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ACRYLIC VS METAL COMPLETE DENTURE

Nagapraveena Karumuru*

BDS Hopkinton, USA.

***Corresponding Author: Dr. Nagapraveena Karumuru**
BDS Hopkinton, USA.

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ABSTRACT
The goal of dentistry is for patients to keep all of their teeth throughout their lives in health and comfort. If the teeth are lost despite all efforts to save them, a reestablishment should be made in such a manner as to function efficiently and comfortably in harmony with the muscles of the stomatognathic system and the temporomandibular joints. The lower denture commonly presents the most difficulties with pain and looseness being the most common complaint. This is because the mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support.

KEYWORDS: Stomatognathic, temporomandibular.

INTRODUCTION

A complete denture (also known as a full denture, false teeth or plate) is a removable appliance used when all teeth within a jaw have been lost and need to be prosthetically replaced. In contrast to a partial denture, a complete denture is constructed when there are no more teeth left in an arch, hence it is an exclusively tissue-supported prosthesis. A complete denture can be opposed by natural dentition, a partial or complete denture, fixed appliances or, sometimes, soft tissues.[1]

Epidemiology and causes of tooth loss

There has been a decline in both the prevalence and incidence of tooth loss within the last decades.;[1][2] people retain their natural dentition for longer. Nonetheless there is still a great demand for complete dentures as more than 10% of adults aged 50–64 are completely edentulous, with age, smoking status and socioeconomic status being significant risk factors.[2] Tooth loss can occur due to many reasons, such as:

- Dental caries
- Periodontal disease
- Trauma
- Congenital disorders (e.g. dentinogenesis imperfecta, molar incisor hypomineralisation)
- Parafunction

Effects of tooth loss on oral tissues

Following the loss of teeth, there occurs a resorption (or loss) of alveolar bone, which continues throughout life.[3] Although the rate of resorption varies, certain factors such as the magnitude of loading applied on the ridge, the technique of extraction and healing potential of the patient seem to affect this.[4] The edentulous ridge can be classified according to the amount of bone in both the vertical and horizontal axes:[5]

- Class I: dentate
- Class II: immediately post-extraction
- Class III: well-rounded ridge form, adequate in height and width
- Class IV: knife-edge ridge form, adequate in height and inadequate in width
- Class V: flat ridge form, inadequate in height and width
- Class VI: depressed ridge form, with some basalar loss evident

Alveolar bone resorption is an important consideration when designing complete dentures. In the absence of natural dentition, such dentures are relying completely on soft tissues for their support. As a consequence, the forces exerted on the mucosa are significant and may, in turn, lead to an increased rate of bone resorption. Therefore, in order to ensure an equal distribution of forces.

Principles of complete dentures

Complete dentures are prone to a variety of displacing forces of differing magnitude as they are resting on oral mucosa and are in close proximity with tissues that are constantly changing due to the action of muscles. Consequently, for complete dentures to be retentive and stable, the retentive forces that hold the dentures in place must be greater than the ones aiming to displace it. Obtaining maximum stability and retention is one of the biggest challenges in full denture construction.[3]

Retention

Retention in removable prosthodontics can be defined as the resistance to vertical dislodgment that can arise from either muscular forces or physical forces. It can be gained from three different surfaces of the denture:

1. Occlusal surface
2. Polished surface
3. Impression surface

Relevant anatomical structures[4]

There are several anatomical structures that have the potential to cause displacement of the complete dentures. These are:

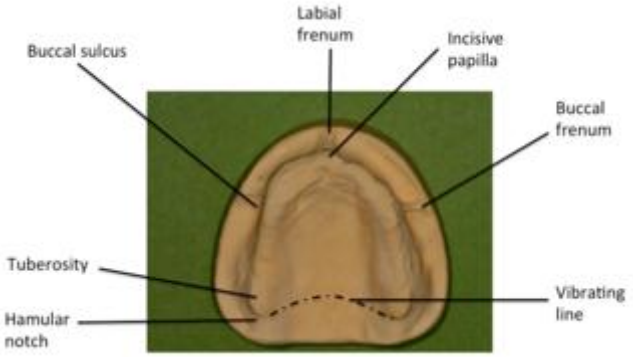
- Mentalis muscle - the effects of this muscle are more evident when there has been considerable alveolar bone resorption in the mandibular (lower) jaw. As the mentalis muscle contracts, it can cause displacement of the prosthesis in a posterior and upward fashion
- Masseter muscle
- Floor of mouth
- Zygomatic process of maxilla - over-extension in the sulcus around the maxillary molar region can cause mucosal trauma as the tissues are trapped between the prosthesis and the zygomatic process of the maxilla
- Coronoid process – on opening of the mandible, the coronoid process can impinge on the denture if the flange on the posterior aspect is too wide. This will either result in displacement of the prosthesis or restriction of mouth opening
- Incisive papillae on the maxillary arch remains relatively constant in position during alveolar bone resorption and remodelling, and can, therefore, be used to mark the midline of the upper jaw and facilitate placement of prosthetic teeth.

