# Prosthodontics


## Dr. Lama Hammoud

# Divisions in the field of Prosthodontics

***Prostbodontics*** **is one of the nine recognized specialties of the ADA. A licensed graduate of dentistry is permitted to perform dental treatment in this area. Some dentists pursue post-graduate studies in this art, and others will complete the three extra years of training to be ABP (*American Board of Prosthodontics*)certified and limit their practice to prosthodontics. A few will continue with yet another year of maxillofacial prosthetic training in correction of birth defects, TMJ disorders, cancer destruction, traumatic disfigurement, and difficult cases and obtain fellowships as maxillofacial prostheses specialists.**

**A prosthesis** is a replacement for a missing body part.

In the dental field, it may be a fixed or removable appliance that replaces removed or nonerupted teeth.

**A fixed appliance**, such as a cemented crown, is placed in the mouth and is not intended for removal.

**A removable appliance** is placed in and out of the mouth at the patient's will.

**Implantology**, *the science of dental implants,* involves the use of both fixed appliances and removable appliance in some instances.

# Types and Characteristics of Prosthodontic Materials

Assorted materials are used in the construction and repair of prostheses. Among the synthetic and precious or semi-precious metals used for appliance fabrication are:

**Noble metals**: the valuable alloys-gold, palladium, platinum, and silver.

**Base metals**: chromium-cobalt or chromium nickel, which may be used alone or in a mixture with noble alloys. These alloys are further classified for insurance purposes as high noble, noble, and base according to their formulas:

**High noble alloy**: contains more than 60% of gold, palladium, and/or platinum.

**Noble alloy:** contains more than 25% of gold, palladium, and/or platinum.

**Base metal alloy:** contains less than 25% of gold, palladium, and/or platinum.

**Porcelain:** shells, veneer covers, or facing fused to the surface of a metal crown to give the appearance of a natural tooth surface; often abbreviated **PFM** (porcelain fused to metal).

**Composite:** resin materials used for tooth-colored replacement.

**Acrylic:** synthetic resin materials used in fabrication of appliance parts, as coverings for the metal frameworks, or as natural tissue replacement.

**Ceramic:** a hard, brittle material produced from nonmetallic substances fired at high temperatures; supplied in block shape for milling into crown and tooth forms.

**Titanium:** corrosion-resistant, lightweight, strong bio-compatible metal used in dental implants and posts.

**Zirconia**($ZrO_2$): corrosion resistant, bio-compatible material, similar to titanium; used for implants.

The choice of which material to use for an appliance depends on the characteristics of that material relevant to prostheses construction.

**Associated terms are:**

**Hardness:** ability of a materials to withstand penetration.

**Tensile strength**: capability of a material to be stretched.

**Elasticity**: ability of a material to be stretched and then resume its original shape.

**Ductility:** ability of a material to be drawn or hammered out, as into a fine wire, without breaking.

**Malleability**: ability of a material to be pressed or hammered out into various forms and shapes.

**Elongation:** ability of a material to stretch before permanent deformation begins.

# Fixed Prosthodontics

Various fixed prosthodontic appliance are used in mouth restoration, from the singular crown to a full arched bridge. Related terms are:

**Inlay:** a solid-casted, or milled restoration, involving some occlusal and proximal surfaces, which is cemented into a tooth preparation.

**Onlay**: a solid-casted or milled restoration that covers some occlusal tooth cusp and side wall area and is cemented onto a prepared site.

**Crown:** a fabricated, tooth-shaped cover replacement for a missing crown area that is cemented onto the remaining prepared crown surfaces. Some of the types of crowns used in dentistry are:

- **Full crown:** cast metal, tooth-shaped cover replaces the entire crown area. Acrylic resin crowns may be used as a temporary crown cover during treatment.

- **Jacket crown**: thin, preformed, metal shield used to cover a large area of anterior crowns; can be gold metal or metal covered with porcelain material to resemble tooth enamel.
- **Dowel crown:** full crown cover with dowel pin extending into the root canal of a pulpless tooth; usually positioned on anterior teeth.
- **Three-quarter crown:** similar to full crown, covering all of the crown except the facial surface of the tooth, which remains intact to present an esthetic, natural appearance.
- **Porcelain-fused-to-gold**: crown that has a complete capping of metal base with fused porcelain to metal, giving tooth contour, shape, and cover.

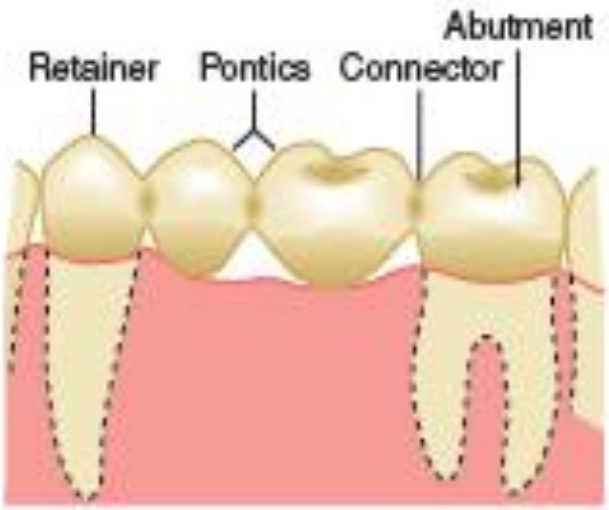
**Veneer**: A **direct veneer** is placed and cured directly on the tooth surface to build up the area or to replace a missing tooth structure. For an **indirect veneer**, tooth material is prepared in the lab and later cemented onto the tooth structure.

Crown replacement and restoration may used stand alone or may also be part of fixed bridgework. A **bridge** is a prosthesis used to replace one or more teeth. Dental bridgework may be of a fixed or removable nature.

