

Introduction to Orthodontic Appliances

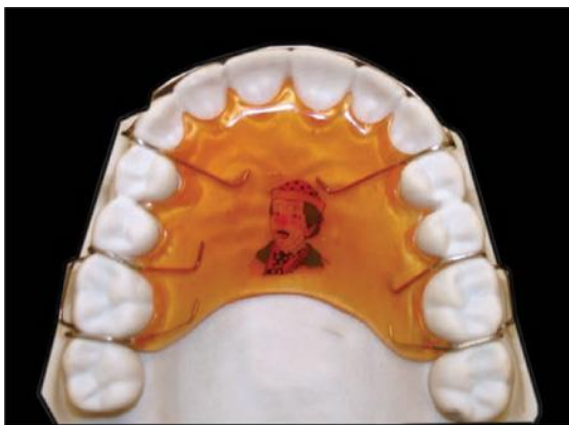
Part 2

Acrylic base plate

The material most often used for base plate is cold cure or heat cure acrylic. It forms a major part of the removable appliance. Base plate acts as a support for pressure sources and distributes the reaction of these forces to the anchorage areas. In the maxillary arch it should extend to the distal of the first molar and slightly cut off in the midline, while in the lower arch does not extend too deep to avoid trauma to the sulcus and any undercut area should be blocked.

Properties of base plate

1. It incorporates both the retentive and active components into a single functional unit (act as major connector).
2. It helps in anchorage and retention of the appliance in the mouth by contact with the palate and with teeth intended not to move and distributes the forces from the active components over a large area.
3. It protects the palatal springs against distortion in the mouth.
4. Bite planes can be incorporated into the base plate and used to treat specific problems.
5. The base plate should be as thin as possible to reduce bulk yet thick enough for strength. It should be closely adapted to all teeth except those which are to be moved.



Modifications of acrylic base plate

Bite plane (anterior or posterior) can be added to acrylic base plate

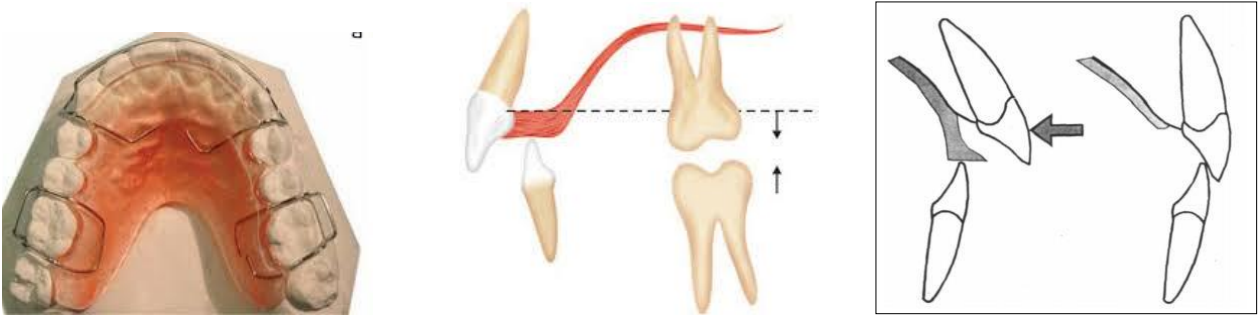
1. Flat anterior bite plane (FABP):

Action: the anterior bite plane is added to the maxillary plate to prevent the posterior teeth from occluding by contacting with lower incisors opening the bite posteriorly.

Properties: the bite plane should be wide enough that the patient cannot bite behind it. It should be flat, not inclined posteriorly, to avoid mandibular retrusion effect. This is

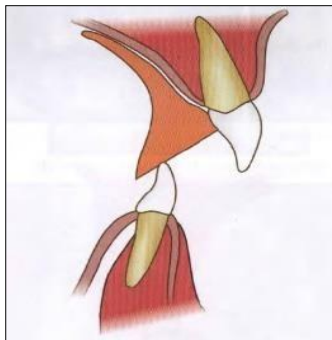
particularly important in class II malocclusion.

Indication: it *corrects deep bite* by separating the molars allowing them to over-erupt & so decreasing the overbite. After opening the bite, the bite plane is cut lingually but not occlusally to allow for upper incisor retraction.



2. Inclined anterior bite plane:

It also corrects deep bite, added to the maxillary plate, but it corrects increased overjet as well by proclining lower incisors and acting as a myofunctional appliance enhancing mandibular growth & retarding maxillary growth.



3. Posterior bite plane:

Action: the posterior bite plane can be added to the maxillary or mandibular plate. It usually covers the occlusal surfaces of all the posterior teeth, so that when the teeth are brought together the mandibular canines, premolars & molars occlude on the bite plane, thus leaving the incisors out of contact & free to be moved without occlusal interferences.

