



Fixed Orthodontic appliances

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١٦ نيسان، ٢٣

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Fixed Orthodontic appliances

Appliances that have attachments fixed (brackets, buccal tubes, bands...etc.) onto tooth surfaces, the orthodontic force applied on these attachments by using archwires and/or auxiliaries.



Advantages of Fixed Orthodontic appliances

1. Precise control over force distribution to individual tooth is possible.
2. Multiple setooth movements: Fixed appliances allow for the control of position of veral teeth during treatment.
3. Patient cooperation is reduced in comparison with removable appliances.
4. Fixed appliance produces variety of tooth movement, e.g. bodily movement, rotation, uprighting, torquing, and intrusion.



Disadvantages OF Fixed Orthodontic appliances

1. Oral hygiene requirement.
2. Esthetic requirement
3. Fixed appliance technique is complex and requires special training.
4. Chairside time is long
5. Anchorage control is difficult.
6. The possibility of producing adverse tooth movement.
7. Increase cost of treatment.



Indications of Fixed Orthodontic appliances

3. Correction of rotations.
4. Overbite reduction by intrusion of incisors.
5. Multiple tooth movements required in one arch.
6. Active closure of extraction spaces, or spaces due to hypodontia.



Fixed Orthodontic appliances

bodily space closure





**PLEASE
NOTE:**

Fixed Orthodontic appliances

Indeed, if a successful result is to be achieved with the minimum of deleterious side-effects, treatment with fixed appliances should only be embarked upon in patients who are willing to:

- maintain a high level of oral hygiene;
- avoid hard or sticky foods and restrict the consumption of sugar containing foodstuffs between meals;
- co-operate fully with wearing headgear or elastic traction, if required;
- attend regularly to have the appliance adjusted.

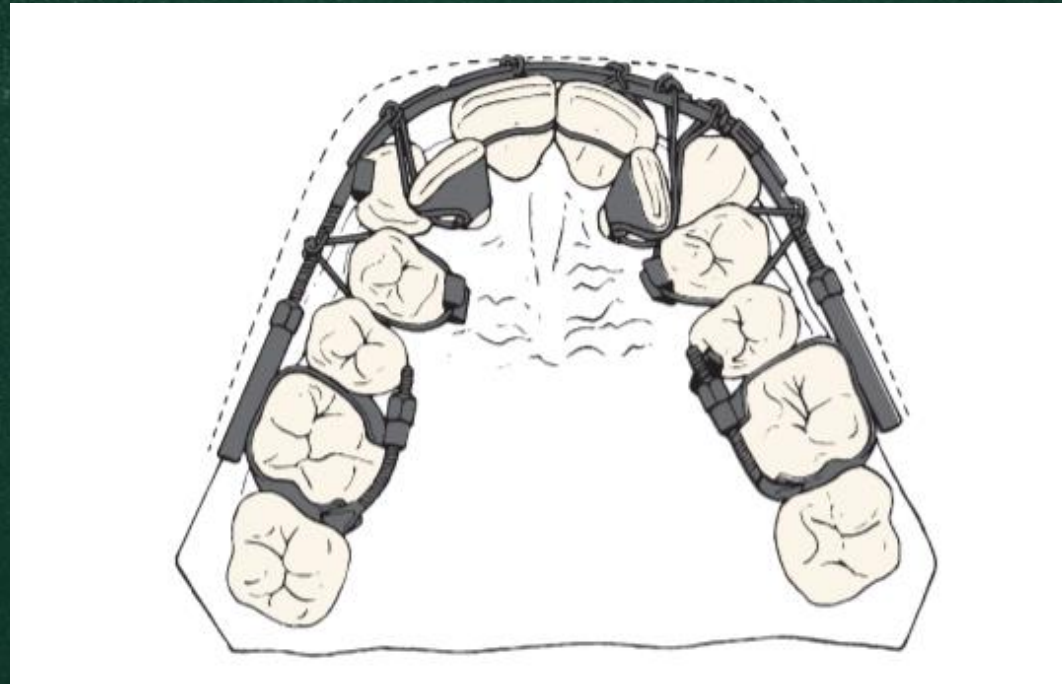
If patient compliance is suspect then it is usually wiser to defer treatment.

the development of contemporary Fixed Orthodontic appliances

Edward Angle's as the "father of modern orthodontics" is based not only on his contributions to classification and diagnosis but also on the creativity in developing orthodontic appliances.

Historical development of Fixed Orthodontic appliance types

E-arch

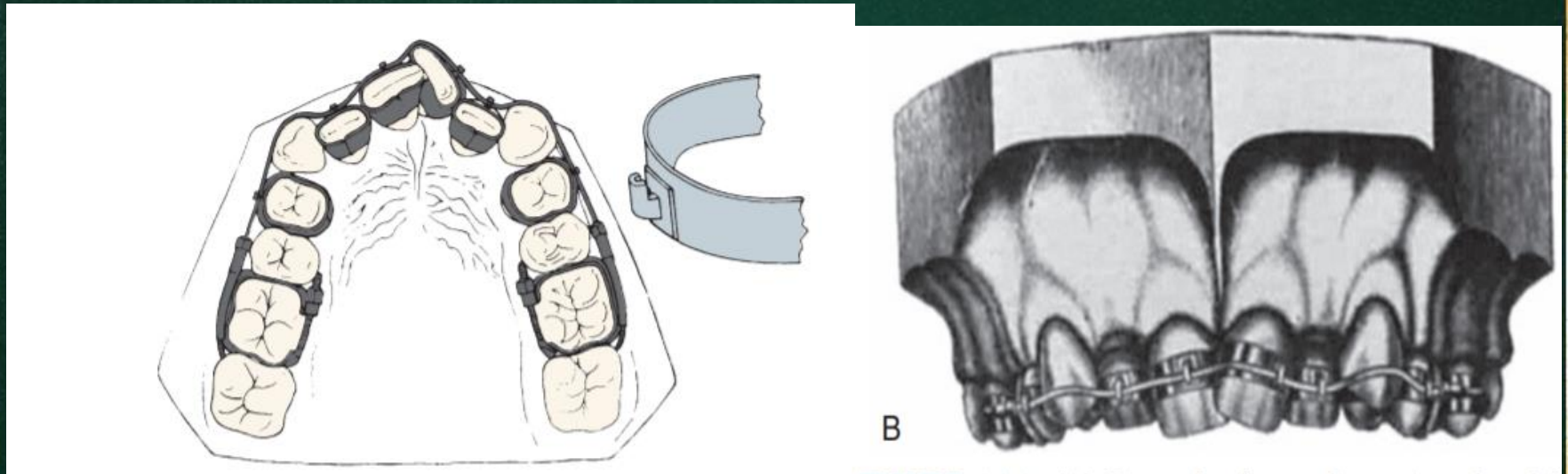


Edward Angle's E-arch from the early 1900s. Ligatures from a heavy labial arch were used to bring malposed teeth to the line of occlusion.