**Fixed bridge:** cemented into the oral cavity and not removed by the patient; the number of teeth involved in the appliance determines the amount or number of units.

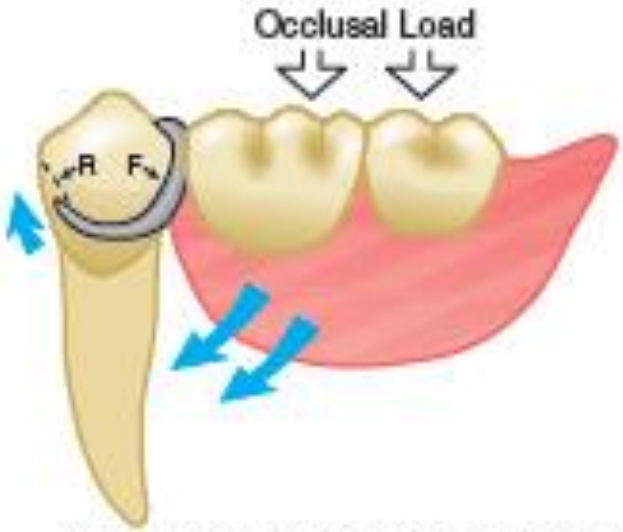
**Cantilever bridge**: bridge with unsupported end, usually saddled.

