Expansion

- Expansion in arch has been one of the oldest means of creating space in the dental arches. It is also one of the conservative method of gaining space. It can also be used to correct the intermaxillary and dental arch relationships primarily in transverse direction. It enables correction of crossbites early in treatment
- Based on the duration of time taken to achieve the desired expansion, expansion devices can be classified as:
- Rapid maxillary expansion devices.
- Slow expansion devices.

CLASSIFICATION

Expansion can be divided into various categories including:

1. Orthodontic.
2. Passive.
3. orthopedic.

- Orthodontic Expansion: It is well known that expansion of the dental arches can be produced by a variety of orthodontic treatments, including those that employee fixed appliances.

- Passive Expansion

  When the occlusion is shielded from the forces of the buccal and labial musculature, a widening of the dental arches often occurs. This expansion is not produced through the application of extrinsic biomechanical forces, but rather by intrinsic forces such as those produced by the tongue. Example as passive expansion are the dimensional changes in the dental arches produced by such vestibular shield appliances as the FR-2 of Frankel or lip bumper.

- Orthopedic Expansion: Rapid maxillary expansion (RME) appliances are the best examples of true orthopedic expansion in that changes are produced primarily in the underlying skeletal structures rather than by the movement of teeth through alveolar bone

DIFFERENCE BETWEEN ORTHOPEDIC AND ORTHODONTIC EXPANSION

- ORTHOPEDIC FORCE
  Result in major change occurring in basal structures of mandible& maxillae. Involves interaction between basal bone & alveolar bone.

- ORTHODONTIC FORCE
  By use of this force the teeth alone are supposed to move . Adaptive changes in specific alveolar bone adjacent to moving teeth.

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RAPID EXPANSION

- Results in major change occuring in basal structures of mandible and maxilla
- Only fixed appliances can be used Force levels: 10-20 lbs
- Activation: 0.5-1 mm / day
- Requires 1- 4 weeks
- Skeletal changes – 50%

SLOW EXPANSION

- By use of this force the teeth alone are supposed to move
- Both removable and fixed appliances can be used Force levels: 2-4 lbs
- Activation: 1mm /week
- Requires 2 – 6 month
- Skeletal changes –16 – 30% of total change and vary with age

Rapid Maxillary Expansion appliance

The RME appliance is essentially a dentofacial orthopedic appliance, which tends to produce its changes by splitting the mid-palatine suture. The rationale being that if extreme forces are applied on to the palatal shelves, the interlying suture splits and results in true skeletal changes. The teeth are generally used for the purpose of transmitting the forces onto the maxillary bone proper.

Indications of RME

- RME appliances are ideally indicated in growing individuals with severely constricted maxillary arches, involving airway impairment or mouth breathing tendencies. They are also indicated in other cases of:
- Posterior cross bites with real or relative maxillary deficiency
- Cleft palate patients
- Along with facemask therapy
- Class III cases with minor maxillary deficiency

- According to Profit the midpalatal suture ossifies by the age of 17 to 18 years in human life. Thus RME is indicated up to 18 to 19 year.

TYPES OF RAPID MAXILLARY EXPANSION APPLIANCES

- Over the years numerous types of RME appliances have been used. They can be best classified as:
- Fixed appliances
  - Tooth-borne
  - Tooth and tissue-borne.
- Removable appliances

HYRAX RME APPLIANCES

- This type of appliances makes use of the HYRAX screw, named after the ability to keep it clean (the hygienic rapid expander).
- The screw has heavy wire extensions, which can be adapted to follow the contour of the palate and are soldered to either metal bands (Fig. 21.2Hi) or a wire framework that has acrylic splints (Fig. 21.2Hii) or embedded in acrylic splints (Fig. 21.2Hiii).

