RETENTION AND RELAPSE

DEPARTMENT OF ORTHODONTICS

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It is proved beyond doubt that teeth moved through bone using any orthodontic appliance have a tendency to return to their original position. Retention has been defined by Moyres as " maintaining newly moved teeth in position , long enough to aid in stabilizing their correction."

Relapse has been defined as “the loss of any correction achieved by orthodontic treatment. “ retention of teeth in ideal function and esthetic position following orthodontic treatment posses the greatest challenge to the orthodontist. Quite often we come across cases that require more skill in retaining the teeth than in regulating them. Retention is too often lightly considered..

Stabilizing the treatment results by retention procedure is an integral part of the orthodontic therapy and therefore provision should be made in the treatment plan for adequate retention keeping in mind the destabilizing factors.

CAUSES OF RELAPSE::::

Numerous are the causes attributed to relapse. No single factor can be the sole cause of relapse. In most cases relapse occurs due to a combination of factors.

1. Periodontal ligament traction:

Whenever teeth are moved orthodontically, the periodontal principal fibers and the gingival fibers that encircle the teeth are stretched. These stretched fibers can contract and are thus a potent cause of relapse. The principal fibers of the periodontal ligament rearrange themselves quite rapidly to the new position. Studies have shown that the principal fibers reorganize in about 4 weeks time. The supra-alveolar gingival fibers on the other hand take as much as 40 weeks to rearrange around new position, and thus predispose to elapse. After comprehensive orthodontic treatment, teeth require 4-5 months of full time retention so as to allow the reorganization of periodontal ligament fibers. After the this period, retention should be continued on a reduced basis for a further 7-8 months so as to allow the more sluggish gingival fibers to readapt to the new tooth positions.

2. Relapse due to growth related changes:

Pts with skeletal problems associated with Class II , Class III , open bite or deep bite malocclusion may exhibit relapse due to continuation of the abnormal growth pattern after orthodontic therapy. Studies have shown that the original growth pattern resurface or dominates if the orthodontic treatment is completed prior to the completion of growth. Hence, prolonged retention is indicated until active growth is completed.

3. Bone adaptation:

Teeth that have been moved recently are surrounded by lightly calcified osteoid bone. Thus the teeth are not adequately stabilized and have a tendency to move to their original position. The bony trabeculae are normally arranged perpendicular to the long axis of the teeth. However during orthodontic treatmen , they get aligned parallel to the direction of force, during the retention phase, they revert back to their normal arrangement.

4. Muscular forces:

Teeth are encapsulated in all directions by a blanket of muscles. Muscle imbalance at the end of the orthodontic therapy can result in reappearance of malocclusion. The orthodontist should aim at harmonizing the muscles at the conclusion of the orthodontic treatment so as to increase the stability of the treatment results achieved.

5. Failure to eliminate the original cause:

The cause of the malocclusion should be determined at the time of diagnosis and adequate treatment steps should be planned to eliminate the same or reduce its severity. Failure to remove the etiology can result in relapse.

6. Role of third molars:

The third molars erupt very late in the development of dentition. They erupt in most cases between the age of 18-21 years. By this time most patients would have completed their orthodontic treatment. The pressure exerted by the erupting third molars is believed to cause late anterior crowding, predisposing to relapse.

7. Role of occlusion:

Good intercuspation of the upper and the lower teeth is an important factor in maintaining the stability of treated cases. The centric relation and centric occlusion should coincide or the slide from centric should be not more than 1.5-2 mm in order to have greater stability of the treatment results. Presence of certain occlusal mannerisms such as clenching, grinding, nail biting, lip biting etc , are important causes of relapse.

THEORIES OF RETENTION:::

Theorem 1 :

Teeth that have been moved tend to return to their former position.

Theorem 2 :

Elimination of the cause of malocclusion will prevent relapse.

Theorem 3 :

Malocclusion should be over-corrected as a safety factor.

Theorem 4 :

Proper occlusion is a potent factor in holding teeth in their corrected positions.

Theorem 5 :

Bone and adjacent tissues must be allowed time to reorganize around newly positioned teeth.

Theorem 6 :

If the lower incisors are placed upright over basal bone they are more likely to remain in good alignment.

Theorem 7 :

Corrections carried out during periods of growth are less likely to relapse.

Theorem 8 :

The farther the teeth have been moved , the lesser is the risk of relapse.