Historical development of Fixed Orthodontic appliance types

Ribbon arch

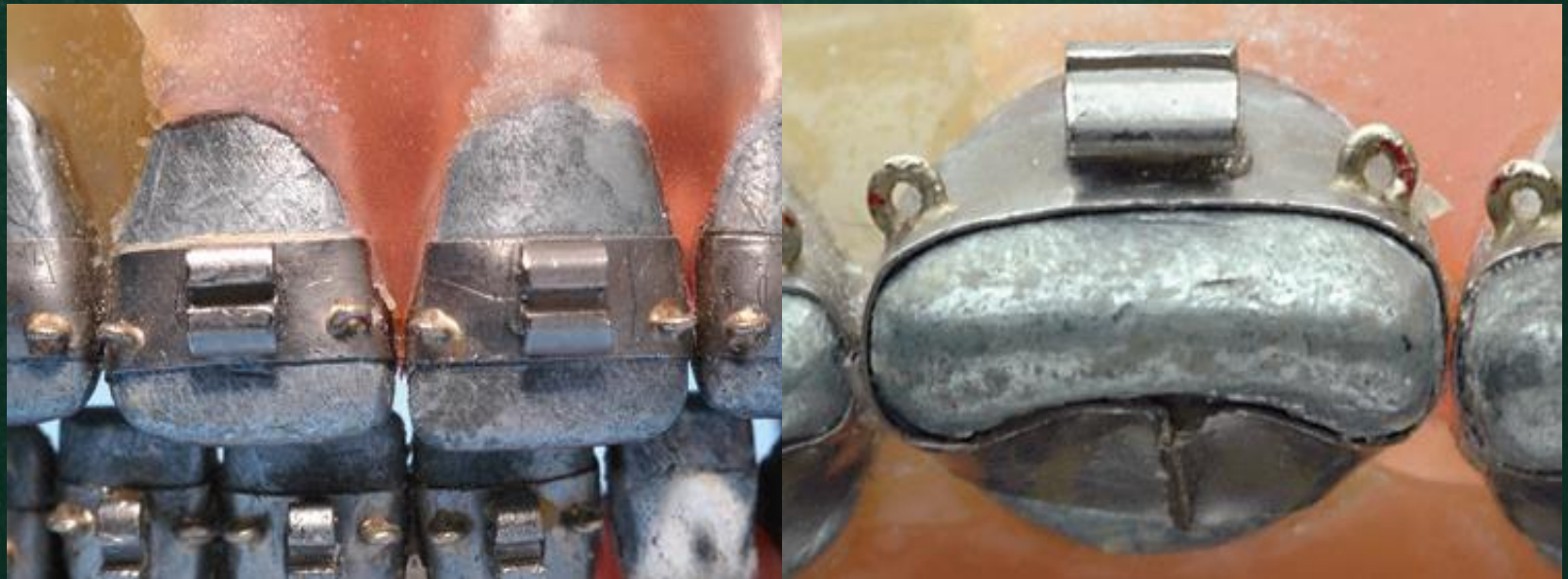
Angle 's ribbon arch appliance, introduced about 1910, was well adapted to bring teeth into alignment but was too flexible to allow precise positioning of roots. It was the first introduction of brackets. Used a gold wire of 10*20.



Historical development of Fixed Orthodontic appliance types

Edgewise:

Angle's edgewise appliance received its name because the archwire was inserted at a 90-degree angle to the plane of insertion of the ribbon arch to overcome deficiency in ribbon archwire.



The Begg appliance uses a modification of the ribbon arch attachment, into which round archwires are pinned. A variety of auxiliary archwires were used in this system to achieve more control of root position.



Contemporary Edgewise

Preadjusted Edgewise Brackets “straight-wire” appliance. It eliminated the difficult wire-bending procedures in conventional edgewise by modifying the brackets

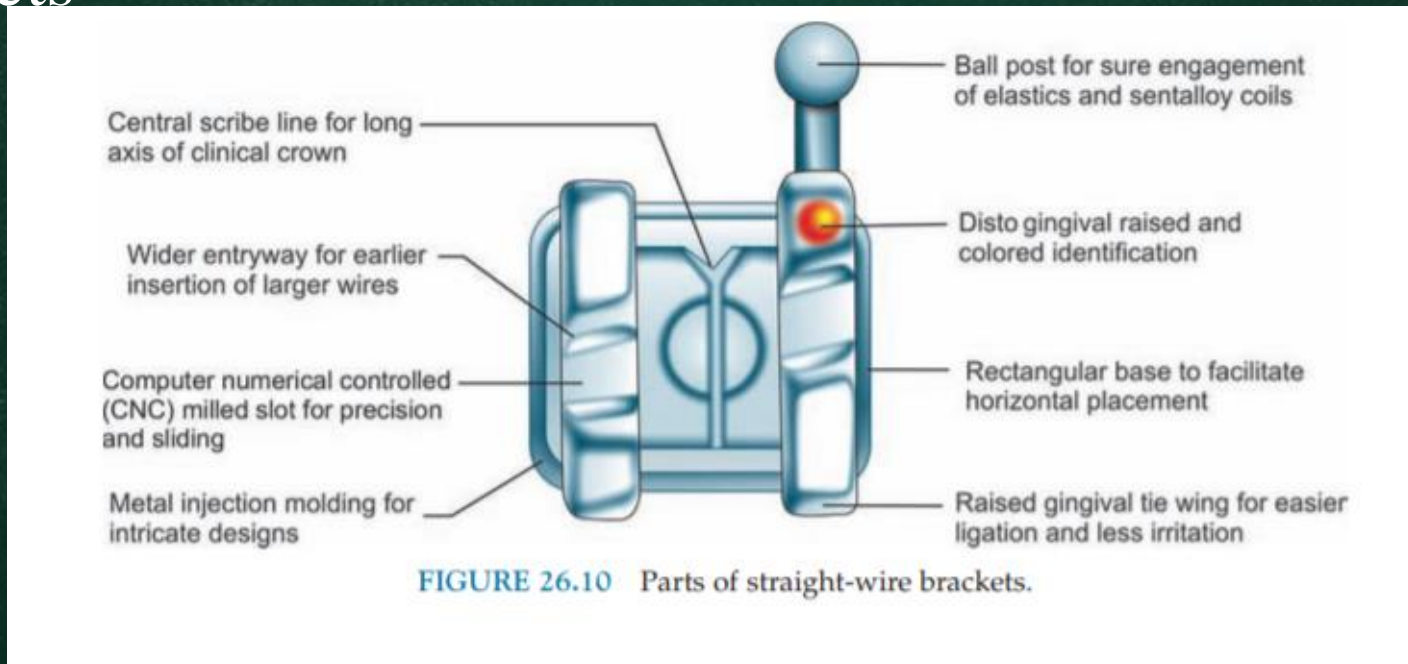


FIGURE 26.10 Parts of straight-wire brackets.

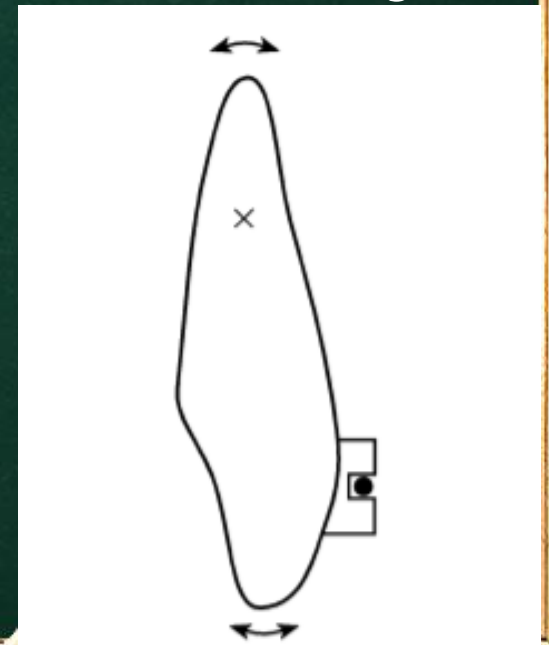
Parts of straight-wire brackets.

Contemporary Edgewise

In “straight-wire” appliance, Angle used the same bracket on all teeth, as did the other appliance systems. In the 1980s, Andrews developed bracket repetitive modifications for specific teeth to eliminate the many repetitive bends (first, second and third order bends) in archwires that were necessary to compensate for differences in tooth anatomy, and bonding made it much easier to have different brackets for each tooth. The result was the “straight-wire) appliance. This was the key step in improving the efficiency of the edgewise appliance.