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tooth-bor

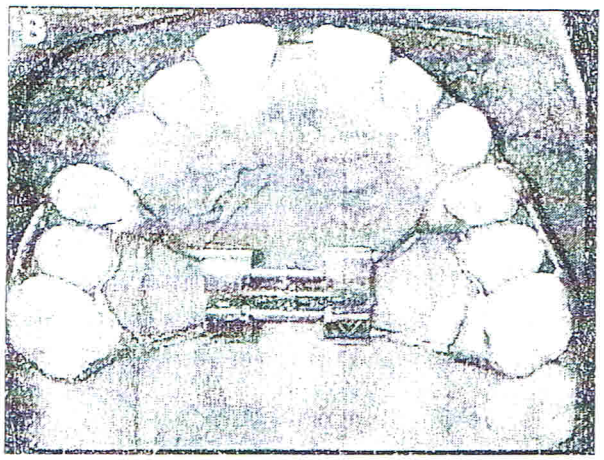


Fig 21.2 Hi

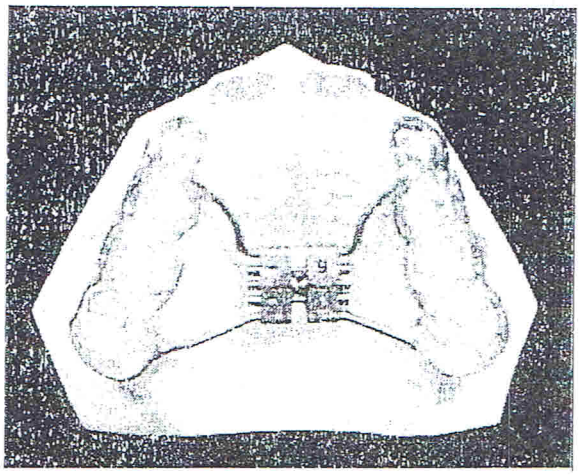
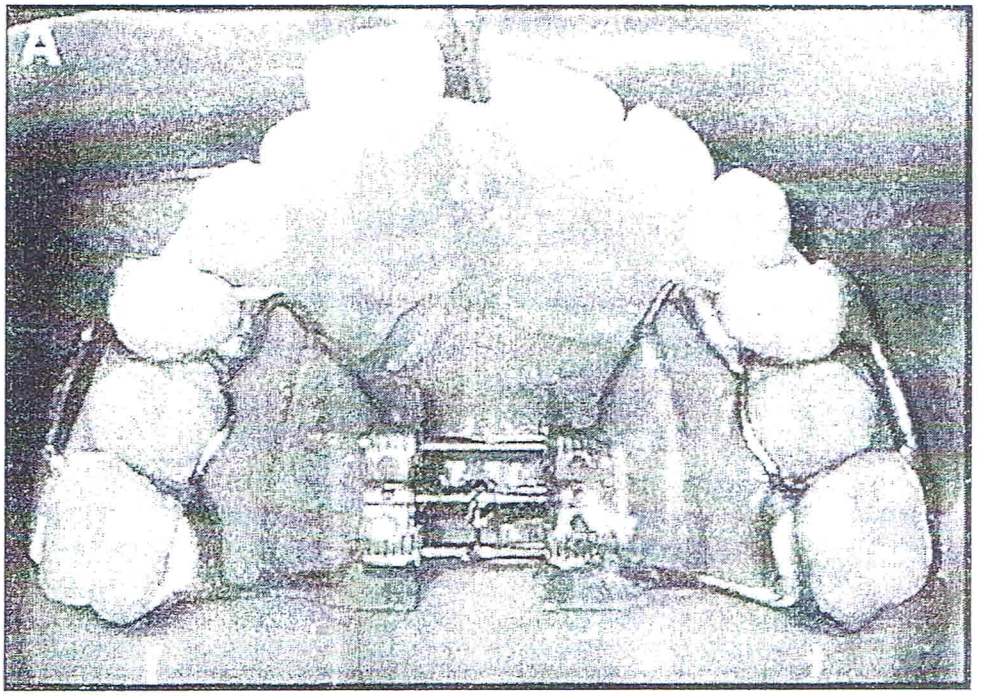


