that patients which exhibited the most growth during treatment demonstrated less relapse
- \* **Post-treatment growth (esp. mandibular growth) will cause secondary crowding**

# Reasons of relapse: Late mandibular growth

- \* Skeletal changes:

- \* Mandible grows downward, forward, or downward and backward → increase lip pressure on incisors → tipped distally

- \* Dental changes:

- \* Third molar eruption (no evidence)
- \* Late mandibular growth (major contributor)
- \* Should be retained until mandibular growth has ceased (G: late teens B: early twenties)

# Basic Theories of Relapse and Retention: lower incisors crowding !!

## 2. Lower incisors are more likely to remain in good alignment if positioned upright over basal bone

- \* Perpendicular to mandibular plane
- \* In terms of stability, it is better to place too much lingual inclination rather than too much labial inclination
  - \* **Labial inclination is more likely to collapse due to lip pressure**
- \* Pretreatment lower incisor proclination is associated with less long-term crowding; this is thought to be due to weaker labial muscular forces

# Reasons of relapse : Lower Incisors !!!

- \* Study conducted by *Little et al*
  - \* Patients with four 1<sup>st</sup> bicuspid extraction were evaluated for incisor crowding 10 years post-retention
  - \* Only 30% had ideal alignment
  - \* 20% had marked crowding
  - \* Post-treatment crowding was concluded to be **unpredictable** based on pretreatment findings

# Basic Theories of Relapse and Retention:

## 3. **Overcorrection** is recommended in malocclusions

- \* Class II → edge to edge
- \* Deep bite cases
- \* Rotated teeth
  - \* Less chance of relapse if there has never been a rotation; should create enough space initially for tooth to erupt into
  - \* Transseptal fibrotomy is also recommended in severe cases

*Reitan, Angle Ortho, 1959*

*Edwards, AJO DO, 1968*

# Theories of Relapse and Retention:

## 4. Relapse is less likely to occur if the cause of the malocclusion is eliminated

- \* Thumb, finger or lip habit **BAD HABITS !!**
- \* Tongue posture
  - \* It has been stated that even after successfully completing tongue therapy/exercises correction is not guaranteed
- \* Nasopharyngeal obstruction → mouth breathing → open bite
- \* In a study by *Gavito et al.*, patients who initially started with an open bite were evaluated 10 years following retention → 35% had an open bite 3 mm or more



# Basic Theories of Relapse and Retention:

## 5. **Obtaining proper occlusion** is an important factor in maintaining corrected positions

- \* No movement is seen from regular grinding
- \* Movement may occur if there is destruction of bone or a build up of fibrous tissue (difficult to maintain tooth position)

# Basic Theories of Relapse and Retention:

## 7. Appliance therapy cannot permanently alter arch form (esp. in lower arch) **DON'T TILT TO LABIAL OR BUCCAL POSITION !!**

- \* Should maintain the initial archform, as it will tend to return to its pretreatment shape
- \* Strang stated:  
*“The width as measured across from one canine to another in the mandibular denture is an accurate index to the mandibular balance inherent to the individual and dictates the limits of the denture expansion in this area of treatment”*



# 9. Reasons of relapse

## Wisdom teeth

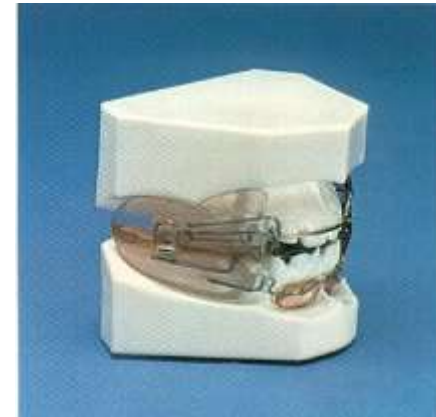
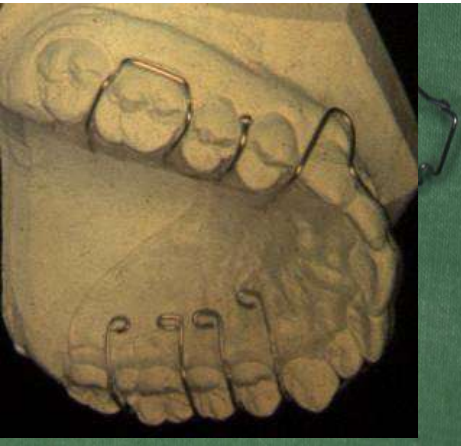