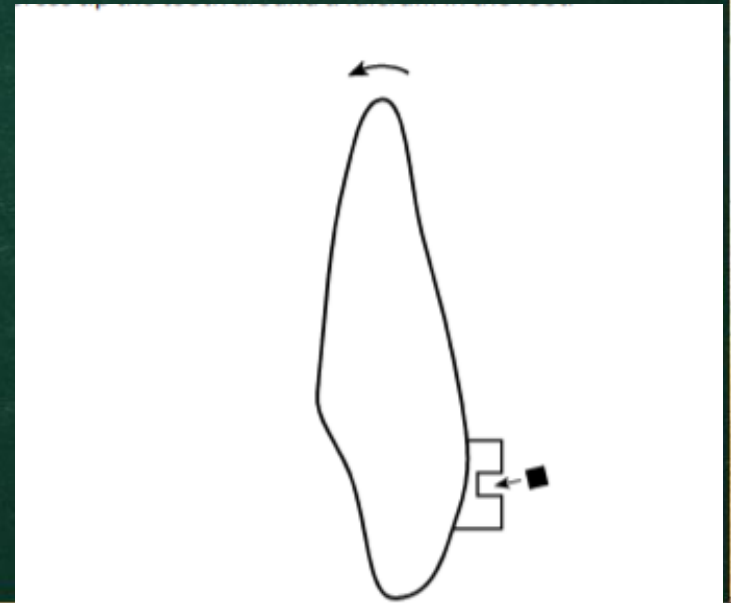
principles of Fixed Orthodontic appliances

A round wire in a rectangular edgewise type of slot will give a degree of control of mesiodistal tilt, vertical height, and rotational position. The closer the fit of the archwire in the bracket, the greater the control gained. However, with a round wire only tipping movements in a buccolingual direction are possible.



principles of Fixed Orthodontic appliances

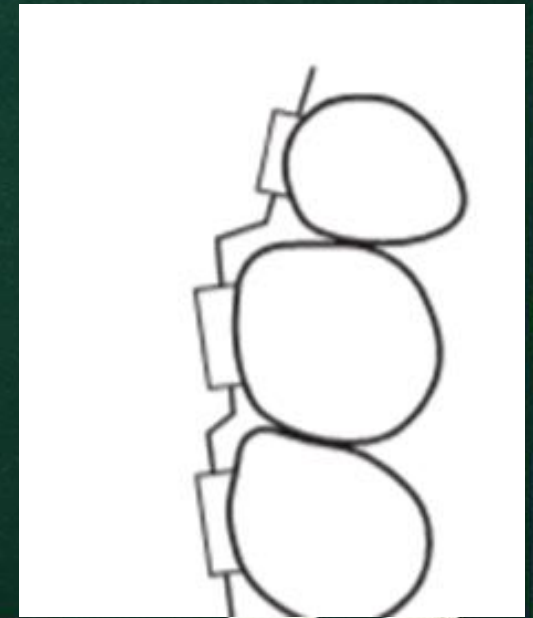
When a rectangular wire is used in a rectangular slot, a force couple can be generated by the interaction between the walls of the slot and the sides of the archwire and buccolingual apical movement is produced. However, some tipping movements will take place before the rectangular wires engage the sides of the bracket slot, with the degree of 'slop' depending on the differences between the dimensions of the archwire and the bracket slot.



Basic bends in standard edgewise appliance

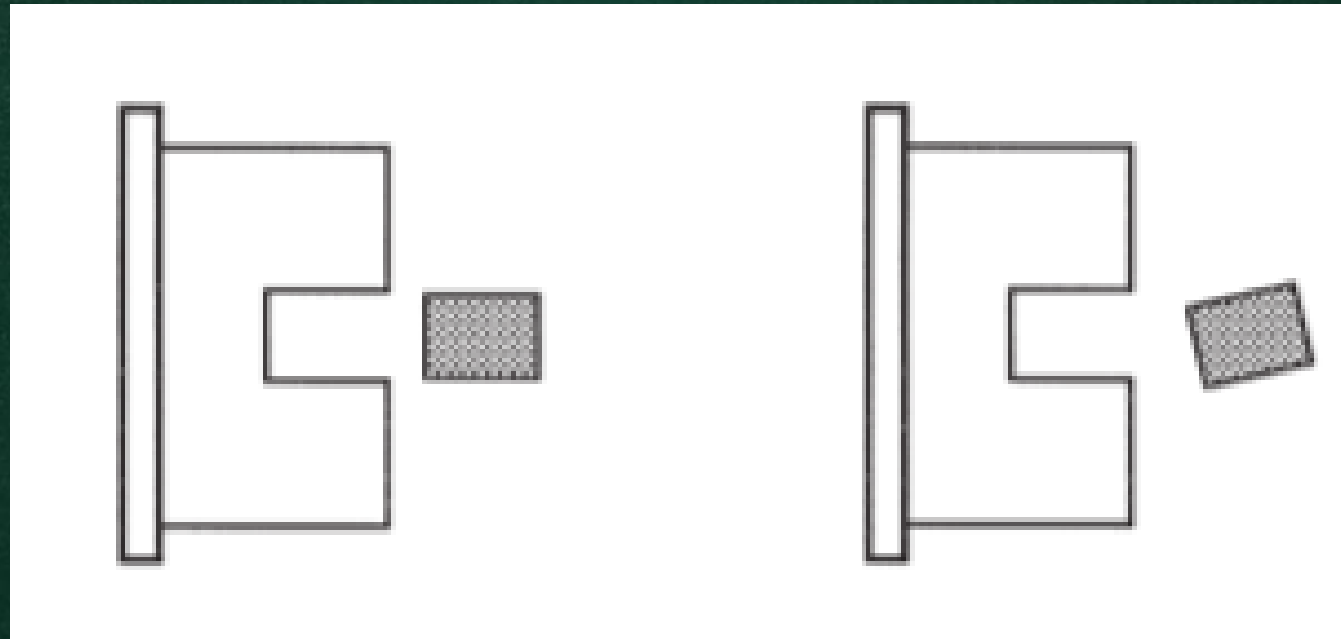
Thus fixed appliances can be used in conjunction with rectangular archwires to achieve tooth movement in all three spatial planes. In orthodontics these are described by the types of bend that are required in an archwire to produce each type of movement:

- **First-order** bends are made in the plane of the archwire (horizontal direction) to compensate for differing tooth widths and buccolingual position. To make the wire conform anatomically to the labial and buccal contours of the teeth.



principles of Fixed Orthodontic appliances

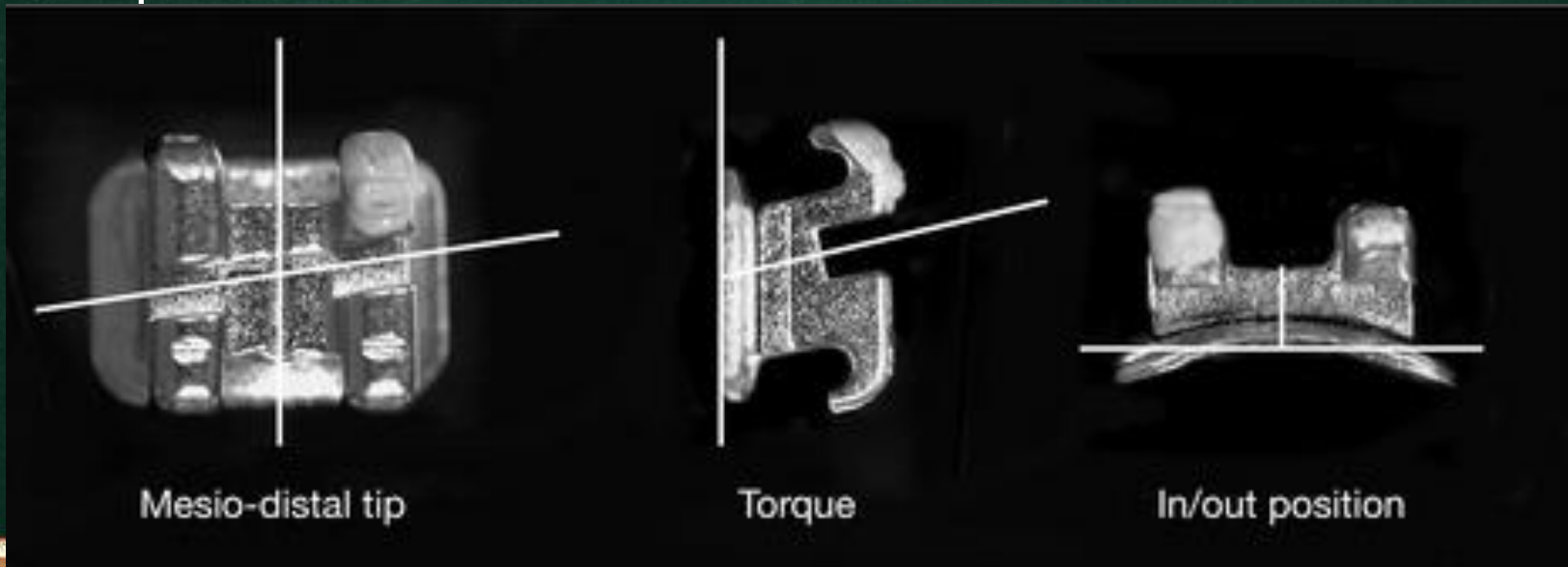
- **Third-order bends** (made for torque) are applicable to rectangular archwires only. They are made by twisting the plane of the wire so that when it is inserted into the rectangular bracket slot a buccolingual force is exerted on the tooth apex. This type of movement is also known as torque