Fig 21.2 Hii

HASS RME

- This appliance is a rigid appliance which not only transmits forces on to the teeth but also on to the palatal shelves directly.
- It has a rigid wire framework, which is soldered to the first premolar and molar bands both buccally and palatally.
- The palatal extensions of the 1.2 mm diameter wire are incorporated in an acrylic plate which contains an expansion screw in the midline

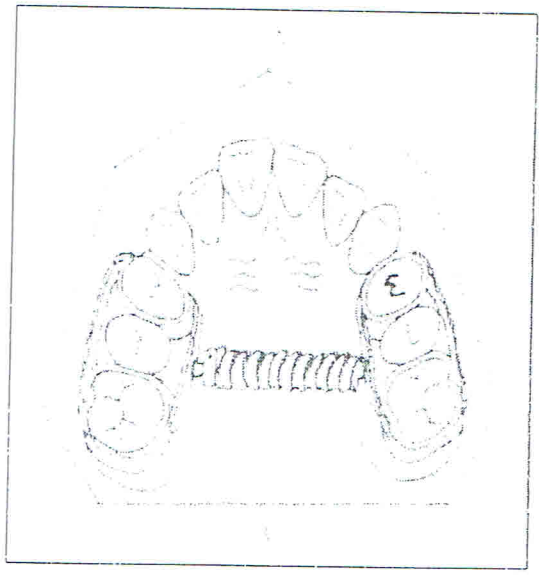


Hass expander

tooth-tissue borne

Issacson

- This is a tooth borne appliance without any acrylic palatal covering
- Minnesota expander consists of a metal framework soldered both labially as well as palatally on the first premolar and molar bands.
- A spring loaded screw is soldered on the palatal extension of the metal framework.



Dentofacial effects of RME

1. Increase in diastema or midline spacing.
2. Increase in transverse width of maxilla
3. Split of midpalatal suture, split is fan shaped and more in the anterior region.
4. limited tipping and/or extrusive orthodontic movement of the teeth.

tipping buccally

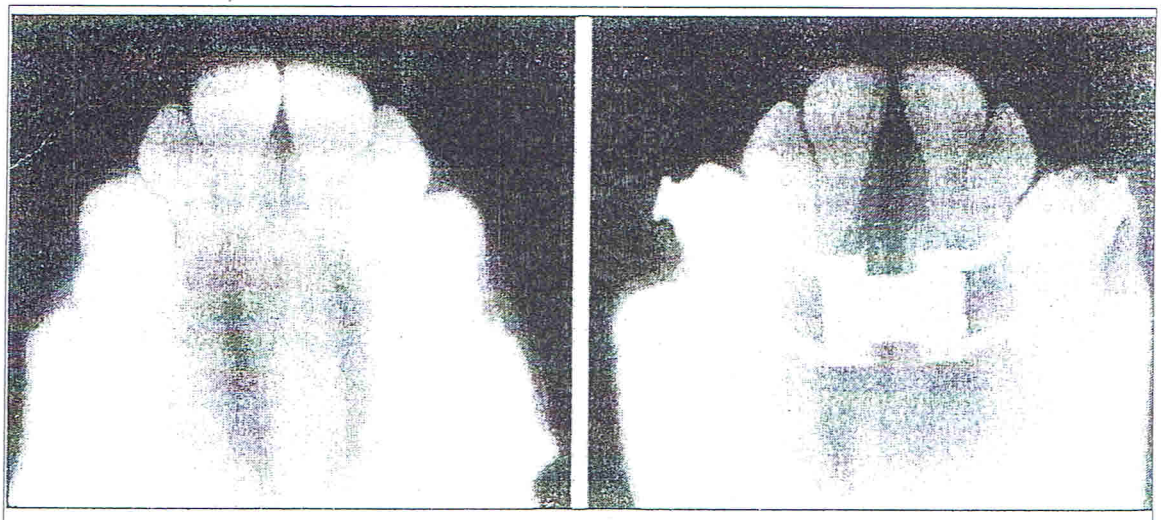


Fig. 21.2E: The triangular split of the mid-palatine suture is evident on the occlusal view radiograph (patient PS)