Indications:

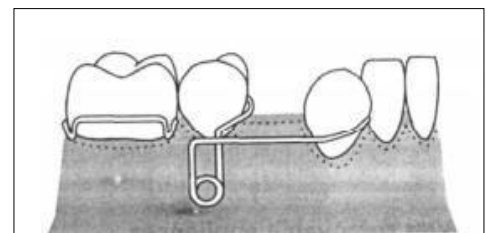
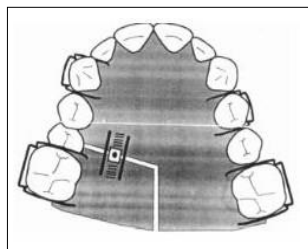
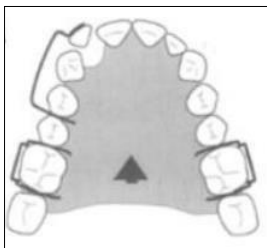
- It opens the bite anteriorly to allow, correction of anterior crossbite.
- Treatment of posterior crossbite by expansion screw. The bite plane is flat on both sides to allow for mandibular repositioning after crossbite correction.



Anchorage components:

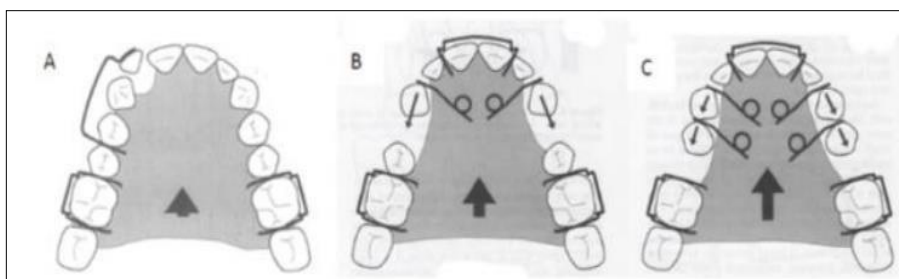
It is an imaginary component of the removable appliance resisting unwanted tooth movement.

In orthodontic treatment we apply force to move the teeth, and according to *Newton's third law* (for every action there is a reaction of equal magnitude and opposite direction), so this means that when we apply a force to move the teeth, the reaction force will be transmitted through the appliance and tends to move the anchor teeth in the opposite direction which is undesirable and should be avoided.



Factors that affect anchorage

1- The root surface area the tooth root surface area in the anchor group should be larger than the teeth to be moved so that the movement of anchor teeth is as minimal as possible. This can be performed by only **moving one tooth each quadrant** and **involving as many anchor teeth** as possible.



2- if the force is too large, the anchor teeth will also move, so keep the force as low as possible.

- 3- Tendency of the teeth to shift to mesial. Therefore, it must be carefully considered if there is a mesial force acting on the anchor teeth. For example, in canine retraction there is an action to move the canine distally and there is a mesial force or retraction acting on the anchor teeth.

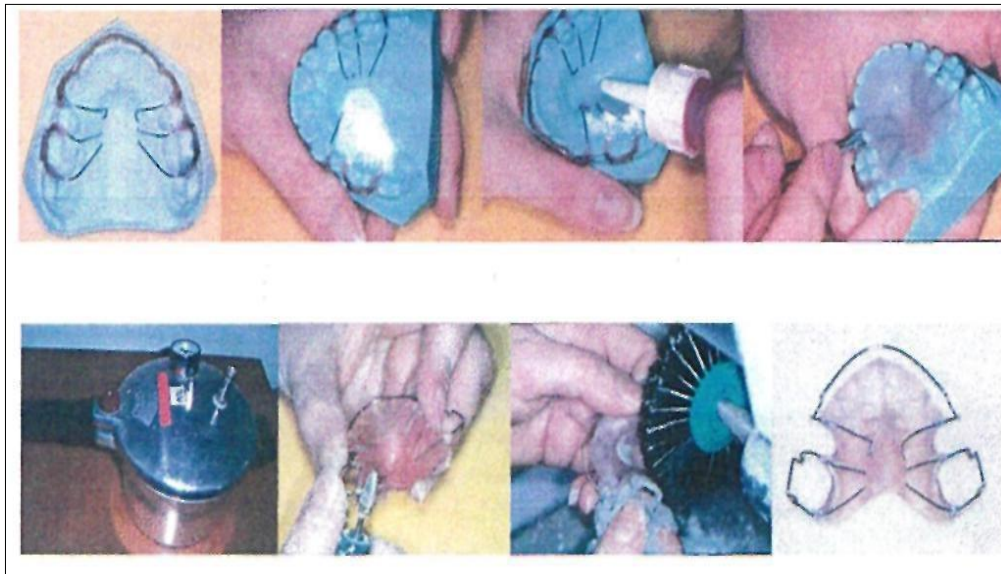
Fabrication of a removable orthodontic appliance

The materials used in removable orthodontic appliance are:

- a- Stainless steel wires (springs, clasps and labial bow).
- b- Acrylic base plate (hot cure acrylic, cold cure acrylic or most commonly orthocryl).