Anatomy of the Denture Bearing Areas[5]

Extensions

 Maxillary (upper) complete denture posterior extension: vibrating line (i.e. the intersection between the soft and hard palate). The landmarks for the vibrating line are the fovea palatinae (collecting ducts of minor salivary glands) that can be seen as two concavities on the mucosa. Extending the maxillary denture to the vibrating line ensures maximum extension for retention, while at the same time it excludes the movable tissues of the soft palate that would cause instability.

 Mandibular (lower) complete denture posterior extension: pear-shaped pads (act as tissue stops to prevent horizontal displacement of denture).



- Surface anatomy of maxillary denture-bearing area

Functional depth of sulcus (determined by border moulding) for optimum retention.

STEPS FOR CONVENTIONAL DENTURE FABRICATION

1. Make preliminary impression using a stock tray specifically designed for edentulous patients and alginate. Tray periphery may be enhanced with wax.
2. Fabricate preliminary cast and custom impression tray. This cast should be slightly over-extended in the periphery.
3. Master impression using border molded custom tray with PVS or polyether.
4. Send impression to laboratory for fabrication of master cast and record base/wax rim.
5. Confirm fit and extension of record base. Contour wax rims for lip support, future incisal edge position, occlusal plane, occlusal vertical dimension and midline. Record facebow transfer and bite registration at correct vertical dimension. Select tooth mold, tooth shade and desired occlusal scheme.
6. Return all items to laboratory. Lab will index and mount casts and develop trial denture set-up.
7. Try-in initial denture set-up. Depending on clinician/technician preference this may be either an "esthetic try-in" of just the maxillary anterior teeth (requiring an additional try-in) or the full set-up. Evaluate for accuracy of mounting, occlusal vertical dimension, esthetics and phonetics. Perform modifications as necessary. Patient and clinician should be satisfied before moving to next step.
8. Return all items to laboratory for prosthesis fabrication. dentures should be remounted and equilibrated to compensate for errors in denture processing. Dentures should be returned finished and all external surfaces polished. Many clinicians

will request clinical remount casts to be fabricated and returned with the case.

9. Insert dentures and adjust as necessary. Typical post insertion follow-up includes 24-hour, one-week and one-month appointments. Determine an appropriate recall interval.

Muscular control of the dentures[6]

The peri-oral muscles (muscles of the cheeks and lips) can cause displacement of the dentures. Patients can, however, learn to control and coordinate their muscles so that the forces exerted are minimised or counter-acted to prevent such displacement. With age, the ability to learn new skills and acquire some level of neuromuscular control declines. Therefore, the "training" time-frame for patients to learn how to successfully use their new complete dentures is expected to be much longer for older patients.

Transition into complete dentures[7]

Many patients find the idea of wearing complete dentures very upsetting.[9] Such psychological effects, together with the challenges that accompany successful prosthetic wear, can make acceptance of treatment difficult. It is, therefore, reasonable to consider different ways of transitioning into the edentate state in patients who have not yet lost all of their teeth but in which complete dentures will be required in the foreseeable future.[6] Certain teeth can be retained in the short to medium-term with partial dentures provided in the interim so that the patient can become accustomed to denture wearing. Alternatively, if the former is not possible, consideration should be given to whether roots of teeth can be retained in strategic locations in the maxilla or mandible to help with the stability of the prostheses.

Transitional partial dentures

Teeth that can be restored despite a poor long-term prognosis may be retained to transition the patient into the edentulous state via a series of transitional partial dentures. It is important that the patient can maintain good plaque control during this period, as progression of periodontal disease will lead to further destruction of bone that will later become the foundation for denture support. Complete dentures require some level of muscular control from the patient (e.g. lifting tongue to stabilise upper denture on biting) and this process of adaptation can last for several weeks or even months. As patients age, the process of learning and memorising new skills as well as neuromuscular control (i.e. controlling when and how much muscles contract) becomes more challenging.[10] Hence transitional partial dentures can provide a practice period for the musculature, before complete dentures are provided.

Overdentures

An overdenture is a prosthesis that fits over retained roots or implants in the jaws. Compared to conventional complete dentures, it provides a greater level of stability and support for the prosthesis. The mandibular (lower) jaw has a significantly less surface area compared to the maxillary (upper) jaw, hence retention of a lower prosthesis is much more reduced. Consequently, mandibular overdentures are much more commonly prescribed than maxillary ones, where the palate often provides enough support for the plate.

Tooth supported

Retaining two or three natural teeth as retained roots can greatly improve the retention and stability of a complete denture, especially if the roots are fitted with special precision attachments. The process involves decoronation (removing the crown of the tooth) and elective root canal treatment of the overdenture abutments. For matters of simplicity for endodontic treatment provision, single rooted anterior teeth are preferred, with the exception of lower incisors as they lack sufficient root surface area.[6] If plaque control is satisfactory, tooth-supported overdentures can be considered as a long-term treatment option. Alternatively, if treatment fails, the roots can be extracted and the overdenture can easily be converted into a conventional complete denture.