SLOW EXPANSION APPLIANCE

Appliances used could be divided in to:

1. Removable

a. Expansion screw

b. Coffin spring

2. Fixed

a. W arch

b. Quad helix

SLOW EXPANSION APPLIANCE

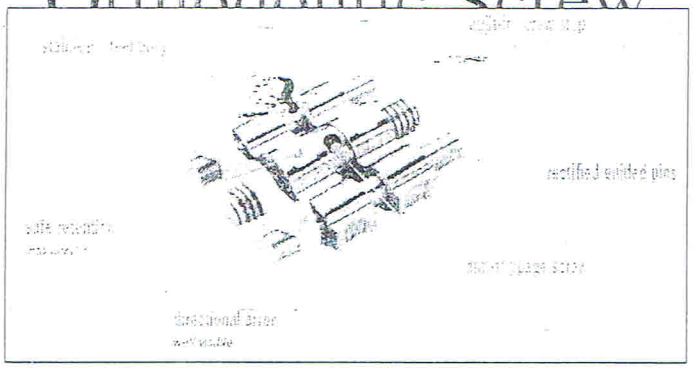
Indications of slow expansion

- Correction of unilateral cross bites.
- Correction of 'V' shaped arches as in "thumb suckers".
- Preparation for bone grafts in cleft cases.
- Minimal crowding in the upper arch (1-2 mm).

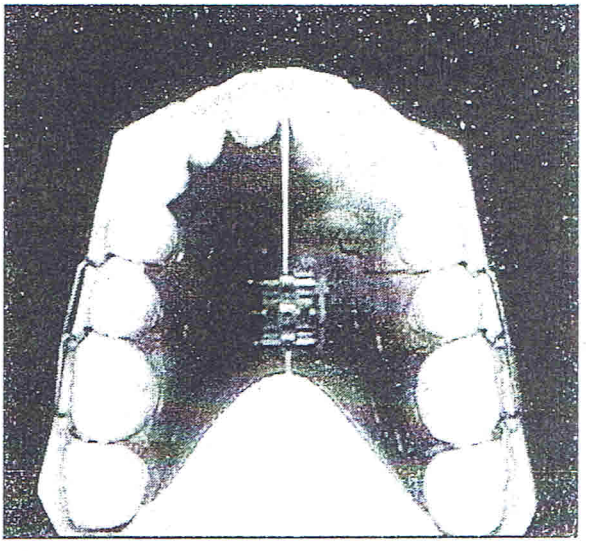
Expansion screw

- The expansion screw is a very small metallic appliance which may be designed to move a single tooth or a group of teeth or the skeletal bases as required. This screw as a source of force together with the acrylic segment of the plate effect the teeth and the alveolar process.
- Different type of screws may be used advantageously for certain procedure during treatment with removable appliance