# Types of Retention

1. Removable Retention
2. Fixed Retention
3. Active Retention

# Grouping of orthodontic appliances

## Removable appliances



## Fixed appliances

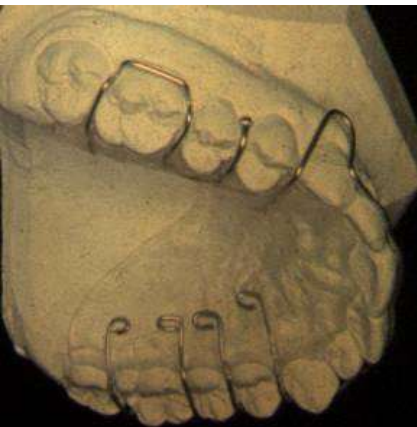


# Removable appliances



- Active plates
- Passive plates
- Functional, bimaxillary appliances

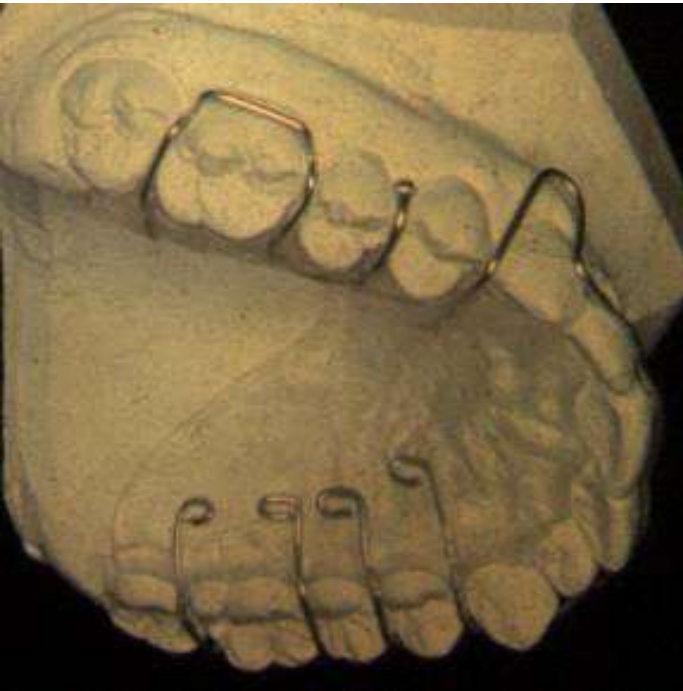
(To improve the relationship between the upper and lower jaw)  
Frankel-appliance, Hansa-appliance, Bionator, Aktivator