Theorem 9 :

Arch form, particularly in the mandibular arch, cannot be permanently altered by appliance therapy.

Theorem 10 :

Many treated malocclusions require permanent retaining devices.

RALEIGH WILLIAMS – KEYS TO ELIMINATE LOWER RETENTION:::

Raleigh Williams put forward 6 keys to eliminate lower retention and achiee lower arch stability following orthodontic treatment. The following are the keys:

1. The incisal edge of the lower incisor should be placed on the A-P line or 1 mm in front of it. This position of the lower incisor ensures stability following treatment. It also creates optimum balance of soft tissue in the lower third of the face.
2. The lower incisor apices should be spread distally to the crowns more than is generally considered appropriate and the apices of the lower lateral incisor must be spread more than those of the central incisors. In other words the lower incisor roots should be diverging.
3. The apex of the lower cuspid should be positioned distal to the crown.
4. All four lower incisor apices must be in the same labiolingual plane.
5. The lower cuspid root apex must be positioned slightly buccal to the crown apex.
6. The lower incisors should be slenderized as needed after treatment.

TYPES OF RETENTION:::

Malocclusion occurs due to numerous causes and they present themselves in various ways. While some treated malocclusions do not require retention, other malocclusions may need a certain period of retention to ensure stability. Retention can be of three types:

1. **Natural or no retention:**

   Some of the conditions that do not require any retention include,

   a. Anterior crossbite
   b. Serial extraction
   c. Blocked out or highly placed canines in class I cases
   d. Posterior crossbite in patients having steep cusps.

2. **Limited or short term retention:**

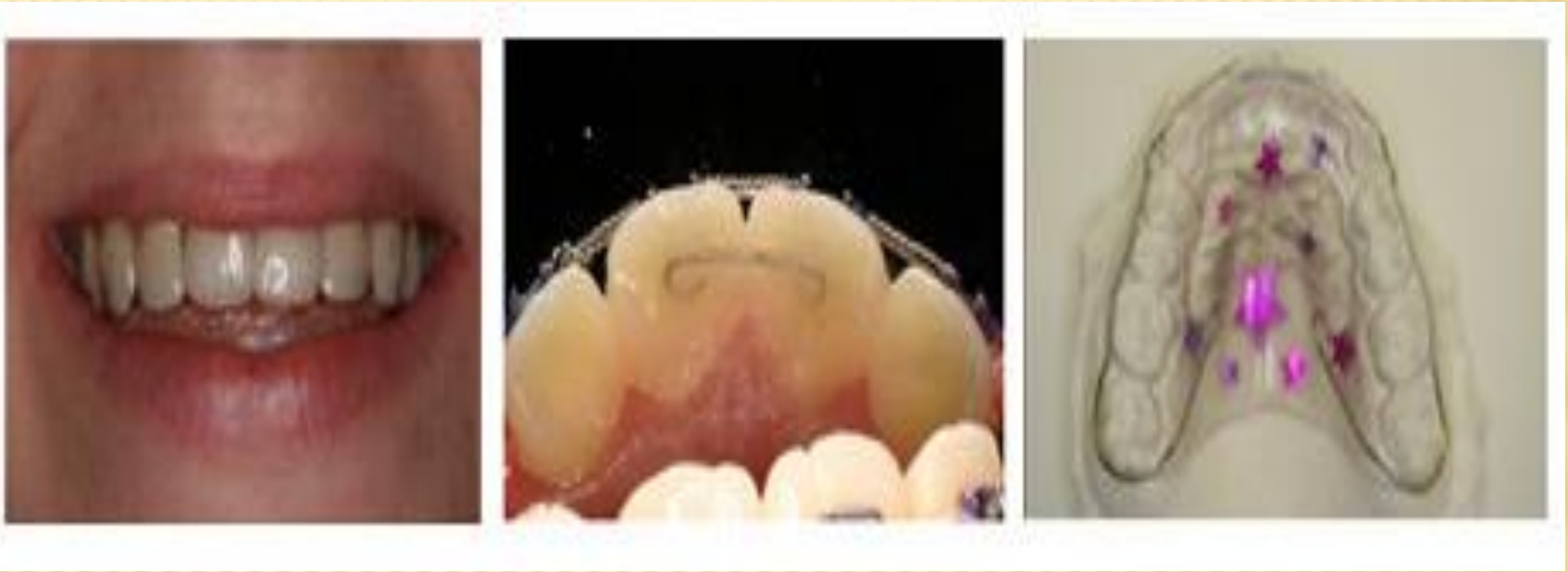
Most cases treated routinely in the orthodontic clinic fall into this category. Retention is recommended to allow the bone and other periodontal tissues to readapt to their new location.

a. Class I non-extraction with dental arches showing proclination and spacing.
b. Deep bites
c. Class I, Class II, div.1 and div.2 cases treated by extraction.