**Maryland Bridge:** replaces anterior or posterior tooth and is cemented directly to the adjacent or abutting teeth.

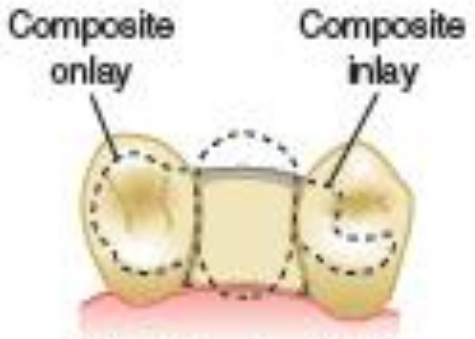



(A) Four-Unit Permanent Bridge

(B) Removable Bridge



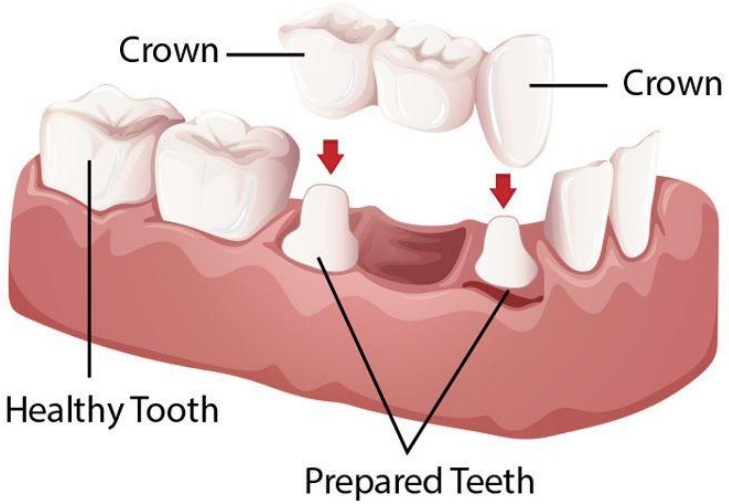

(C) Cantilever Bridge/Cantilever Partial Denture



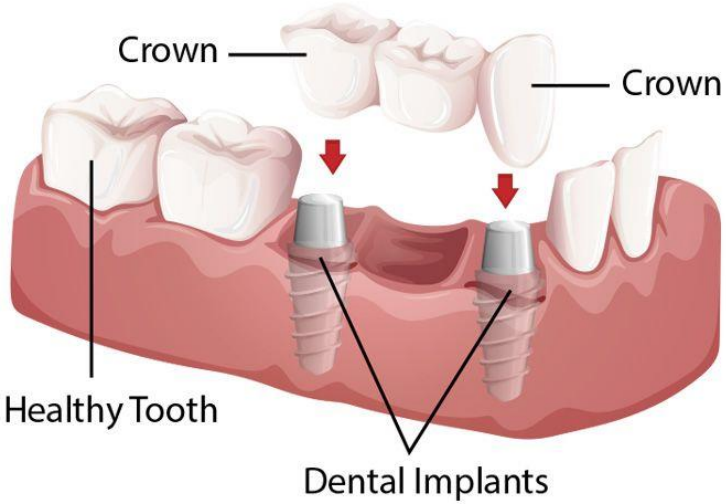

(D) Maryland Bridge

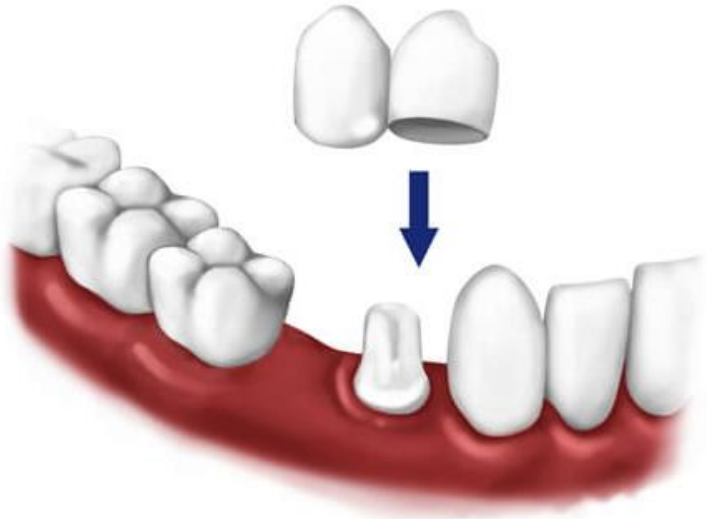
(E) Bridge with a Post Abutment

## Traditional Bridge

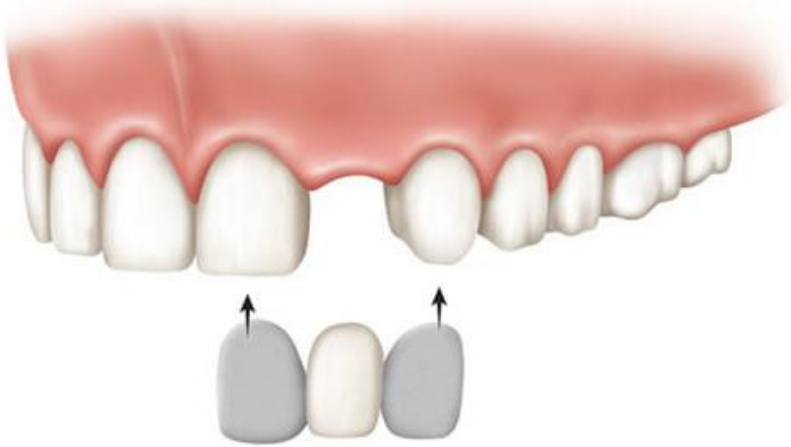



## Implant-Supported Bridge



Cantilever Bridge



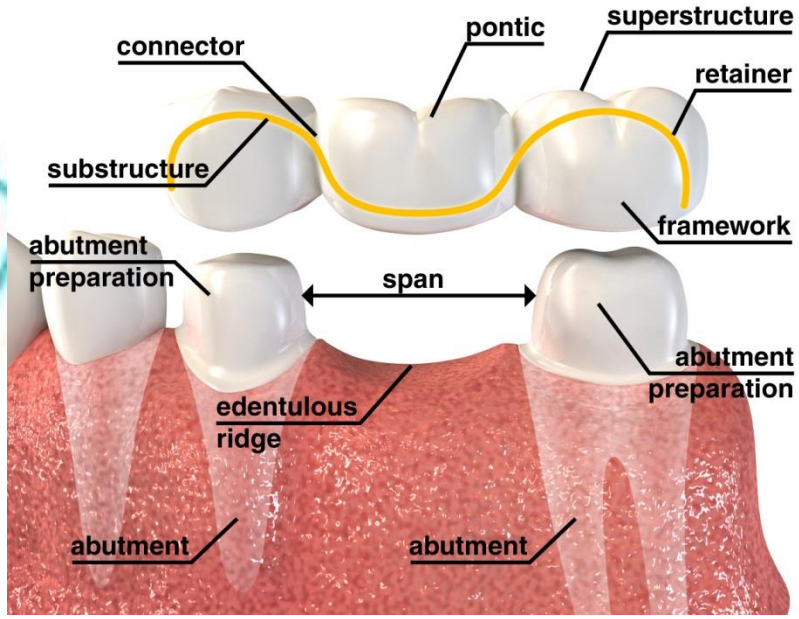
Maryland Bridge

A bridge has three components or structural parts.

**Pontic**: artificial tooth part of the bridge that replaces the missing tooth and restores function to the bite.

**Abutment:** natural tooth that is prepared to hold or support the retaining part of the bridgework in position.

**Adjacent teeth**: may be included in units if they are involved in the bridge area.

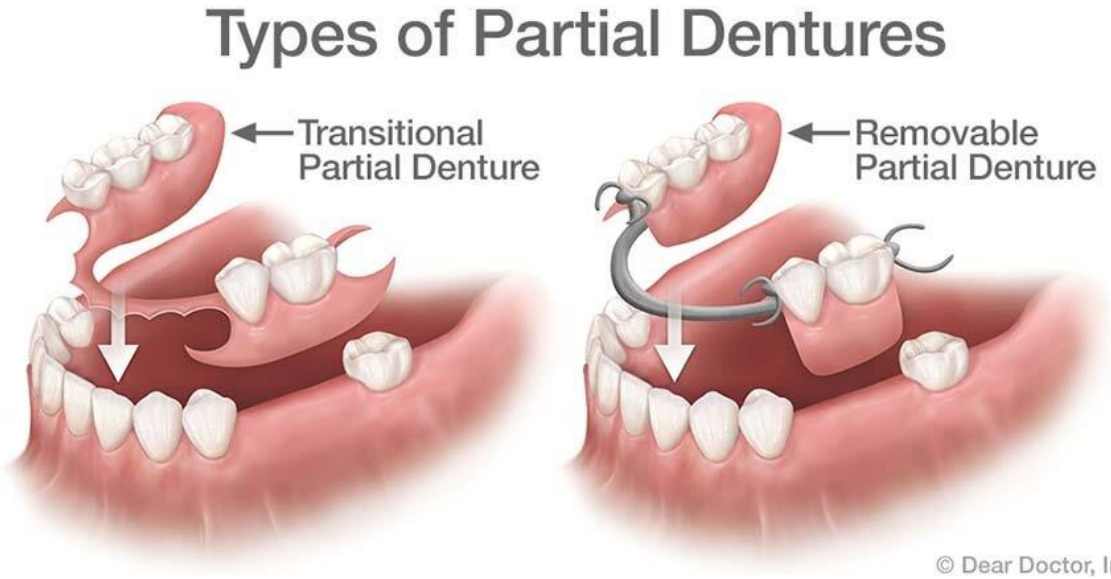


# Removable Dental Prostheses

**Prostheses that the patient can take in and out at will are called removable prostheses. These devices include full mouth dentures, as well as a replacement for single teeth. Terminology includes the following:**

**Complete denture: (removable appliance composed of artificial teeth set in an acrylic base) full denture designed to replace the entire dentition of an upper or lower arch.**

**Partial denture:** removable appliance usually composed of framework, artificial teeth, and acrylic material; replaces one or more teeth in an arch.