Orthodontic Screw

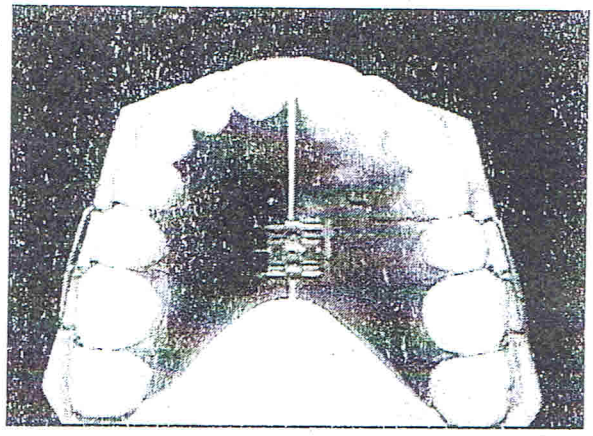


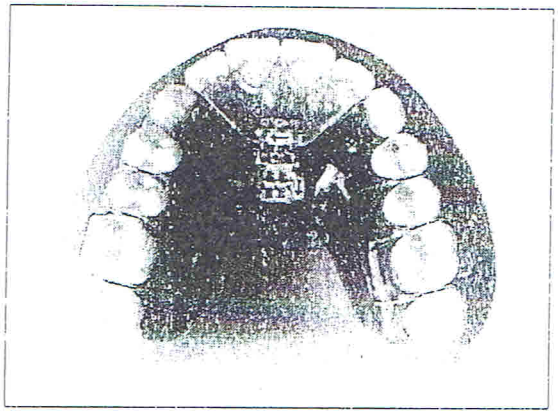
- The screw normally transmits its forces by means of acrylic, which comes in contact with the teeth.
- The patient usually activates the screw once or twice a week.
- Fairly high force is generated but it is intermittent in nature.
- Desirable features in screw are stability and minimal bulk.
- Screws can be used for various tooth movements in antero-posterior and transverse arch expansion and also in contracting a wide arch.
- Quarter turn activation of the screw will produce 0.25mm expansion

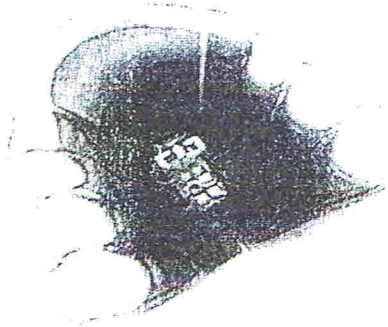


Indications of screw

- Expansion screw appliance used for symmetrical expansion of dental arch.
- Appliance with screw to move individual teeth or small group of teeth in a buccal or labial direction .
- Appliance with screw to move individual teeth or small group of teeth in a mesial or distal direction







Guidelines for screw positioning

- It is positioned in three dimensions accurately.
- It should be placed in the mid line oriented to median raphe when bi-lateral expansion is to be planned. Screw lies on a imaginary line passing between the first and second premolar.
- In a narrow arch it should be positioned more posteriorly
- The horizontal plane of the screw is placed parallel to the plane of the occlusal surface.

Coffin Spring

- It is a removable appliance capable of slow dento alveolar expansion
- The appliance consists of an omega shaped wire of 1.25mm thickness, placed in the mid palatal region
- The free ends of the omega wire are embedded in acrylic covering the slopes of the palate
- The spring is activated by pulling two asides apart manually