Striaight wire appliance

This built-in prescription of the preadjusted edgewise appliance was based around Andrews' measurements from the untreated sample of ideal occlusions he studied and included a number of features:

- Pre-angulated slots for correct mesiodistal tooth angulation or tip;
- Bracket bases inclined for correct inclination or torque; and
- Variable distance from base of slot to base of bracket for correct in/out position.



Components Fixed Orthodontic appliances

- Attachments
- Archwire
- Auxiliaries.



Components Fixed Orthodontic appliances

Attachments (passive components):

- Bands
- Buccal tube
- Brackets
- Lingual attachment (button, cleats, eyelets, sheath...etc.)
- The attachment may be welded to bands, or directly placed to the tooth surface.

Components Fixed Orthodontic appliances

- Bands

These are rings encircling the tooth to which buccal, and as required, lingual, attachments are soldered or welded.

Prior to the introduction of the acid-etch technique (1980s), bands were the only means of attaching a bracket to a tooth. With the development of modern bonding techniques, directly bonded attachments became popular

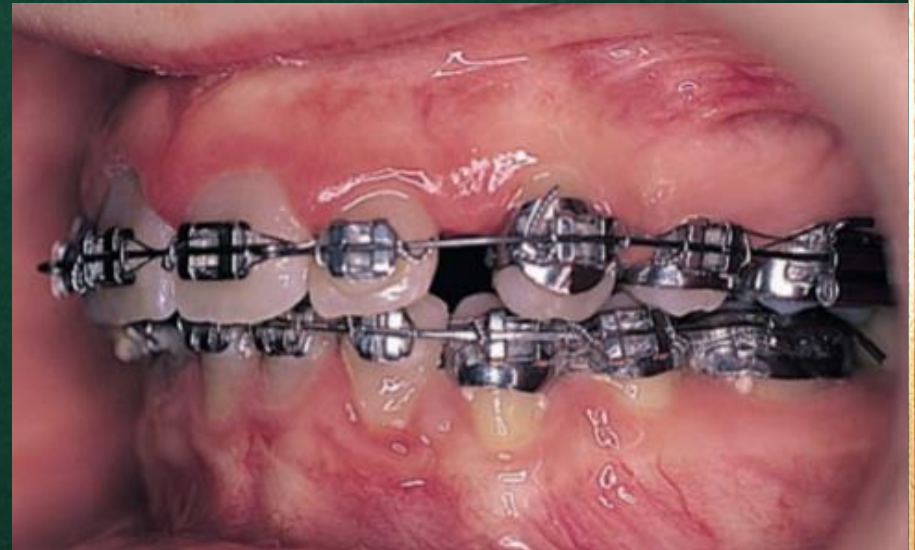


Components Fixed Orthodontic appliances

However, many operators still use bands for molar teeth, particularly for the upper molars when headgear or a cemented palatal arch is to be used.

Bands can be used on teeth other than molars, most commonly following the failure of a bonded attachment, but for aesthetic reasons bonds are preferred

Fixed appliance case where bands have been used for the canines, premolars and molar teeth. The impact of bands upon the aesthetics of the appliance can be readily appreciated.



Components Fixed Orthodontic appliances

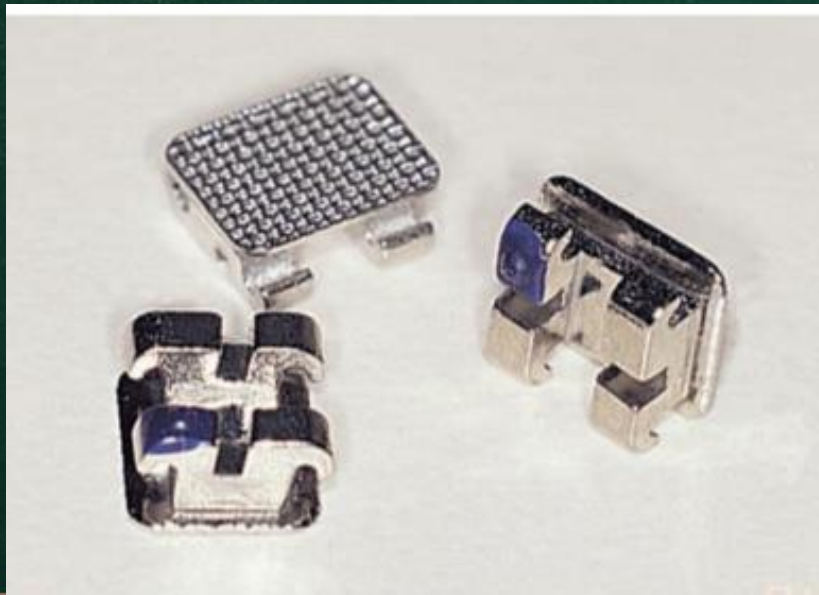
Buccal tube



Components Fixed Orthodontic appliances

- Brackets

Bonded attachments were introduced with the advent of the acidetch technique and the modern composite. Adhesion to the base of metal brackets is gained by mechanical interlock. It made up of base, stem with bracket slot, and some form of hook used for intermaxillary attachment of elastics or coil.



Bracket types

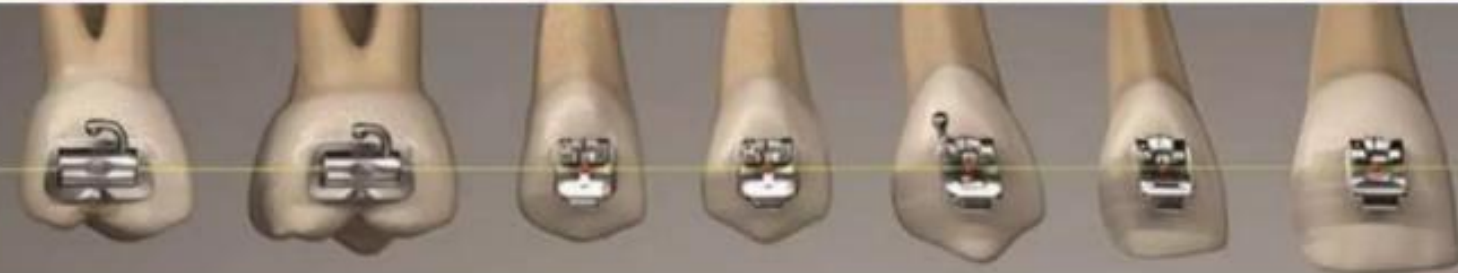
There are many types can be classified as follow

- According to the material
- According to the prescription
- According to the slot size
- According to the ligation method.