**Immediate denture**: denture prosthesis that is placed into the mouth at the time the natural teeth are surgically removed.

**Overdenture:** prosthetic denture that is prepared to fit and be secured on implant posts or on prepared retained roots

Partial Denture

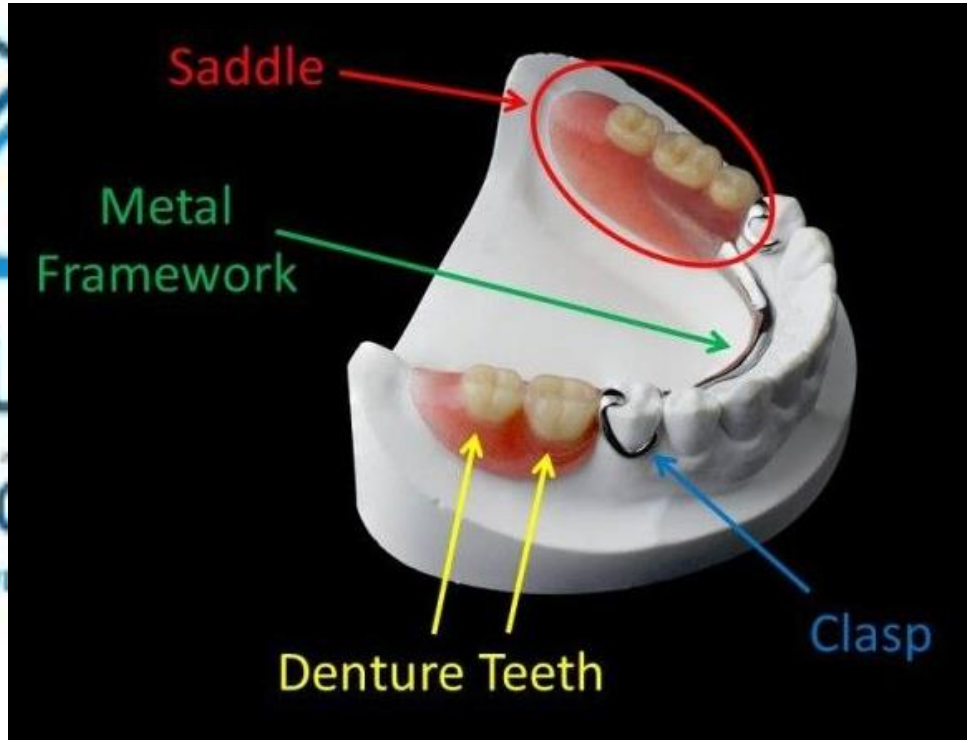
Complete Dentures

Implant supported denture

Although all removable appliances are constructed to fit in a designated area and to return the mouth to a proper function, not all are fabricated in the same manner or using the same materials or components such as:

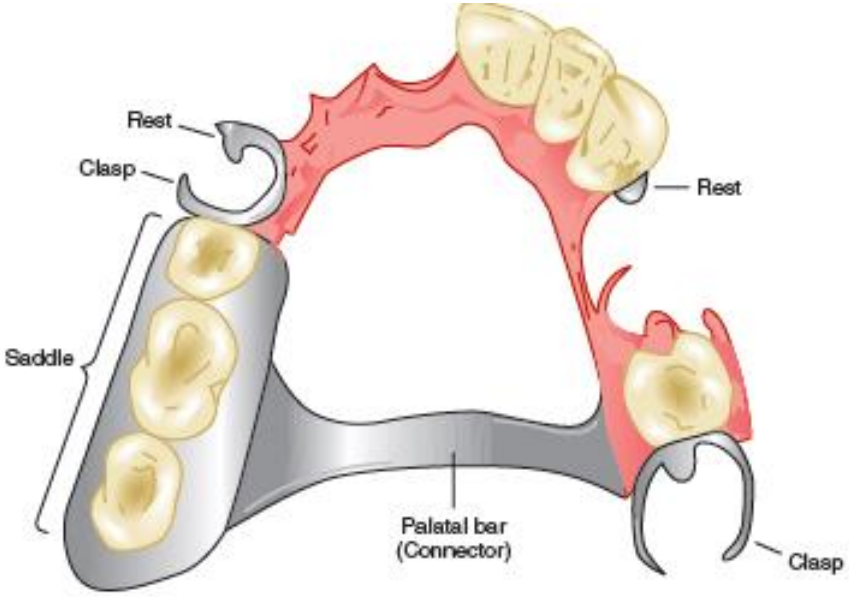
**Framework:** metal skeleton or spine onto which a removable prosthesis is constructed.

**Saddle:** the part of the removable prosthesis that straddles the gingival crest; used to balance the prosthesis and serves as a base for the placement of artificial teeth.



**Rests:** small extensions of the removable prosthesis made to fit or sit atop the adjoining teeth; provide balance and stability for the partial denture appliance. Rests are named for the area that is in contact with the tooth surface-occlusal, lingual, incisal, and so on.

**Clasp:** extension of partial framework that grasps the adjoining teeth to provide support and retention of the prosthesis.