3. **Prolonged or permanent retention:**

Cases that require indefinite or prolonged retention include,

a. Midline diastema
b. Severe rotations
c. Arch expansion achieved without ensuring good occlusion
d. Certain Class II,div.2 cases
e. Patients exhibiting abnormal musculature or tongue habits
f. Expanded arches in cleft palate patients.



RETAINERS:::

Retainers are passive orthodontic appliances that help in maintaining stabilizing the position of teeth long enough to permit reorganization of the supporting structures after the active phase of orthodontic therapy.

The type of retainer to be used depends on various factors such as the type of malocclusion treated, the esthetic needs, patient's oral hygiene, patient co-operation, the duration of retention, etc.,.

Grabber has put forward certain criteria that a good retainer should possess.

1. The retainer should retain all teeth that have been moved into desired positions.
2. It should permit normal functional forces to act freely on the dentition.
3. It should be self-cleansing and should permit oral hygiene maintenance.
4. It should be as inconspicuous as possible.

CLASSIFICATION:::

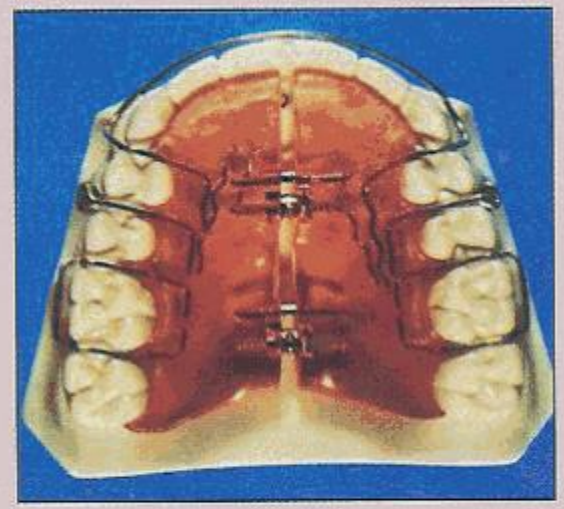
Retainers can be classified into

1. Removable retainers
2. Fixed retainers

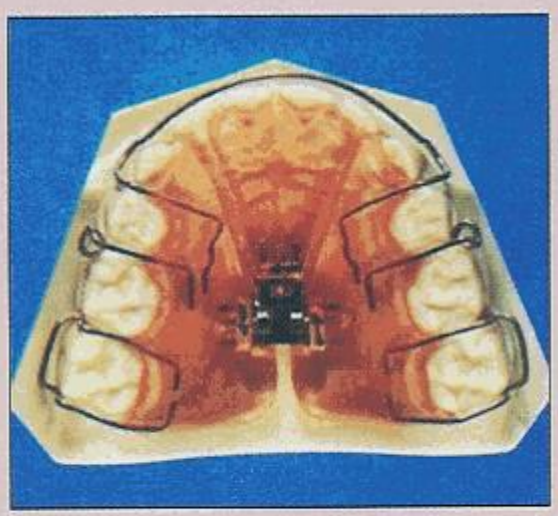
REMOVABLE RETAINERS

They are passive appliances that can be removed by the patients and reinserted at will.