Bracket Position



Upper Arch Brackets On Andrews® Plane Line



BRACKET PLACEMENT IN ORTHODONTIC BONDING (DR. Shehnaz Jahangir

Bracket Position



Lower Arch Brackets On Andrews® Plane Line



BRACKET PLACEMENT IN ORTHODONTIC BONDING (DR. Shehnaz Jahangir)

Components Fixed Orthodontic appliances

Lingual attachment (button, cleats)



Components Fixed Orthodontic appliances

Minscrew (temporary anchorage device)



Components Fixed Orthodontic appliances

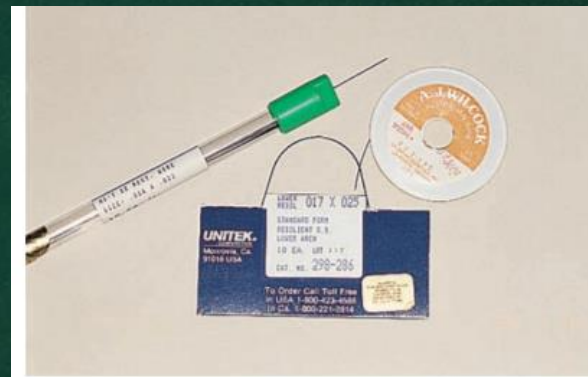
Active components:

- Archwires
- Ligature wires & elastics
- Separator
- Elastics (extra and intraoral)
- Springs
- Palatal or lingual arch
- Expansion screw

Components Fixed Orthodontic appliances

Archwires

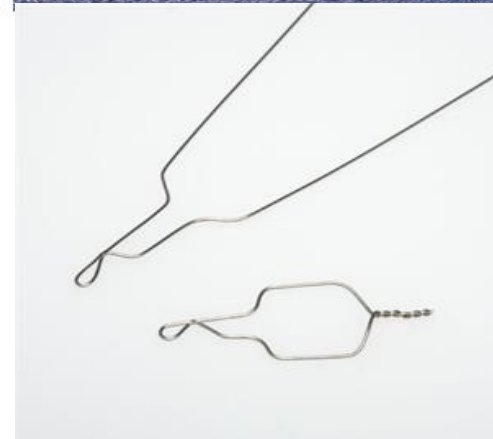
Once an operator has chosen to use a particular type of bracket, the amount and type of force applied to an individual tooth can be controlled by varying the cross-sectional diameter and form of the archwire, and/or the material of its construction



Components Fixed Orthodontic appliances

Ligature wires & elastics

Very small elastic bands, often described as elastomeric modules or wire ligatures are used to secure the archwire into the archwire slot. Elastic modules are quicker to place and are usually more comfortable for the patient, but wire ligatures are still used selectively as they can be tightened to maximize contact between the wire and the bracket.



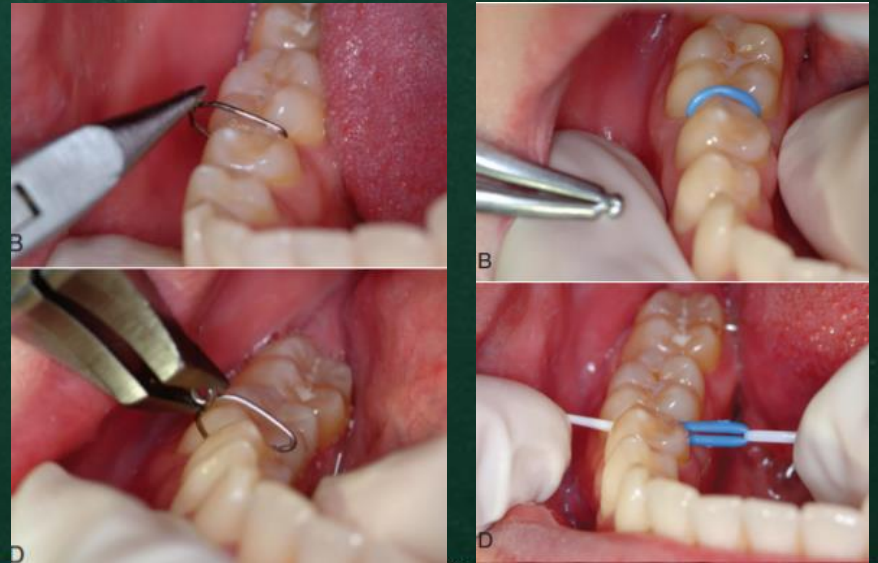
Components Fixed Orthodontic appliances

- Separators

- Metal separators

- Elastic separators

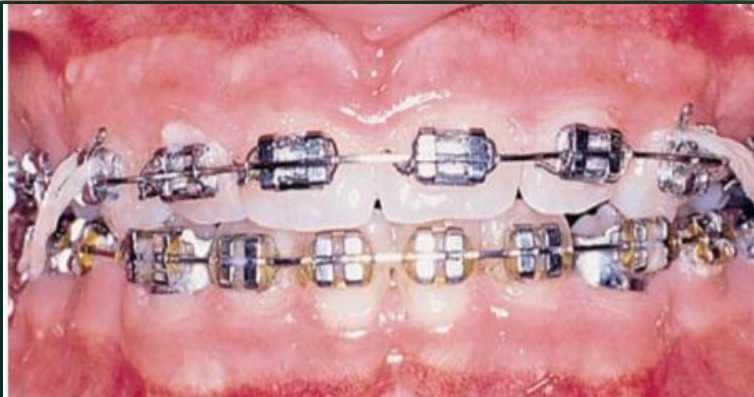
Tight interproximal contacts make it impossible to properly fit a band, which means that some device to separate the teeth usually must be used before banding. Although there are many types of separators, the principle is the same for all of them: A device to force or wedge the teeth apart is left in place long enough for initial tooth movement to occur, so that the teeth are slightly separated when bands are to be fitted.



Components Fixed Orthodontic appliances

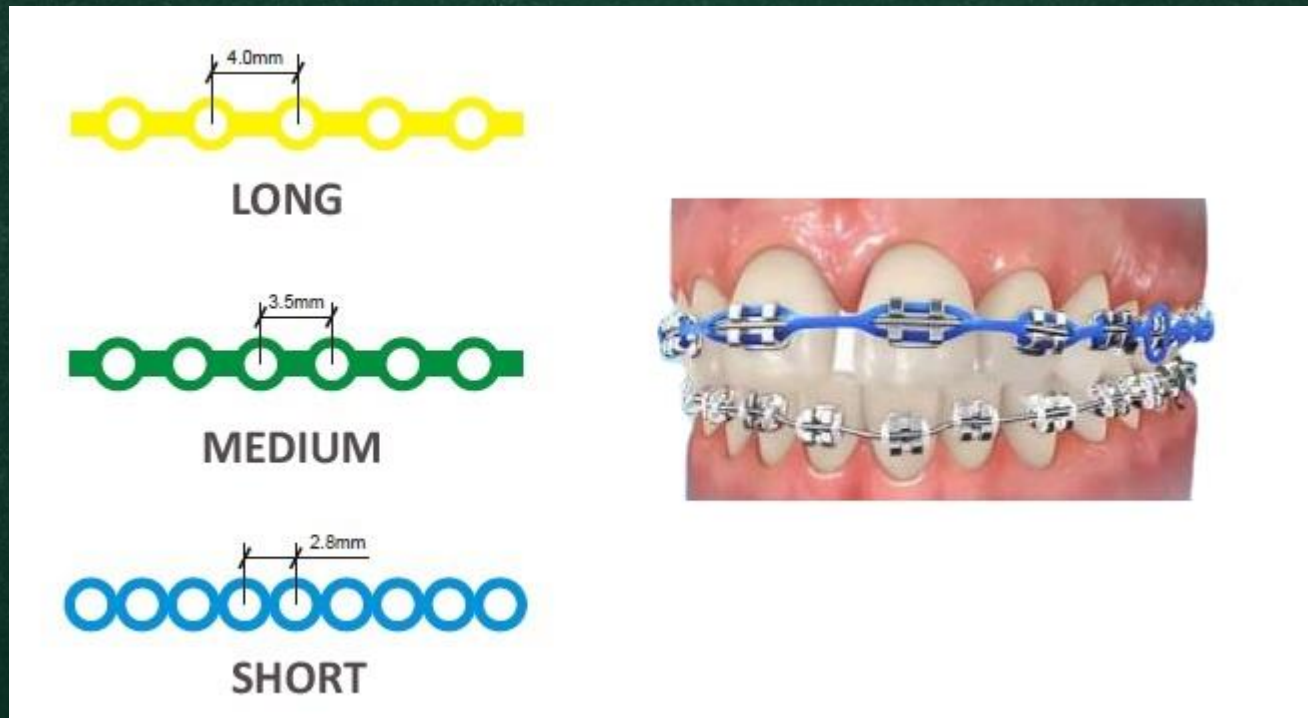
Intra-oral elastics

Intra-oral elastics for traction are commonly available in 2-, 3.5- and 4.5-ounce strengths and a variety of sizes, ranging from 1/8 to 3/4 inch. For most purposes they should be changed every day. Latex-free varieties are now available.