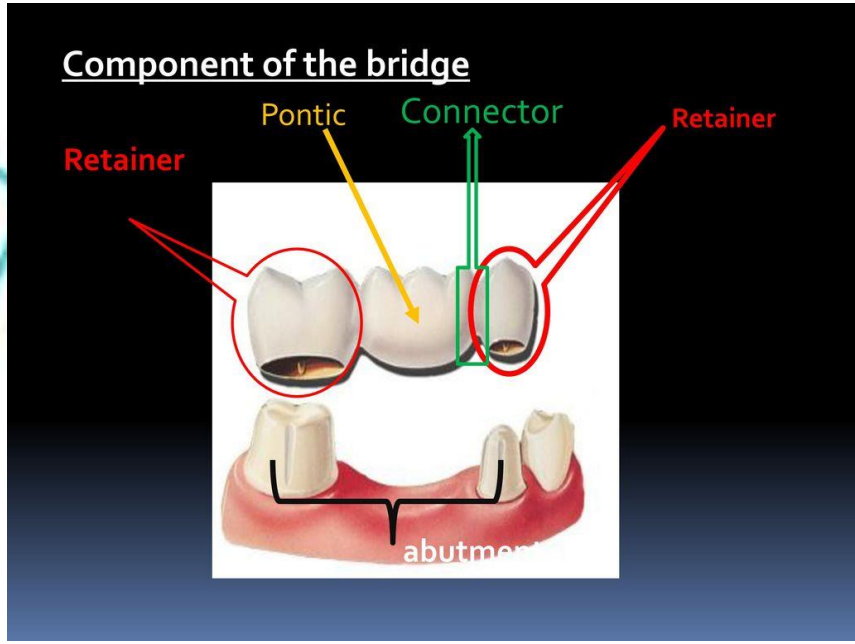


**Retainer**: in fixed prosthesis, the part of the appliance that joins with the abutting, natural tooth to support the appliance.

**Connector:** used to connect quadrant of a partial denture or connect and support an overdenture.

**Stress breaker:** a connector applied in stress-bearing areas to provide a safe area for stress relief and possible breakage.

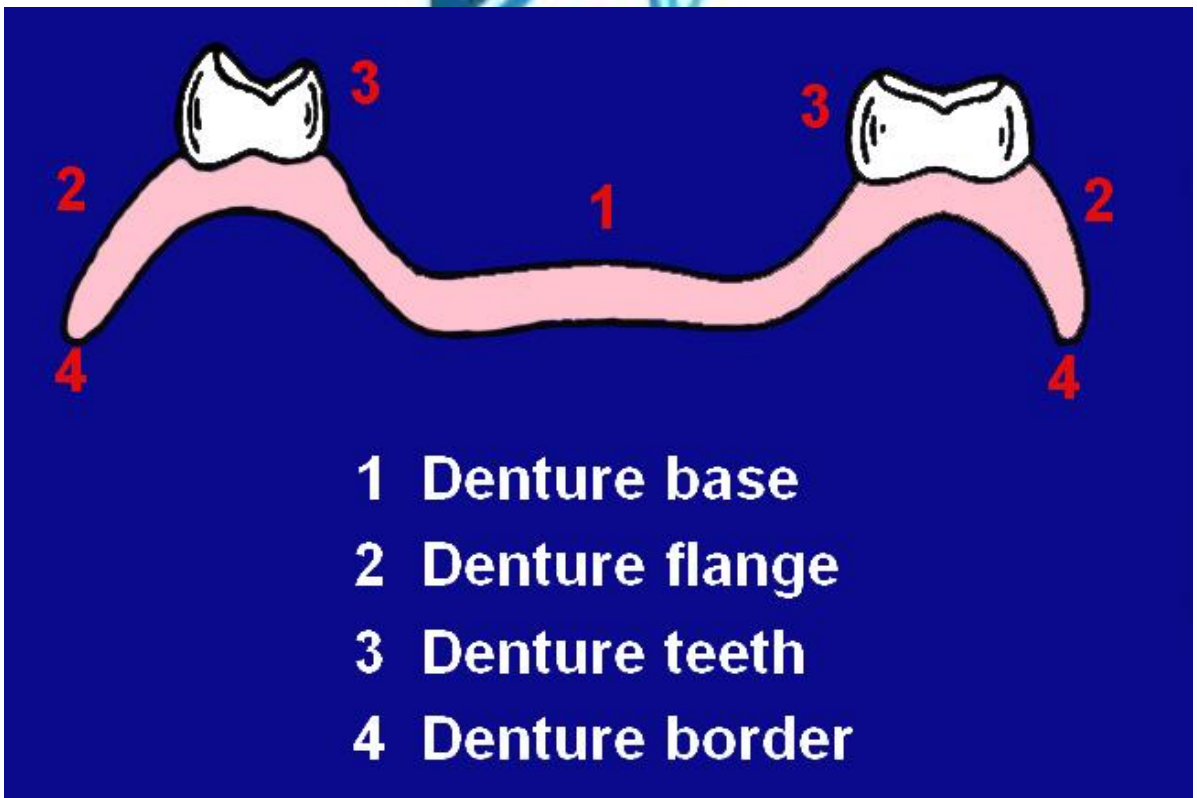
**Artificial teeth:** anatomical substitutes for natural teeth; made of porcelain or acrylic material in various shades and shapes, called molds.



**Denture base:** acrylic part of the denture prosthesis that substitutes for the gingival tissue.

**Flange:** projecting rim or lower edge of prosthesis.

**Post dam**: posterior edge of the maxillary denture; helps to maintain the denture and suction.



# Procedures and Methods Used in the Prosthodontic Practice

**Many of the operative procedures for fixed and removable prosthodontic appliances are similar in nature, which a few variations or step changes.**

# Impression Procedure

Throughout the prosthodontic appointment, various impressions of the teeth and tooth preparations are taken. The choice of material to be used and the necessary items required for the procedure depend on the reason for the treatment and the condition or physical properties of the item to receive the impression. Impression materials must be elastomeric (having properties similar to rubber), to be pliable during the impression process. Elastic impression items include hydrocolloids, rubber bases, and compounds. All materials must be carried and applied in the mouth by use of designed trays.