Maxillary Schwarz/Sagittal Combination



Maxillary Schwarz



Maxillary 3-D Appliance

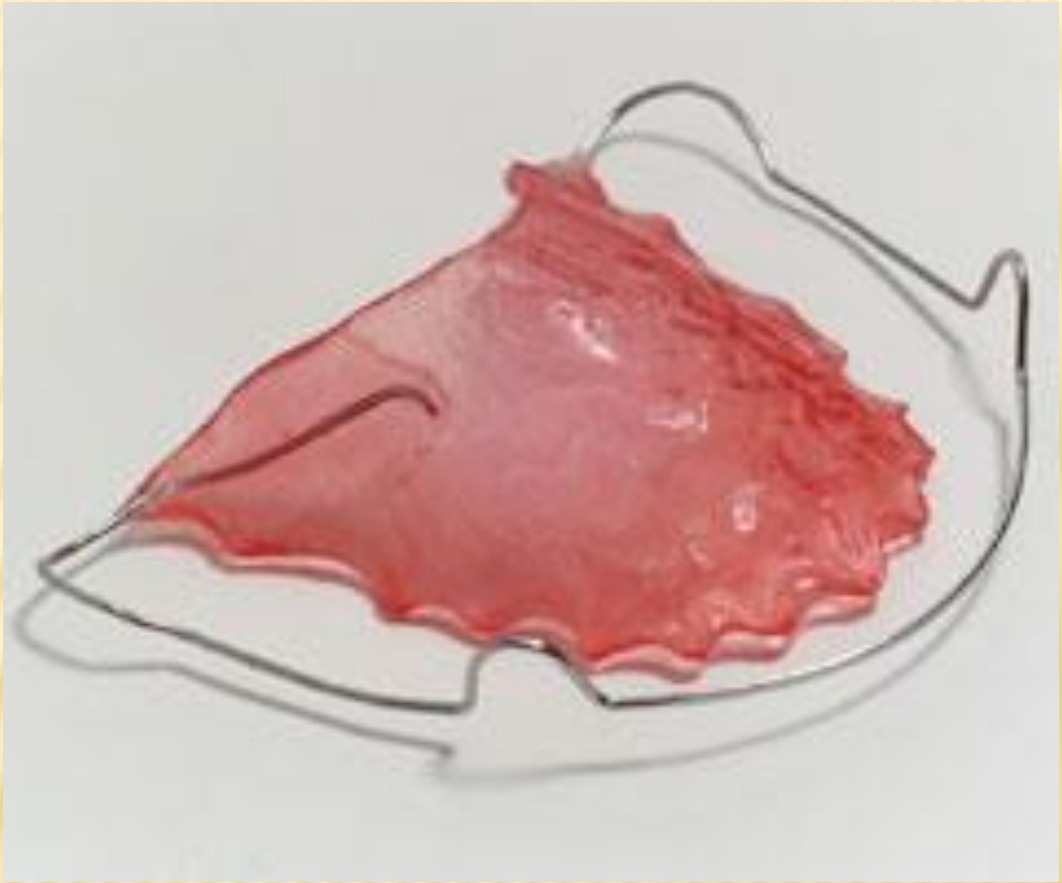
Hawley's appliance:

It is the most frequently used retainer designed in 1920 by Charles Hawley. Classic retainer consists of clasps on the molars and a short labial bow extending from canine to canine having adjustment loops.

This design can be modified to suite the specific requirements. The labial bow can be made to extend from first premolar to opposite first premolar. This design helps in closing the spaces distal to canine. Another modification is to solder the bow to the bridge of Adam's clasp. This design avoids the risk of space opening up between canine and premolar due to the cross-over wires. Fitted labial bow can also be used to offer excellent retention. Anterior bite planes can be incorporated to retain or correct deep bite cases. The advantages of this appliance include ease of fabrication and minimal patient discomfort and also it's relatively inconspicuous.

Begg retainer:

Popularized by P.R.Begg. it consists of a labial wire that extends till the last erupted molar and curves around it to get embedded in acrylic that spans the palate. The advantage of his retainer is that there is no cross-over wire between the canine and premolar thereby eliminating the risk of space opening up.



Clip-on retainer / spring aligner:

This appliance is made of a wire frame work that runs labially over the incisors and then passes between canine and premolar and is recurved to lie over the lingual surface. Both the labial as well as the lingual wire segments are embedded in a strip of clear acrylic. The retainer can be used to bring about correction of rotations commonly seen in lower anterior region. In such cases where it is used as an active retainer, it is fabricated on a cast wherein the teeth are placed in ideal positions by wax set up.

Wrap around retainer:

This is an extended version of the spring aligner that covers all teeth. It consists of wire that passes along the labial as well as lingual surfaces of all erupted teeth which is embedded in a strip of acrylic. This type of retainer is not routinely used in orthodontic practice. It finds application in stabilizing a periodontally weak dentition.