Components Fixed Orthodontic appliances

Power chain



Components Fixed Orthodontic appliances

Springs



Components Fixed Orthodontic appliances

Expansion screws



The comprehensive orthodontic treatment with Fixed appliances

The first stage Alignment and Leveling:

The objective of this phase is to modify vertical discrepancies and dental crowding, for which light forces are used.



The comprehensive orthodontic treatment with Fixed appliances

The second stage Correction of Molar Relationship, bite and space closure (ex. Extraction spaces).

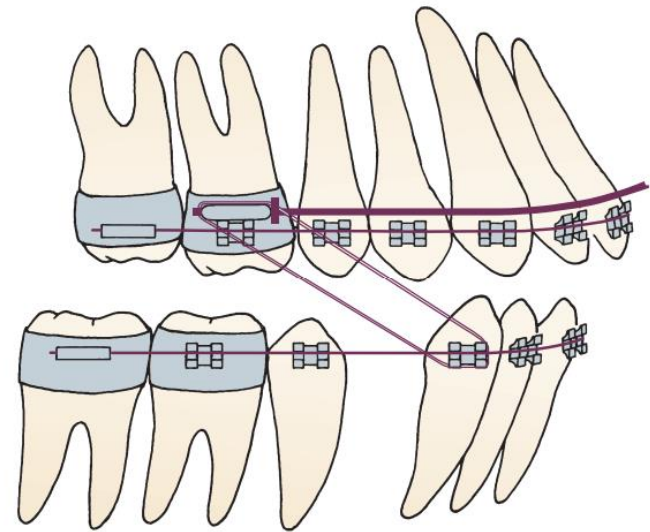


Fig. 9.22 Reinforcement of archwire can be obtained by adding

The comprehensive orthodontic treatment with Fixed appliances

The third stage: Finishing (settling) optimizing the occlusal relationship between the upper and lower dental arches.



Fixing attachments

Attachments can be fixed to the tooth surfaces by either bonding or banding.

The procedure of cementing a band on tooth surface is called “banding”. The method of fixing attachment directly to the enamel using resins is called “bonding”.

It greatly enhances esthetic, and maintenance of oral hygiene as compared to banding.

Fixing attachments

Banding involve:

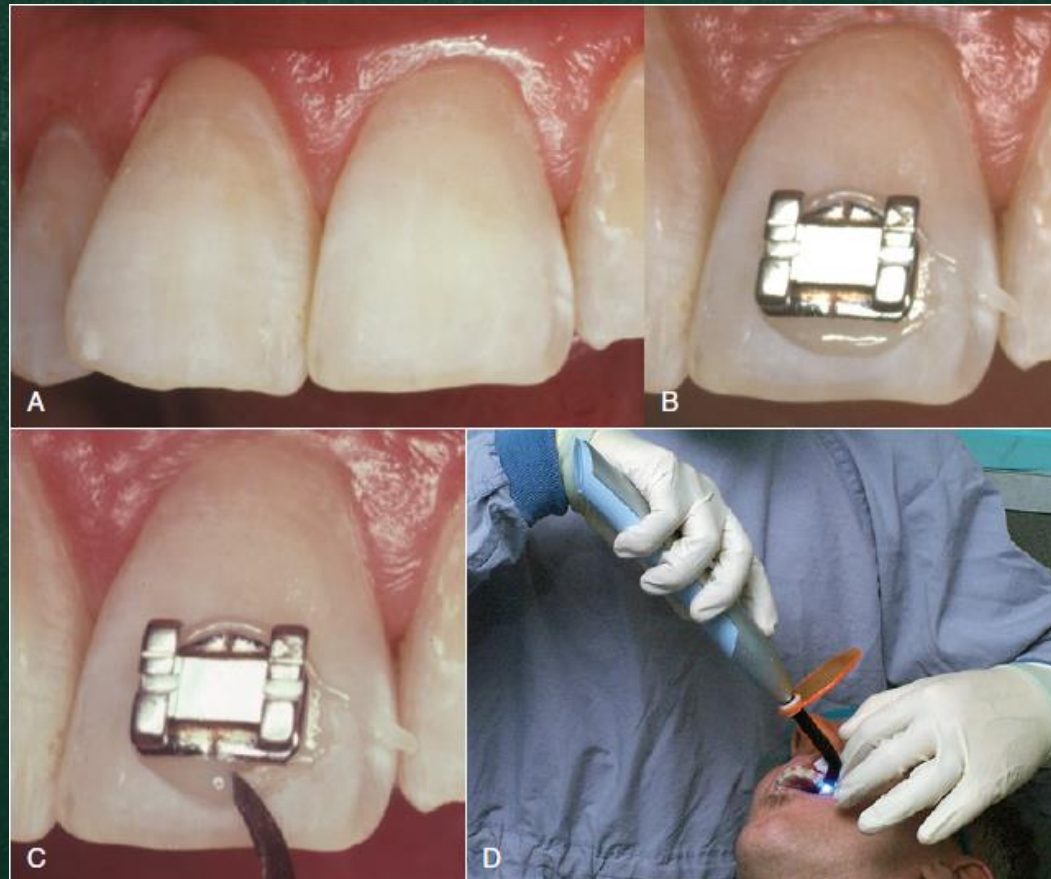
- ❑ separation of teeth
- ❑ Selection of proper band size with close fit.
- ❑ Cementation of the band preferably using glass ionomer cement.

Number of indications still exist for using band over bonding attachment :

- ❑ Heavy intermittent forces against the attachments. This is the primary indication for banding. An excellent example is an upper first molar against which extraoral force will be placed via a headgear.
- ❑ Teeth that will need both labial and lingual attachments, such as a molar with both headgear and lingual arch tubes and transplatal arch.
- ❑ Teeth with short clinical crowns, so that bonded brackets are difficult to place correctly.
- ❑ Teeth with extensive restorations

bonding over banding Fixed Orthodontic appliances

Bonding is a method of fixing attachments directly over the enamel surface of tooth using adhesive resins.



bonding over banding Fixed Orthodontic appliances

The advantages of bonding over banding are as follows:

- It is easier and faster to bond than to pinch bands around teeth.
- Better oral hygiene maintenance.
- Superior aesthetics.
- Risk of caries under loose bands is eliminated.
- It is the best method in case of partially erupted and fractured teeth and in teeth with abnormal shapes

Direct bonding of Fixed Orthodontic appliances

Direct bonding refers to the direct attachment of the bracket to the etched enamel using self- or light-cure agent. Widely used as it is simple and reliable. The steps involved in direct bonding on facial or lingual surface are as follows:

- ❑ **Cleaning** The first step in bonding is removal of plaque and the organic pellicle by using hand piece and prophy brush or cup.
- ❑ Etching of enamel surface by 35-27% phosphoric acid for 15-30 seconds.
- ❑ washing and drying the tooth surface.
- ❑ Placing unfilled primer on the etched area of the tooth
- ❑ Placing composite resin on the bracket base
- ❑ Positioning the bracket on the tooth crown
- ❑ Cleaning up excess composite from around the bracket base.
- ❑ Curing the composite , either chemically or with a blue light source.