# Hydrocolloids

An impression material that is both reversible and irreversible is hydrocolloid, an agar-like material that can change from one form to another. The types of hydrocolloid are:

**Reversible hydrocolloid**: impression material that can change from solid or gel state, to a liquid form and back again, depending on temperature changes. This material is used in a water cooled tray.

**Thermoplastic:** quality of a material that changes from a rigid to plastic or movable form as a result of application of heat.

**Irreversible hydrocolloid:** quality that, once chemically set or in gel form, this material cannot be reversed or used again. An example of an irreversible hydrocolloid is **alginate** powder that is supplied in bulk containers or individual envelopes in regular or fast-set times. Alginate is stored in a dry, cool place until mixed with a premeasured water dose. Humidity can affect the water balance and stability of an irreversible hydrocolloid. Swelling from absorption of water is called **imbibition**, and evaporation or fluid loss cause shrinkage.

# ALGINATE IMPRESSION
## Normal

# Rubber Bases

Rubber bases are common impression materials. They exhibit rubberized characteristics and are supplied in tubes, wash, and putty consistency or in a twin cartridge, calibrated mixing dispenser called an extruder gun.

The base mixture requires an activator or catalyst to instigate mixing together into a homogeneous mass and chemical set. The basic types of rubber bases are silicone, polyether, polysulfide, and polyvinylsiloxane.

# Compound

Another thermoplastic impression material is compound, a nonelastic impression material that may be used in edentulous impressions. Compound is supplied in cakes or block and is heated to a soft, pliable mass; placed in an impression tray; and put into the mouth..

# Impression Trays

Dental impression of the mouth are accomplished by placing the desired material into a carrying device and inserting it into the patient's oral cavity. The specific device used to transport the impression material depends on the site to be reproduced. Impression can be of one tooth, a few teeth, or an entire edentulous arch. Some transport devices are copper tubes. Some are trays of *stock* metal or plastic purchased through dental suppliers. Trays may be custom constructed or purchased as full arch, quadrant, or sectional and anterior trays. Impression trays come in various sizes and shapes to accommodate specific areas of the mouth.

#1 Large Upper

#2 Large Lower

#3 Medium Upper

#4 Medium Lower

#5 Small Upper

#6 Small Lower

#7 Quadrant Upper Right Lower Left

#8 Quadrant Upper Left Lower Right

#9 Anterior Upper

#10 Anterior Lower

# Preparation of Teeth and Site

**Site preparation must be accomplished before a prosthesis can be placed. The teeth and the area involved could receive one or a combination of a variety of preparations:**

**Alveolectomy: surgical removal of alveolar bone crests; may be required to provide smooth alveolar ridge for denture seating.**