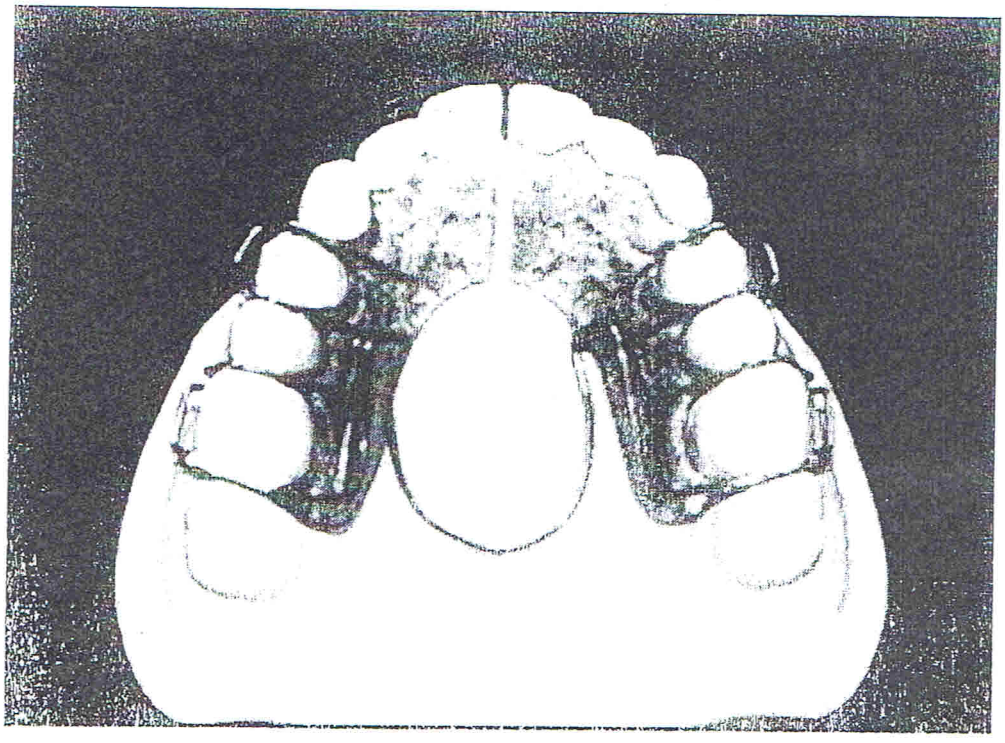


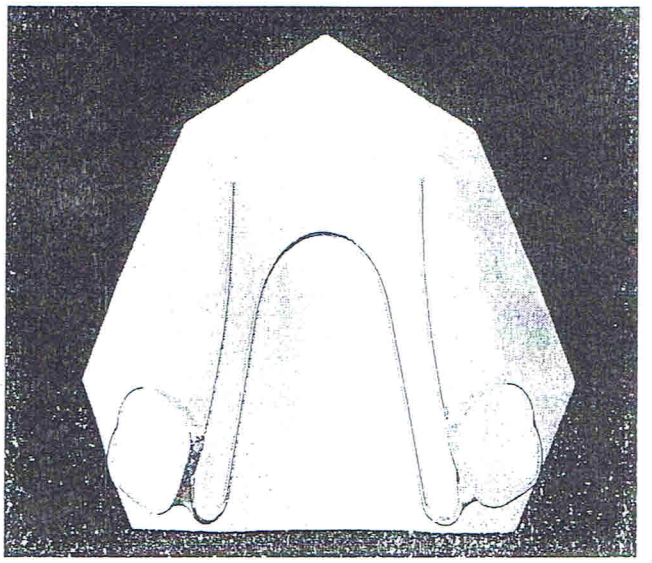
Fig. 21.30: The coffin spring

Indications

- Upper arch expansion where lateral expansion is indicated.
- It can be used in cases of unilateral as well as bilateral crossbites.
- Controlled movement can be obtained.
- When space requirement is less than 3 mm.

W- arch

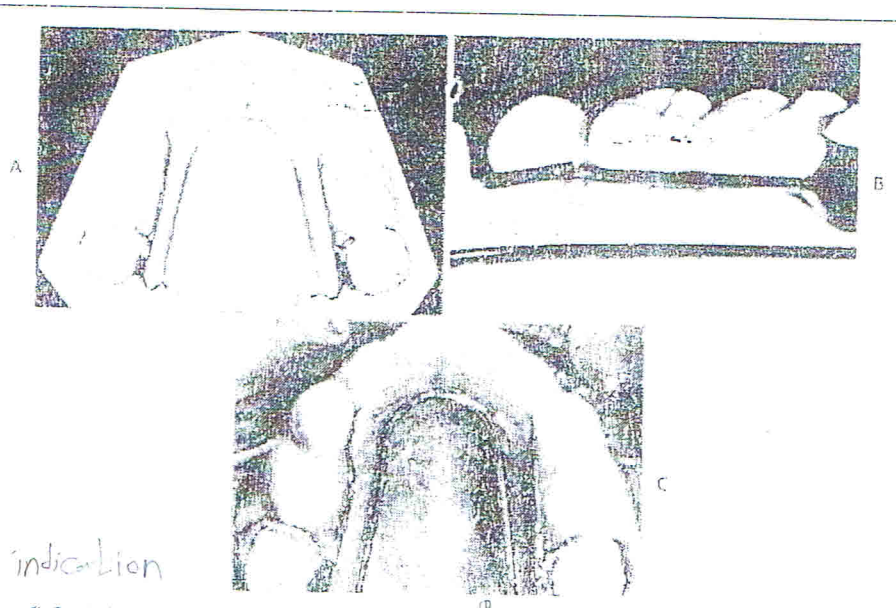
- The W – arch is a fixed appliance constructed of 36 mil Stainless steel wire soldered to molar bands to avoid soft tissue irritation ,the lingual arch should be constructed so that it rests 1-1.5mm off the palatal soft tissue .