Kesling tooth positioned:

Described by H.D.Kesling in1945. It is made of a thermoplastic rubber like material that spans the inter-occlusal space and covers the clinical crowns of the upper and the lower teeth and a small portion of the gingival. The tooth positioned needs no activation at regular intervals and is durable. The drawbacks include difficulty in speech and risk of TMJ problems.

Invisible retainers:

They are retainers that fully covers the clinical crowns and a part of the gingival tissue. They are made of ultra thin transparent thermo-plastic sheets using a Biostar machine. They are esthetic and often go unnoticed.

FIXED RETAINERS

These retainers are fixed o fitted to the teeth and cannot be removed and reinserted by the patient.

The fixed appliance:

The fixed appliance that was used for orthodontic correction can be left in place to serve as a retainer.

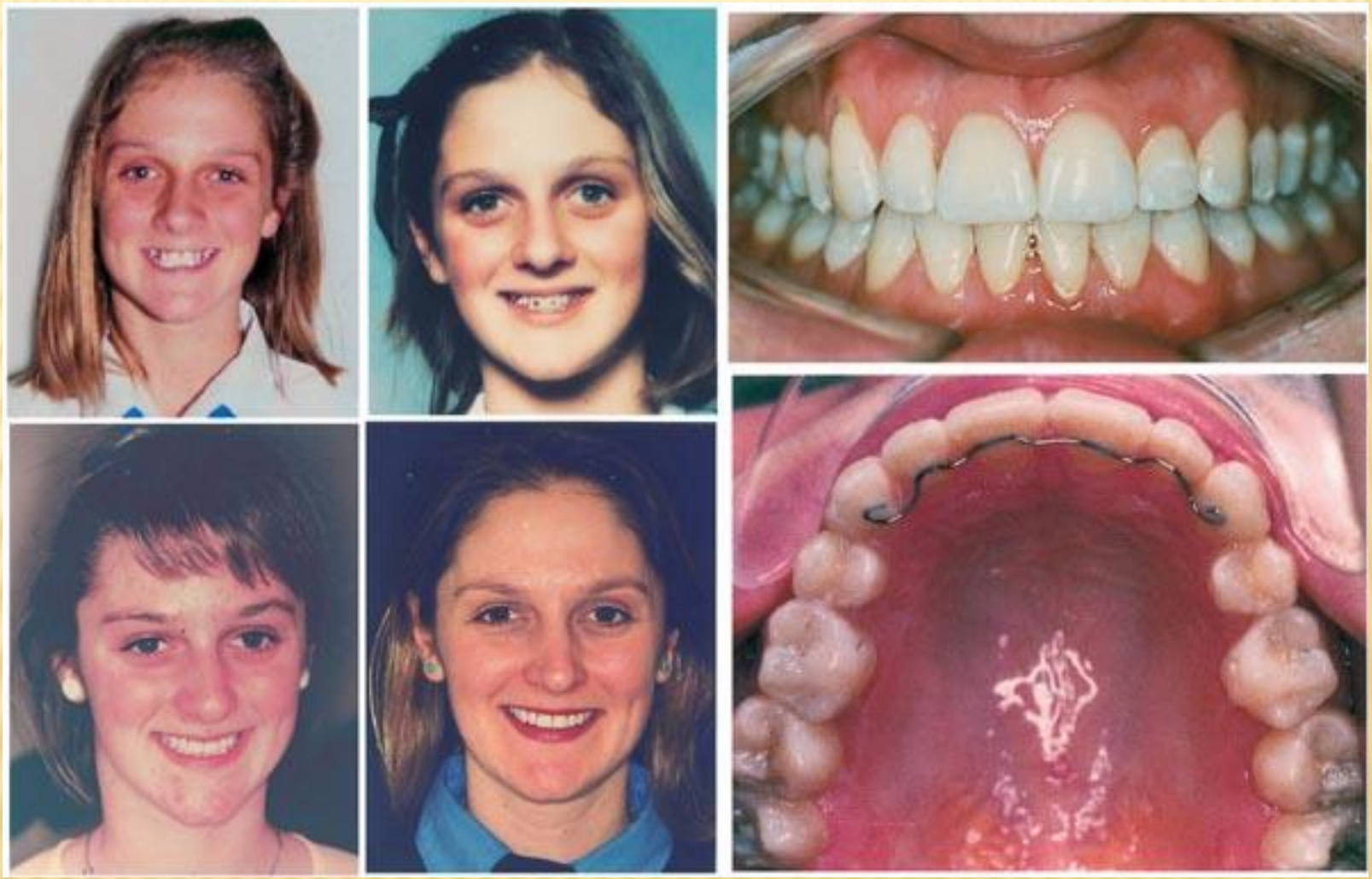
Banded canine to canine retainer:

This type of retainer is commonly used in the lower anterior region. The canines are banded and a thick wire is contoured over the lingual aspects and soldered to the canine bands. The bands predispose to poor oral hygiene and are esthetic.