# Grouping of plates

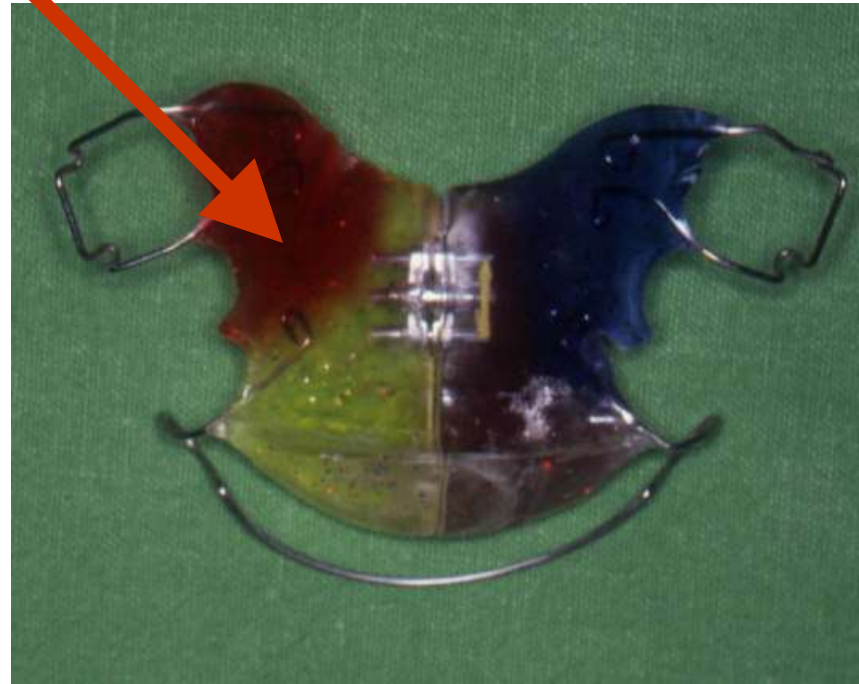
**Passive**



Upper passive (retention) plates

**SCREW**

**Active**



Upper active plate

# Removable Retainers

- \* Advantages as a retainer:
  1. Reestablishes normal tissue when gingival hyperplasia is present
  2. Maintains occlusal relationship and intra-arch position
  3. Unlikely to break
  4. Can be made with jaws rotated down and back to prevent Class III relapse
  5. Can be constructed to prevent relapse in skeletal Class II and open bite cases
    - \* Growth control is less effective than part-time functional appliance or headgear



# Removable Retainers

## Disadvantages of removable retainers:

- \* Worn 4 hours during day and while sleeping
- \* Separates teeth by 2-3mm
- \* Mounted on Articulator: if it is to be worn for an extended period of time or the case is severe (otherwise not necessary)
- \* If appliance is made with incorrect hinge axis the patient's posterior teeth will not contact when incisors do

# Removable Retainers

## \* Hawley Retainer:

- \* Most common removable retainer
- \* Developed in 1920s
- \* Clasps on molars, palatal coverage, and labial bow with adjustment loops
- \* Can incorporate biteplate for deep bite patients



# Barrer-retainer



# Removable Retainers

## \* **Wraparound Modification: “3-3 Clip-on”**

- \* Used mainly for lower anterior area
- \* Can realign incisors and/or maintain lower incisor space closure
- \* Used if posterior teeth were well aligned pre-treatment



# Removable Retainers

## \* Essix:

- \* Developed in 1993
- \* Plastic removable appliance
- \* Advantages:
  - \* Esthetic
  - \* Patient is more likely to wear
  - \* Inexpensive
  - \* Quick fabrication
  - \* Minimal bulk
  - \* High strength
  - \* No adjustments
  - \* Usually does not interfere with speech or function
- \* Studies have determined that Essix retainers are as efficient as Hawley-type or bonded wire retainers



# Removable Retainers

## \* **Damon Splint:**

- \* Basically, upper and lower Essix retainers connected
- \* Retentive splint for Class II, Class III, and bilateral crossbite treatment
- \* Assists in tongue training
- \* Holds teeth and arches in corrected position



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# Retainers – Essix retainer