- The w --arch is activated simply by opening the apices of w-arch and is easily adjusted to provide more anterior than posterior expansion ,or vice versa if this is desired .

indication

- The appliance delivers proper force levels when opened 4-6mm wider than the passive width and should be adjusted to this dimension before being inserted .



indication

FIGURE 13-28 The W-arch appliance is used for bilateral maxillary expansion. *A*, The appliance is fabricated from .36 mm wire and soldered to the bands. The lingual wire should contact the teeth involved in the crossbite and extend not more than 1 to 2 mm distal to the banded anchor to eliminate soft tissue irritation. Activation at point 1 produces posterior expansion and activation at point 2 produces anterior expansion. *B*, The lingual wire should remain 1 to 1.5 mm away from the marginal gingiva and the palatal tissue. *C*, The W-arch is being used to correct a bilateral constriction in the primary dentition.

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FIGURE 13-33 An unequal W-arch used to correct a true unilateral maxillary constriction. The side of the arch to be expanded has fewer teeth against the lingual wire than the anchorage unit. Even with this arrangement, both sides can be expected to show some expansion movement.

Quad-helix

- The quad helix consists of four helices made of 0.038" diameter wire, soldered to the molar bands
- The quad-helix consists of two anterior and two posterior helices. The portion of wire in between the two anterior helices is called the anterior bridge and that connecting the anterior helices and the posterior helices is called the palatal bridge. The free wire ends that are usually adapted close to the premolar teeth are called the outer arms. The outer arms are soldered to the molar bands.

- When the anterior bridge is adjusted the molar expansion is produced (Fig. 21.3Fi) and when the palatal bridges are activated, the premolar and canine region gets expanded

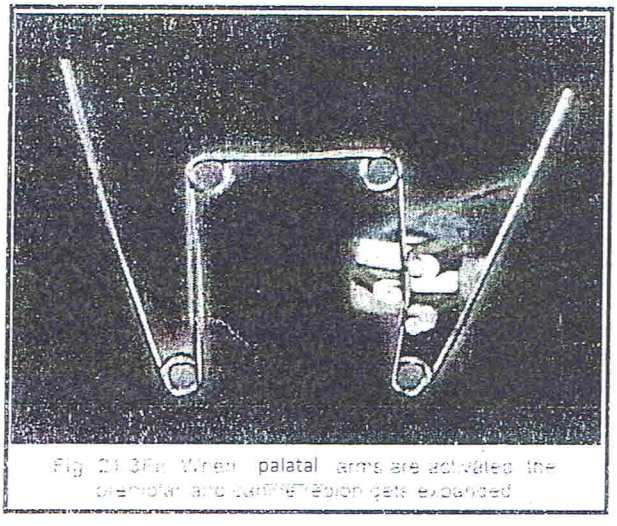

Fig. 21.3Fii: When palatal arms are activated the premolar and canine region gets expanded

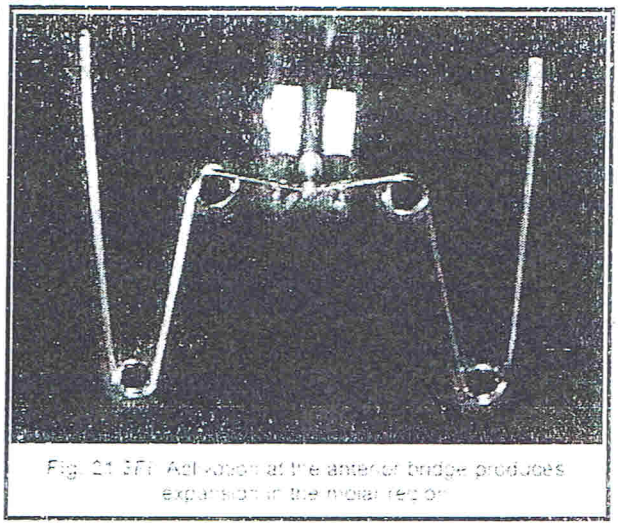

Fig. 21.3Fi: Activation of the anterior bridge produces expansion in the molar region