In direct bonding of Fixed Orthodontic appliances

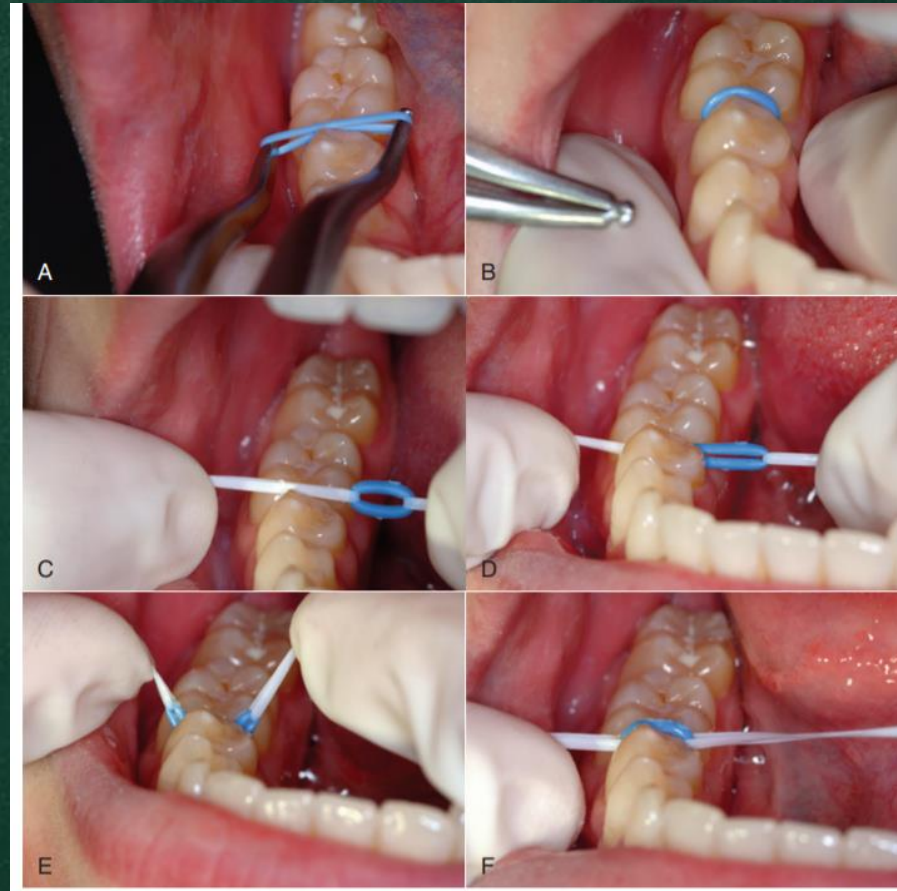
In indirect bonding, the brackets are glued with a temporary material to the teeth on the patient's models, transferred to the mouth with some sort of tray into which the brackets become incorporated, and then bonded simultaneously with adhesives. The main advantages of indirect compared to direct bonding are:

- 1- the bracket maybe placed more accuratlet in the laboratory.
- 2- the clinical chair time is decreased..

However the method is:

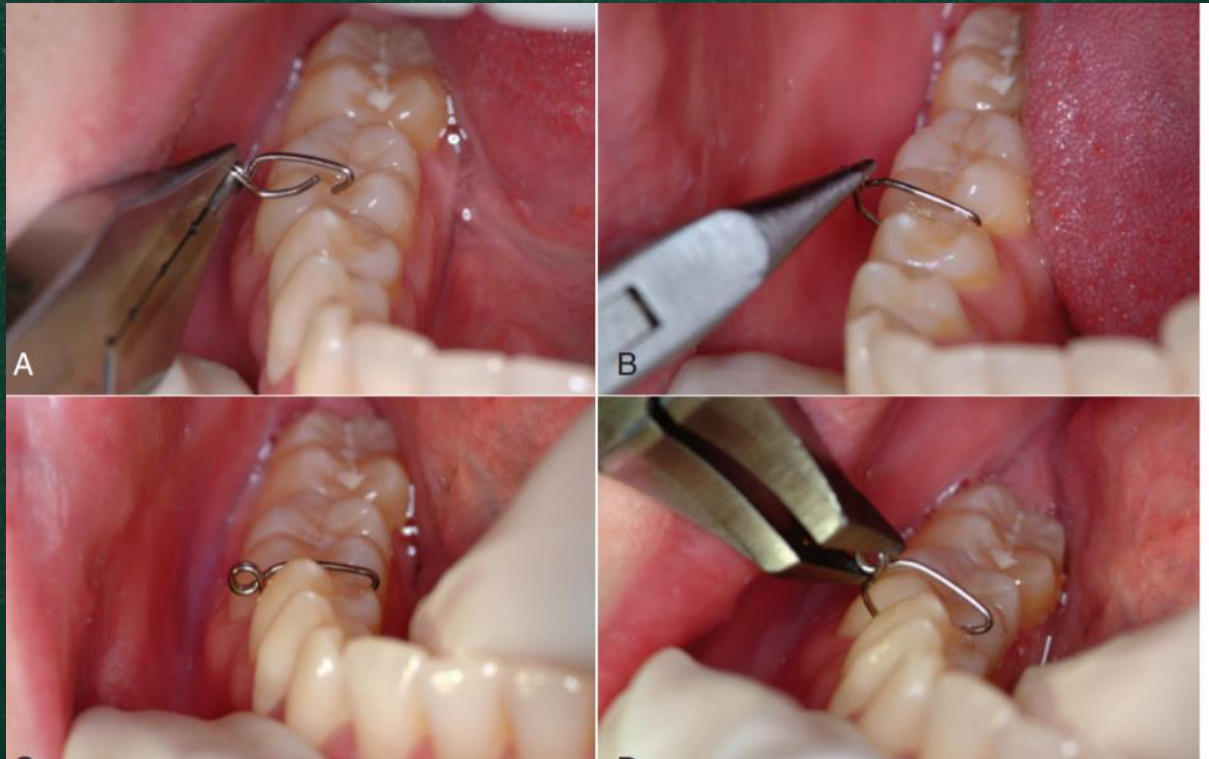
- ❑ Technique sensitive.
- ❑ The procedure requires greater experience.
- ❑ Removal of excess adhesive ore difficlut and more time consuming with some techniques.
- ❑ The risk of adhesive deficiencies under the bracket is greater.
- ❑ The risk of adhesive leakage to interproximal gingival areas can disturb oral hygiene procedures.
- ❑ The failure ratswith some methods seem to be slightly higher.

banding of Fixed Orthodontic appliances



Separation with an elastomeric ring or "doughnut."