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# Removable Retainers



- \* **Positioner:**

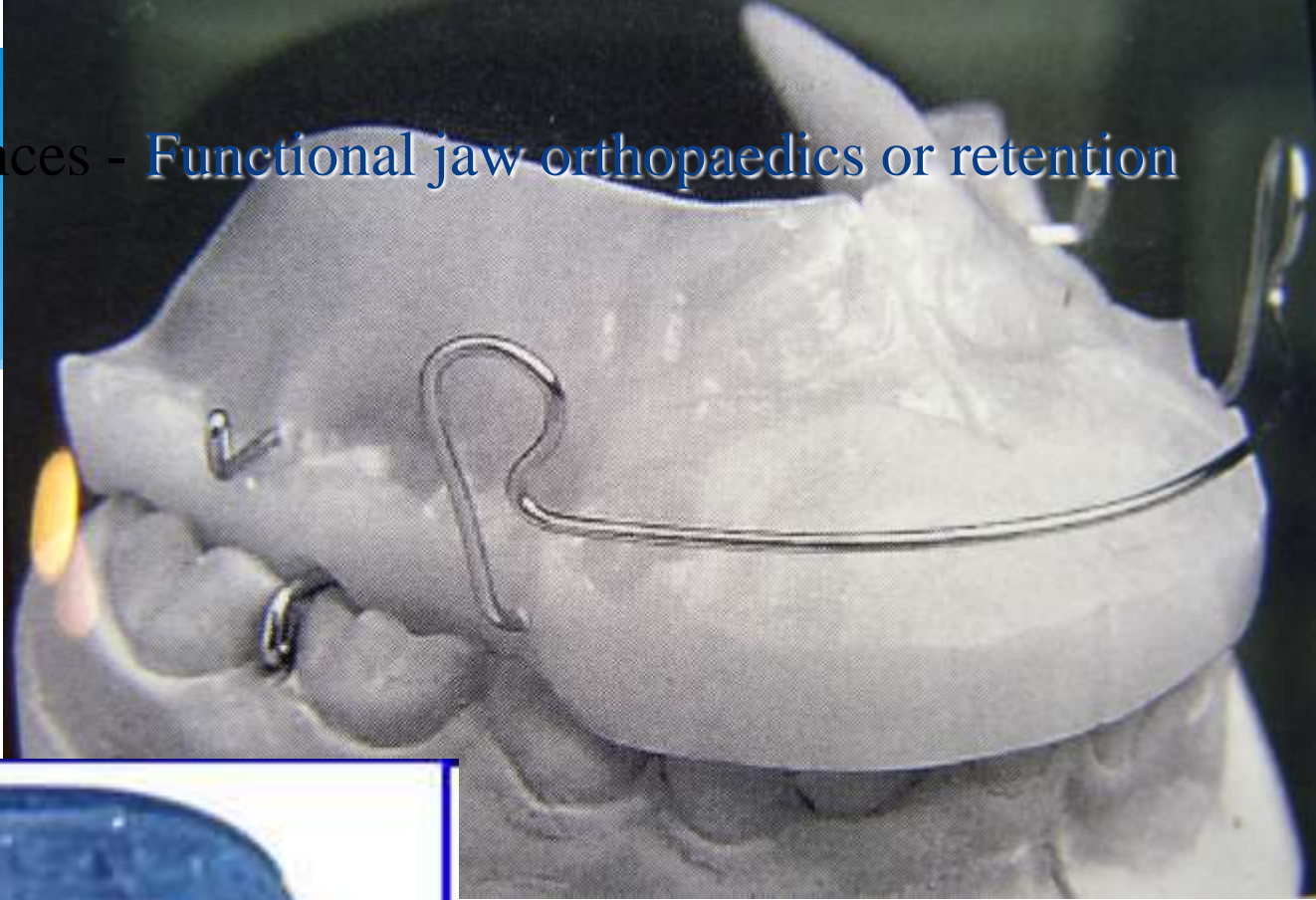
- \* Can be made as retainer or used for finishing and then maintained as retainer
- \* Disadvantages as a retainer:
  1. Bulky and difficult to wear full-time
  2. Do not retain incisor position as well as a conventional retainer b/c patients usually wont wear full-time
  3. Overbite increases due to limited patient wear