**Alveoplasty: surgical reshaping or contouring of alveolar bone.**

**Extracting: surgical removal of teeth may be necessary.**

**Coping: metal cover placed over the remaining natural tooth surfaces to provide attachments for overdentures.**

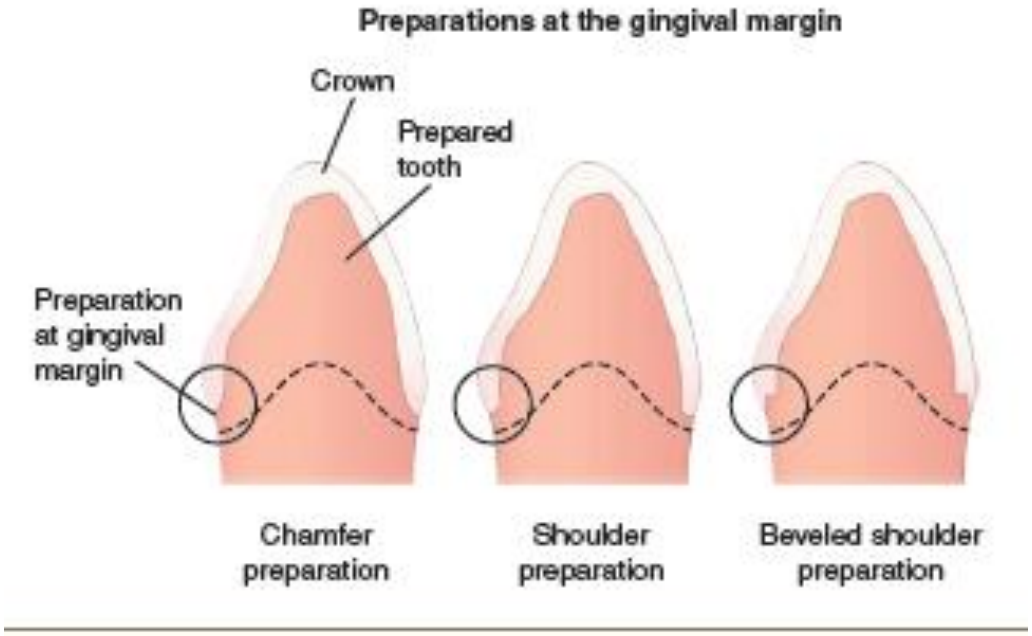
**Alveoplasty**

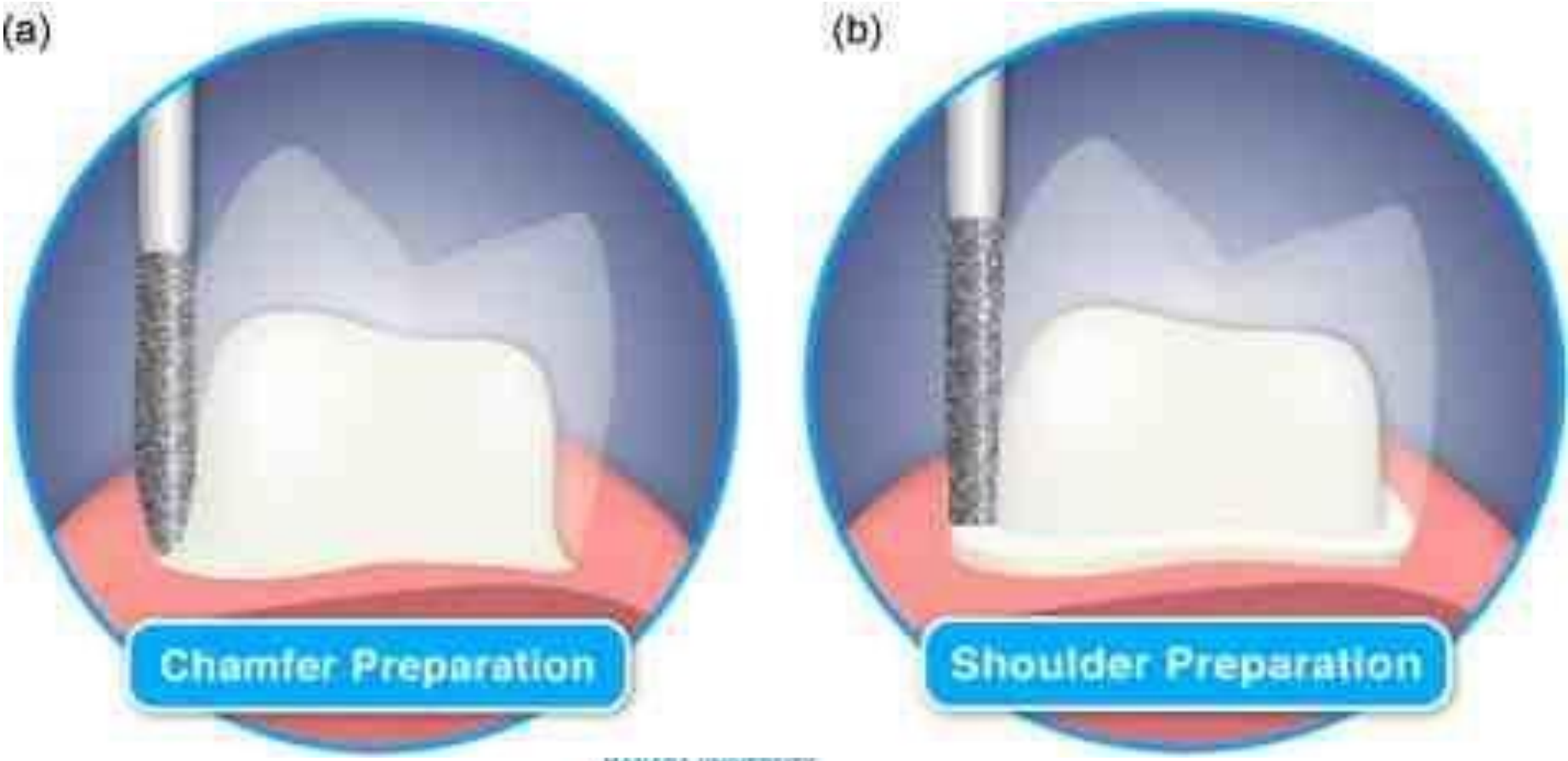
**Reduction**: removal of tooth decay and surfaces to receive the appliance. Various margin edges are prepared on the natural tooth to accommodate the thickness and material of the covering artificial crown.

**Chamfer**: preparation for crown placement or full veneer covering.

**Shoulder:** preparation to provide junction of the crown and tooth; usually for metal on crown or porcelain jacket crown.

**Bevel**: tooth preparation for seating and holding of a crown.




(a)
Chamfer Preparation
(b)
Shoulder Preparation
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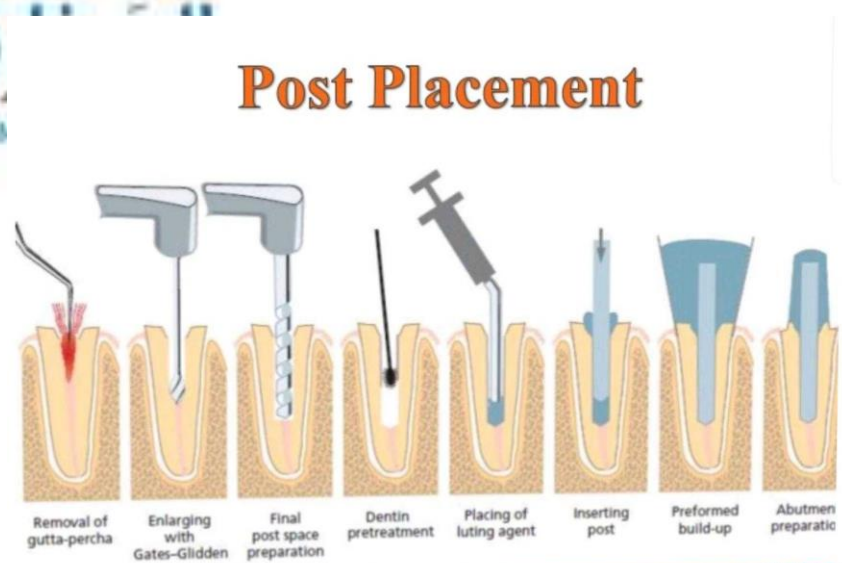
**Core buildup:** use of synthetic material to enlarge tooth core area to provide support for an artificial crown and to protect the pulpal tissues. Small pins may be inserted into the material to aid retention and strength.