banding Fixed Orthodontic appliances



Separation with steel separating springs

lingual Fixed Orthodontic appliances



Instruction to the patient wearing fixed orthodontic appliances

CLEANING

EATING

BREAKAGES

Maintain regular visits

Oral hygiene measures for patient wearing orthodontic appliances



Risk of fixed orthodontic appliances

Enamel demineralization



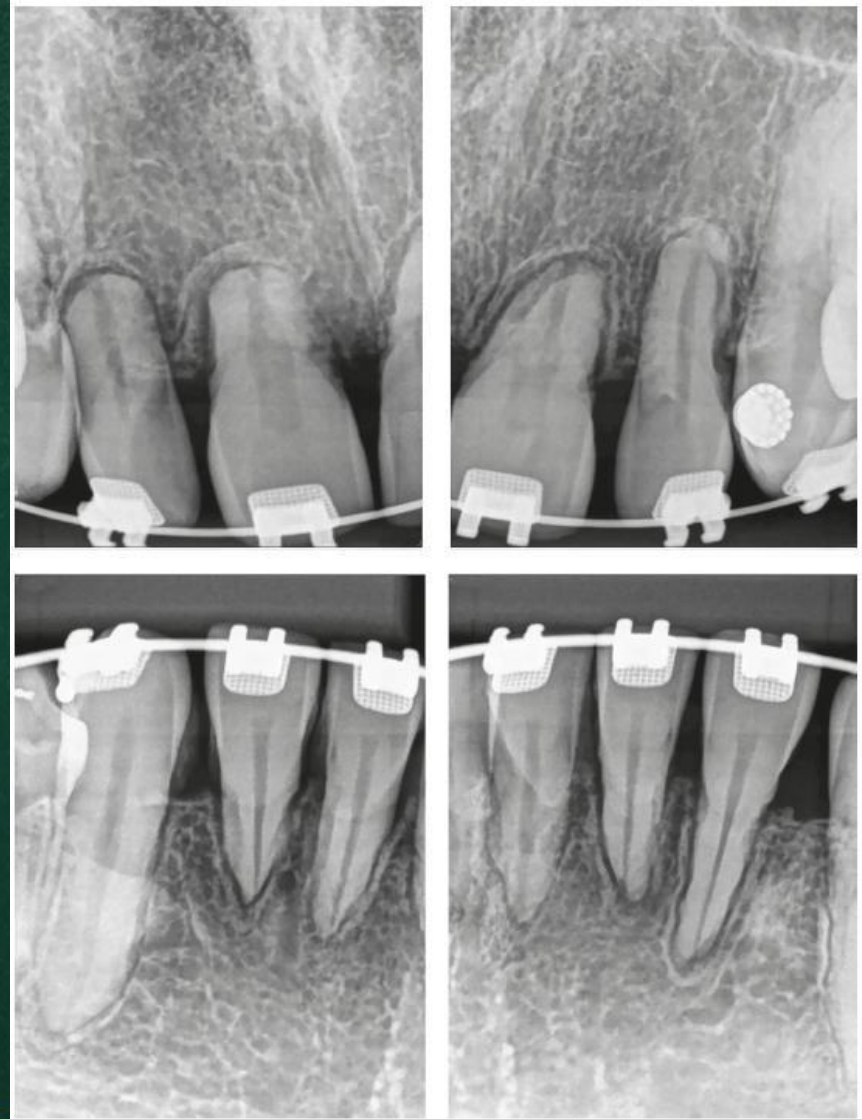
Risk of fixed orthodontic appliances

Enamel fracture and abrasion

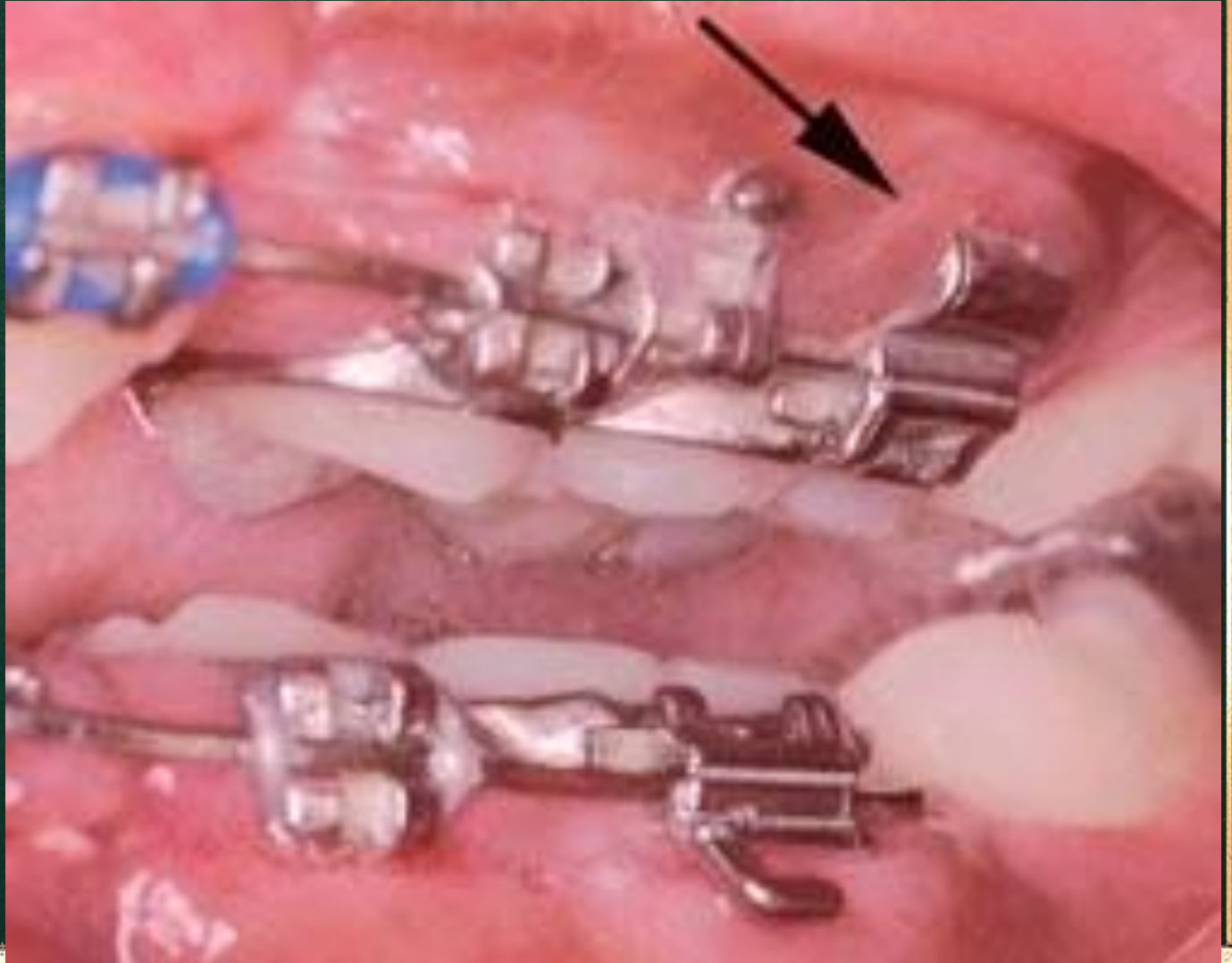


Risk of fixed orthodontic appliances

Root resorption



Risk of fixed orthodontic appliances gingivitis



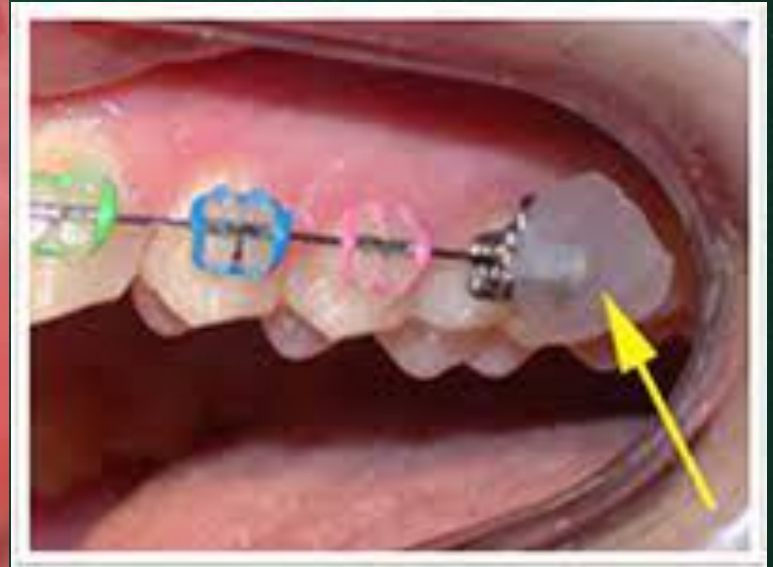
Risk of fixed orthodontic appliances

Alveolar bone loss



Risk of fixed orthodontic appliances

Oral ulceration



Risk of fixed orthodontic appliances

Allergic reaction



(1)



(2)



**PLEASE
NOTE:**

Limitations of fixed orthodontic appliances

Medical problems

Oral hygiene

Patient's perception and cooperation