# Active Retainers



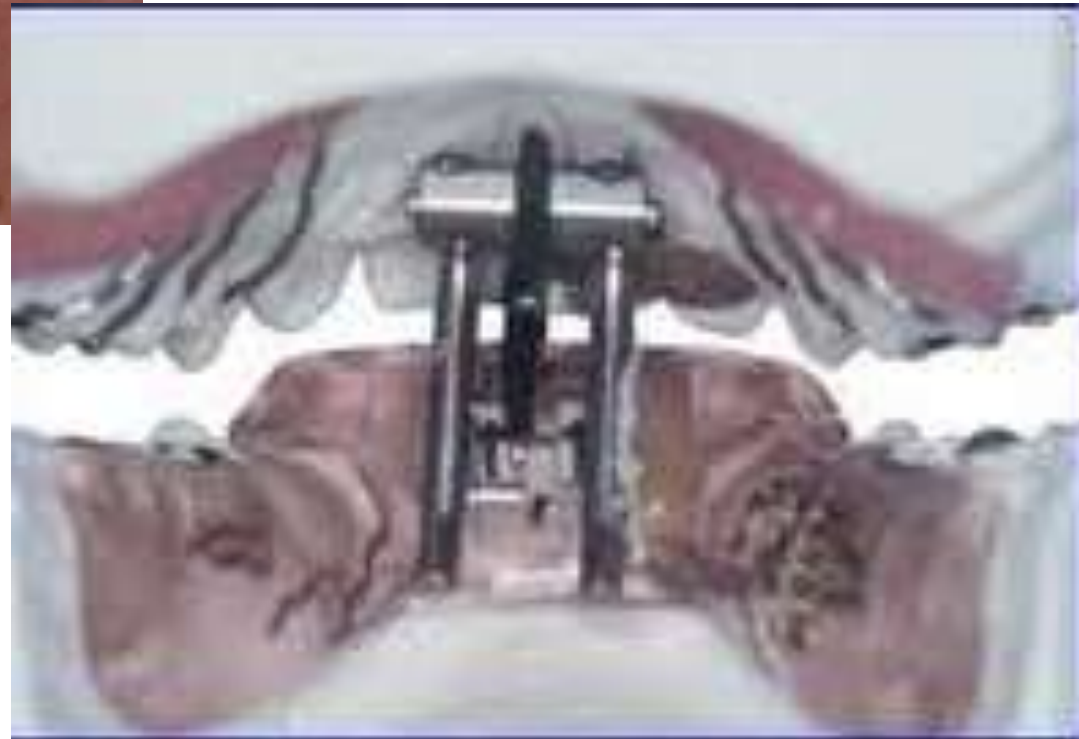
- \* **Modified functional appliance:** manage relapse potential in Class II or Class III cases
  - \* Activator or Bionator:
    - \* Upper and lower retainers joined by inter-occlusal bite blocks
    - \* Maintain teeth within arch while slightly altering occlusal relationship
    - \* Example: If adolescent slips back 2-3 mm into Class II after early correction, this appliance can be used to recover proper occlusion
    - \* No value if used in adults (as no vertical growth remains)
    - \* Moves teeth (no skeletal change)
    - \* Can only be used if no more than 3mm correction is needed
    - \* Goal: Hold maxillary posterior segment and allow for eruption of mandibular posterior segment anteriorly (Class II)

# Bimaxillary appliances - Functional jaw orthopaedics or retention



Bite block between the upper and lower teeth

# Double Plate



# Fixed Retainers

- \* Utilized in cases where stability is questionable and prolonged retention is planned
  
- \* Four main indications:
  1. Maintaining lower incisor position
  2. Holding diastema closed
  3. Implant or pontic space maintenance
  4. Retaining closed extraction spaces



# Fixed Retainers



## 1. **Maintaining lower incisor position during late mandibular growth:**

- \* Even mild mandibular growth between the ages of 16-20 can cause lower incisor relapse
- \* A fixed lingual bar bonded only to canines can prevent distal tipping of lower incisors
- \* A heavy wire, 28 or 30 mil, should be used due to long span
- \* Studies indicate that placing retention loops on canines will decrease breakage

# Fixed Retainers



- \* If teeth were severely rotated or spaced, all teeth (3-3) can be bonded together using a 17.5 mil braided steel wire – as it is not desirable to use too rigid of a wire (must allow physiologic tooth movement)
- \* Patients who were evaluated after 20 years of having a lower fixed retainer showed NO signs of periodontal problems
- \* If proper flossing is maintained, fixed retainers can remain indefinitely