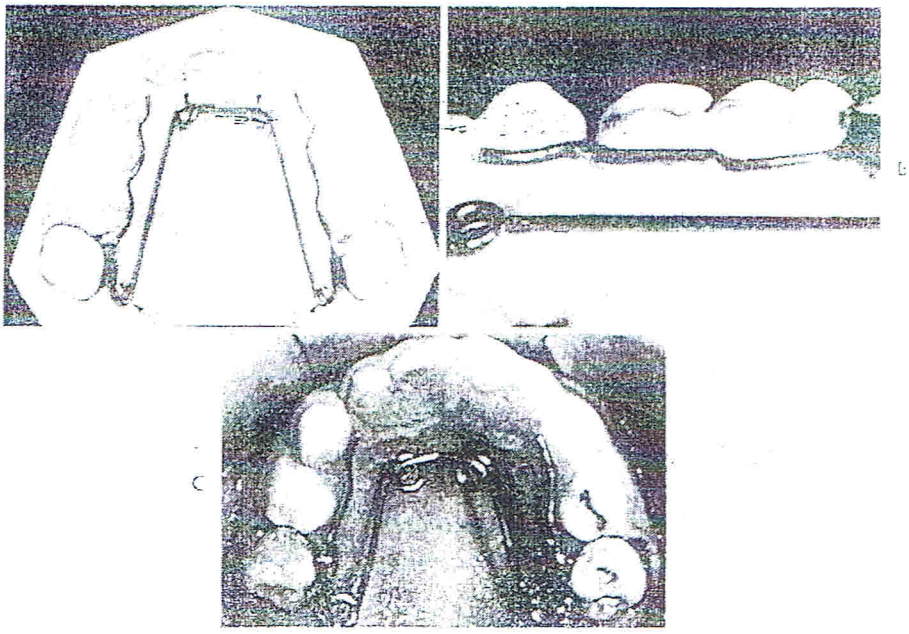

FIGURE 13-31 The quad helix used to correct bilateral maxillary constriction. A. The appliance is fabricated from .38 mm wire and soldered to the bands. The lingual wire should contact the teeth involved in the crossbite and extend no more than 1 to 2 mm distal to the banded molars to eliminate soft tissue irritation. Activation at point 1 produces posterior expansion, while activation at point 2 produces anterior expansion. B. The lingual wire should remain 1 to 1.5 mm away from the marginal gingiva and palatal tissue. C. This quad helix is being used to correct a bilateral maxillary constriction in the primary dentition.

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Indications of Quad-helix

- The combination of a posterior crossbite and a finger-sucking habit is the best indication for this appliance. The helices in the anterior palate are bulky, which can effectively serve as a reminder to aid in stopping a finger habit.
- All cross- bites in which the upper arch needs to be widened.
- Mild expansion in the mixed dentition or permanent dentition, which frequently exhibits mild lack of space for the upper laterals.
- Class II cases
- Class III with constricted upper arch

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Activation

- Expansion using w-arch or quad helix should continue at the rate of 2mm (1 mm on each side) per month until the cross bite is slightly overcorrected. In other word the palatal cusps of upper teeth should occlude on the lingual inclines of buccal cusps at the end of active treatment.

Retention

- The w-arch and quad helix should be left passively in place at the end of treatment for about 3 months for retention

- Some opening of the mid palatal suture in the primary or mixed dentition child could be seen, so the expansion is not solely dental.