The steps are:

1. Do the necessary wire bending (springs, labial bow and clasps).
2. Fix the springs and clasps to the cast by wax on the occlusal and labial surfaces of the teeth, so that they do not move during fabrication of the acrylic. Wax is applied on the coils and arms of Z-, recurved, T- and finger springs not to be embedded in the acrylic baseplate.
3. Soak the cast in water for about 5 minutes until no more air bubbles come out of the cast to prevent the monomer from entering inside the cast and fusing the acrylic with the stone of the cast.
4. Materials: either heat cure or cold cure acrylic which is preferred because it is easy to use and faster to fabricate but care must be taken to eliminate residual monomer to reduce the porosity in the appliance, so orthocryl (a type of cold cure acrylic that need to set under pressure in a hydroflask) was introduced and gave better properties, it can be prepared by the dough stage method or by the sprinkle method (salt and pepper) to construct the acrylic base-plate by successively applying polymer and then monomer.
5. Cure in a hydroflask under 2 bar pressure to eliminate porosity. The hydroflask contains water at 40°C to accelerate the curing reaction.
6. The wax is cleaned and the acrylic base plate is finished with a carbide bur and polished with pumice.



Welding:

Welding is the union of two stainless steel wires by melting them onto each other by passing an electrical current through them. This is accomplished by a welder machine.

The two wires are put in firm contact under pressure of the jaws of the welder and then a low voltage high amperage electrical current is passed through the wires to melt the surfaces of the wires and make them fuse.

The resulting welding joints are generally weak and require soldering for reinforcement but can be used for fixation prior to soldering.

Note: the wires should be welded at right angle to each other (not parallel) to have a small contact surface area that concentrates the electrical current and make the wire melt more making a stronger joint.



Soldering:

Soldering is the union of two stainless steel parts by a third material (solder).

The requirements are:

1. A butane gas fine flamed torch.
2. Silver solder wires (low melting type, in the shape of wires 0.5-0.6mm in diameter).
3. Flux either separately or incorporated in the solder wire.



Welding and soldering is generally used in orthodontics to:

1. Repair fractured clasps.
2. Solder Hawley arch or buccal canine retractor to the bridge of the Adams clasp.
3. Solder a variety of modifications to the bridge of the Adams clasp (e.g. hooks for elastics and face bow tubes).



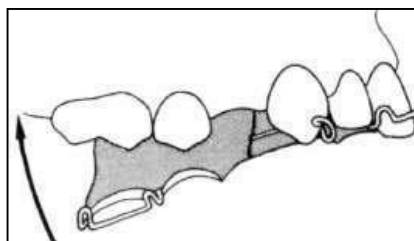
Fitting the appliance

a) Before inserting the appliance

1. Check that you have the correct appliance and design for the patient.
2. Show the appliance to the patient and explain how it works.
3. Check the fitting surface for any roughness

b) Inserting the appliance

1. The appliance should be inserted into the mouth with the anterior part lightly into position and then press the acrylic base upwards until the molar clasps engage. Removal of the appliance: Should be carried out in the reverse order. The finger tips are used to pull down on the bridges of the molar clasps until they disengage readily, make sure the patient can insert and remove the appliance.



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2. Adjust the retentive components and check the retention.
3. Activate the springs and check the teeth if they are free to move (adjustment of retention comp., so that the appliance will be retention inside mouth).

c) Instruction to the patient and to the parents:

- 1- The patient should be shown in a mirror the insertion and removal of the appliance. Insist that the appliance be maneuvered by the bridges of the clasp and not the labial bow or springs. The correct method of insertion is to engage the anterior wire on the incisors and then press the acrylic palate upwards until the molar clasps engage. Removal is accomplished by pulling down on the molar clasps before disengaging the anterior teeth
- 2- You might face some discomfort during eating and speech in the first few days and in case of appliance damage report immediately to the dentist.
- 3- You should wear the appliance during day and night (24 hrs).
- 4- You should clean your teeth and the appliance regularly without distorting any component.
- 5- Avoid all sticky or hard foods such as; boiled sweets, chewing gum etc. These precautions will minimize the chances of a breakag