# Üvegszálás retainerek



# Fixed Retainers

## 2. Holding diastema closed:

- \* Utilize lighter wire (17.5 or 19.5 mil twist)
- \* Bond above cingulum – out of occlusion
- \* Can prevent bite deepening if lower incisors erupt

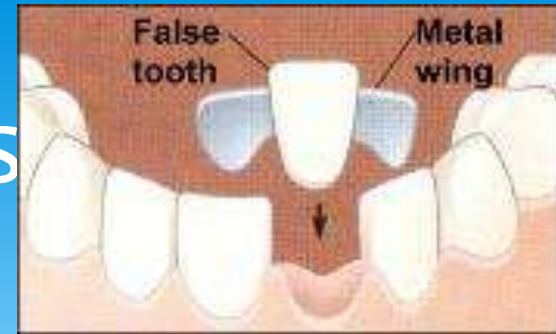


# Fixed Retainers

## 3. Implant or pontic space maintenance:

- \* Reduces mobility of teeth making it easier to place bridge
- \* Holds space if prolonged periodontal treatment is required post-ortho, prior to placement of restoration
- \* Implants should be placed as soon as ortho is completed so it can be included in initial stages of retention

# Fixed Retainers



- \* For posterior teeth, heavy wire is bonded to shallow preparations in adjacent teeth
- \* The longer the span, the heavier the wire
- \* Placed out of occlusion
  
- \* For anterior teeth, a pontic can be placed on a removable retainer for short term use
- \* If the patient must wait an extended period of time prior to completion of vertical growth for placement of final restoration, a **bonded bridge** is preferred

# Fixed Retainers

## Retaining closed extractions spaces:

- \* Placed on facial surfaces of posterior teeth
- \* Mainly used in adults, as they tolerate this better than removable retainers
- \* More reliable than removable retainer

# Retention: Class II

- \* Relapse in these patients are most likely due to a combination of dental and skeletal changes
- \* Dental changes (short-term relapse) :
  - \* 1-2mm of A-P change tend to occur immediately following treatment, especially when Class II elastics are used
    - \* Overcorrection is important in preventing relapse
  - \* Forward movement of lower incisors **more than 2mm** will require permanent retention, as lip pressure tends to upright these teeth, leading to an increase in crowding, overbite, and overjet

# Retention: Class II

- \* Bionator/Activator

- \* Maintain occlusal relationship
- \* Bite registration is taken in CR, so appliance is “passive”
- \* Not edge to edge like when used for “active” Class II correction





# Retention: Class III

- \* Relapse occurs mainly from mandibular growth
- \* Chincups and functional appliances: rotate mandible downward causing more vertical growth
  - \* Not as effective as maintaining Class II
- \* If relapse occurs in normal or excessive face height patients: may need surgical correction after growth
- \* In less severe Class III cases: Utilize functional appliance or positioner
  - \* Will maintain occlusal relationship in these cases
  - \* May position jaws down and back to prevent relapse

# Retention: Deep Bite

- \* Must control overbite during retention period
- \* Construct upper removable retainer with a baseplate to prevent lower incisors from over-erupting; posterior occlusion is maintained
- \* After stability is achieved, worn at night only
- \* *Nanda and Nanda* found that the pubertal growth spurt in deep bite patients is 1.5-2 years later than that of open bite cases; therefore longer retention period is required for deep bite cases



# Retention: Anterior Open Bite

- \* Patients with habit (thumb or tongue):
  - \* Relapse occurs by a combination of molar elongation and incisor intrusion
- \* Patients without habit:
  - \* Relapse is due to elongation of posterior teeth, mainly upper molars; not incisor related
  - \* Important to control eruption of upper molars

# Retention: Anterior Open Bite

- \* High-pull headgear with use of conventional removable retainers
- \* Appliance with posterior bite blocks (open bite activator or bionator) at night and conventional retainers during the day
- \* Preferred because:
  - \* Prevents eruption of upper and lower molars
  - \* Better patient acceptance



Thank you for your attention !