**Post placement**: addition of a metal retention post to teeth that have had pulp removal and root canal enlargement, to aid in stability and strength.

**Undercut:** removal of tooth structure near the gingival edge to provide a seat or placement for the extending edge of the appliance; same as tooth reduction.



**Retraction cord:** chemically treated cord place in the gingival sulcus to obtain chemical or physical shrinking of the attached gingiva. These twisted or braided cords are plain or impregnated with chemicals and packed into the gingival area to cause temporary shrinkage of the surrounding tissue and/or control bleeding.

**Bite registration:** impression of the teeth while in occlusion. A bite registration is taken to assist with the fabrication of the prosthesis. The impression may be obtained from biting into a wax sheet, bite plates, or stock trays and prepared frames filled with impression material. Some dentists will eject impression material on the surfaces of the teeth to make a bite pattern for later use. Bite registrations may be classified in various ways.

**Open-bite:** patient bites into the impression material.

**Closed bite**: the material is injected and expressed around the desired teeth while they are in occlusion.

**Opposing arch:** impression of the occlusal surfaces of both arches are taken in the same procedure.

**Work order:** written directions from the dentist to the laboratory completing the case; the impressions, bite registration, and orders are sent together.

**Temporary or provisional coverage:** temporary protection for the prepared tooth while laboratory work is being completed. Coverage may be in form of an aluminum cap, acrylic custom cover, or preformed resin crown form cemented onto the prepared teeth for protection until the final try-in and delivery.

# Try-In, Adjustment, and Delivery

During the preparation, construction, and delivery of the dental prosthesis, the patient will return for various appointments. Some visits require adjustment and recordings of measurements that will be sent to the laboratory to assist in final fabrication. Related terms include the following:

**Seating:** placement and fitting of appliance for try-in and final cementation. Patient bites on a stick or device, applying pressure for the application of the crown or prosthetic item.

**Condylar inclination:** observation of bite relationship and TMJ involvement. The following articulation movements involve the condyle:

**Centric:** occurring when the condyle rests in the temporal bone during biting, resting and mouth movements.

**Protrusion:** measurement with the mandible thrust forward, with the lower jaw out.

**Retrusion**: measurement with the mandible drawn backward.

**Lateral excursion:** measurement with side-to-side movement of the mandible.

**Appearance indicators:** notations of the smile line and the length of the cuspid point.

# Use of Implants in Prosthodontics

**When prosthodontic appliance do not fit properly or are difficult to retain in the mouth, the dentist may suggest titanium or zirconia implants to provide stabilization and retention. There are different types of implants, and each is used in a specific area, depending on available bone, type, and amount of stabilization needed.**

**The related terms are:**

**Implant: surgical insertion of implant posts or prepared frame to provide stabilization for overdentures or appliance retention. Some implants may be a simple single insertion while others may be complicated and require study and preplanning such as CAD/CAM impression, cone beam radiograph measurements, and preconstruction of placement guides**

A surgical implant may be one or a combination of the following types:

**Plate form implant-endosseous**: screw-type device that is cemented or threaded into the mandible or maxilla bone; used for a single tooth or post implant.

**Plate form implant:** used for narrow jawbone; flat-plate style.

**Subperiosteal**: implant plate or frame is placed under the periodontium and stabilized on the mandibular bone. It is used when bone height or width is insufficient; rests on top of the bone.

**Transosteal:** large plate is stabilized on the lower border of the mandibular bone with posts extending through the gingiva; used to anchor prostheses in difficult situations.

All transplant appliance must bond with the bone tissue to obtain stability. This process is called **osseointegration** and requires from three to six months to occur.

# Miscellaneous Prosthodontic Services

There are a variety of prosthodontic device and treatments that can be rendered by the dentist or prosthodontist, depending on the operator's expertise. Terms related to these services are:

**Maxillary obturator:** palatal cover device worn in the mouth to cover genetic openings into the nasal area, such as a cleft palate.

**TMJ adjustors:** calibrated position splints for wear adjustment to maintain proper vertical dimension of occlusion.

**Sleep apnea and anti-snore forms:** custom-made dental-position device for tongue and mouth position during sleep period to avoid tongue drop and oxygen cutoff.

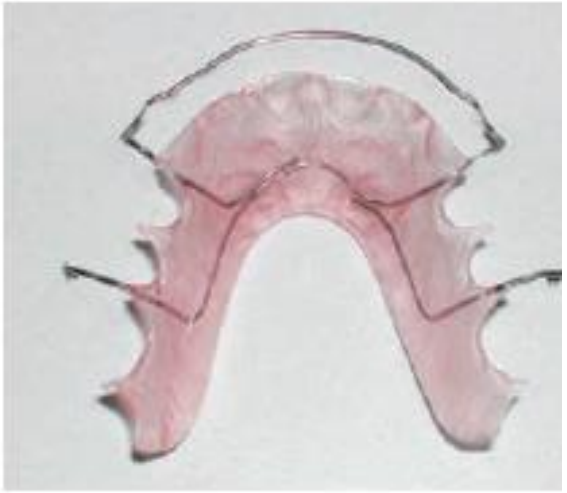

**Positioners:** individual patient devices to maintain mouth or tooth position or to complete orthodontic positioning.

**Sport mouth guards:** custom-made semi-hard forms to be inserted in times of contact sports; may be space-adjusted for orthodontic brace wear.


(A)


(B)


(C)



(D)

**Assorted prosthetic devices: (A) bite adjuster/positioner, (B) anti-snore appliance, (C) Hawley orthodontic retainer, (D) removable orthodontic retainer,**