Bonded lingual retainers:

Stainless steel or blue Elgiloy wire is adapted lingually to follow the anterior curvature. The ends are curved over the canines where it is bonded.

Various pre-fabricated lingual retainers are available that can be bonded to teeth. An alternative to the use of wires is to use etched or perforated metal cast bars that can be bonded to the lingual side of the teeth. Recently some workers have recommended the use of a spiral wire that can be bonded individually to each tooth in a segment.



Band and spur retainer:

Used in cases where a single tooth has been orthodontically treated for rotation correction or labio-lingual displacement. The tooth has been moved is banded and spurs are soldered on to the bands so as to overlap the adjacent teeth. In case it is used to retain a tooth that has been blocked palatally, the spurs are made on the labial aspect so that the tooth does not once again get displaced palatally. In derotation cases one spur is placed labially and the other lingually to avoid relapse.

SPECIAL CONSIDERATIONS IN RETENTION OF CERTAIN MALOCCLUSIONS

Class II malocclusion:

Class II malocclusion generally are a result of discrepancies in growth between the maxilla and the mandible. Relapse following the correction of Class II malocclusion are due to continued differential growth of maxilla relative to mandible. Minor relapse tendencies may be a result of tooth movement due to gingival and periodontal factors. Over correction of the occlusal relationship is an important factor in compensating for relapse following treatment. However long term growth related changes are more likely to pose a problem in retention.. these growth related changes depend on a number of factors including age, sex, and maturity of the patient.

This relapse tendency can be prevented by continued use of headgears to restrict maxillary growth in conjunction with a retainer to maintain the dental alignment. Some authors prescribe the use of functional appliances similar to activator or a bionator after the active phase of class II correction. The use of these appliances maintains the corrected maxilla-mandibular relation and prevents growth related relapse tendencies.

The use of headgears or functional appliances to maintain the Class II correction is indicated if the active treatment is completed at an early age and continued growth is expected following the active phase of treatment.

Class III malocclusion:

Retaining a classIII malocclusion may be a difficult due to the continued growth of the mandible. The use of chin cap to restrict mandiblar growth has been recommended by some authors to counter the continued growth tendency of mandible. However the use of chincap is believed to increase the vertical growth of mandible. Mild class III cases best retained using Class III functional appliances such as a reverse activator, FR3 or Class III bionator. However severe Class III cases that relapse following active orthodontic therapy may require surgical correction after growth ceases.

Deep bite:

Deep over bites are best retained by removable upper retainers made in such a way that the lower anteriors contact the base plate behind the maxillary anteriors. This is similar to anterior bite plane, but the molars need not be separated. This type of retainer helps in maintaining the corrected deep bite.

Open bite:

Relapse following correction of open bite is usually a result of molar extrusion or incisor intrusion. Incisor intrusion may occur due to continued indulgence in habits such as thumb sucking or tongue thrusting. Thus elimination of the associated etiologic factor would help in long term stability. Excessive vertical growth tendencies and continued eruption of posteriors may pose the risk of relapse. In these patients openbites are best retained by high pull headgears to upper molars or use of bite block appliances such as posterior bite plane that stretches the musculature and produces an intrusive force on the dentition.

Pericison

(Circumferential Supracrestal Fibrotomy – CSF)

Pericison is a minor surgical procedure that is undertaken to counter the relapse tendency of the stretched gingival fibers. The trans-septal and alveolar crestal group of gingival fibres remains stretched and do not readily readapt to the new tooth position following correction of rotations hence causing relapse.

Pericison involves surgical sectioning of these fibers by passing a sharp narrow scalpel through the gingival sulcus around the tooth to a depth of 2 mm apical to the alveolar crest. Pericison is generally undertaken as an adjunctive retention procedure after the correction of rotations.

THANK YOU