Advantages

- Increased retention of prosthesis
- Reduced alveolar bone resorption and preservation of alveolar ridge
- Reduced horizontal forces
- Proprioception maintained
- Improved aesthetics (compared to partial dentures)

Disadvantages

- Requires endodontic (root canal) treatment of abutment teeth
- Predisposes to dental caries and periodontal disease

Implant supported

Although an implant supported overdenture is not appropriate for the short-term transitioning stage into conventional complete dentures, it is an option that should be considered for the definitive treatment, given the higher stability and retention of such dentures.[6] Despite complications, the success rate of dental implants is well established, with reports exceeding 98% in 20 years for mandibular anterior teeth.[11] The provision of a two-implant supported overdenture in the mandibular (lower) edentulous jaw is now considered as the first choice of treatment,[12] with patients reporting to have a significant improvement in quality of life and greater patient satisfaction when compared to conventional removable prostheses.[13]

Immediate dentures

When clearance of the dentition is the only viable treatment option, immediate dentures can be constructed prior to the extractions and fitted once the teeth have been removed, on the same appointment. Such dentures help restore masticatory (chewing) function and

aesthetics whilst at the same time allowing a period for the soft tissues to heal and the bone levels to stabilise before constructing the definitive complete dentures.

Advantages

- Restoration of aesthetics and masticatory function
- Allow for time of adaptation as the patient gets used to their new dentures
- Psychosocial advantages
- Protection of wound area following extractions
- Allow clinician to transfer jaw relationship and aesthetics from natural teeth onto immediate dentures. If immediate dentures are not provided, then following extraction of the teeth such information will be lost; hence it prevents later 'guesswork'.

Disadvantages

- Unpredictable fit and aesthetics – the dentures are constructed before all teeth are removed in a jaw, therefore there is some level of guesswork involved with respect to tooth placement and the fitting surface of the denture.
- Limited lifespan of prosthesis and relines often required - as the tissues heal following extractions, the alveolar bone starts to resorb causing the tissues receded. Consequently, immediate dentures will require some level of maintenance, with relines of the fit surface and/or occlusal adjustments.

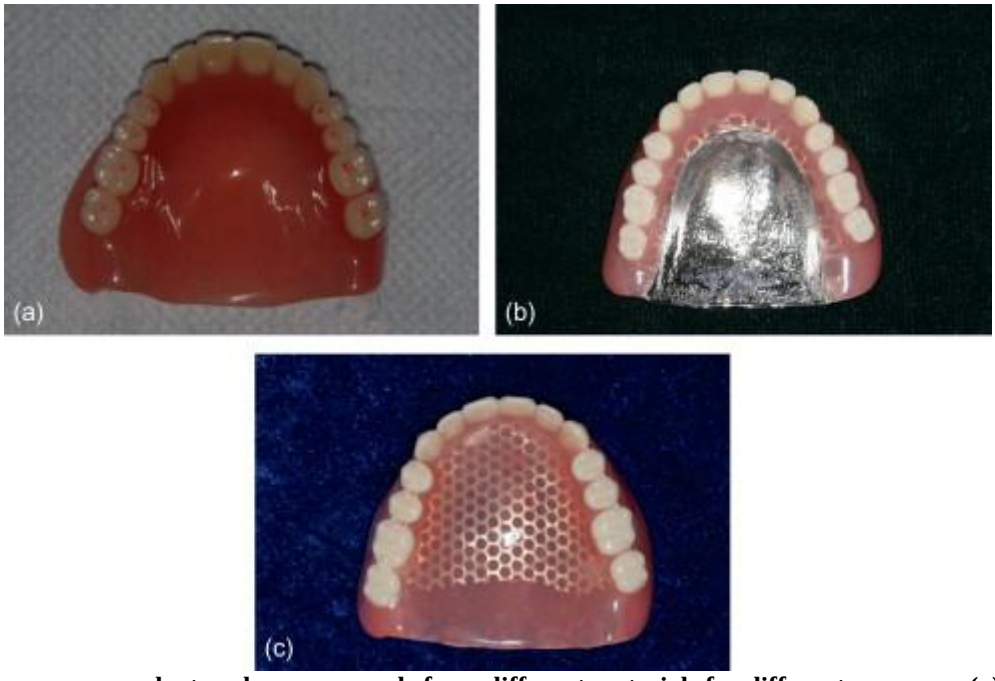


Figure 1: Three common denture bases are made from different materials for different purposes: (a) Resin base; (b) Metal base; and (c) Metal mesh embedded resin base.

DISCUSSION

Complete dentures consist of two main parts, namely the artificial teeth and the denture base. As described previously, an artificial tooth is used to restore the appearance of the natural tooth, its occlusion, oral function, and to assist in word pronunciation. The dental base is the foundation of the artificial tooth and can be used to restore the defective soft and hard tissues. Biting force is distributed from the artificial tooth through the denture base to the oral mucosa and bone tissues. Since tooth support cannot be obtained, the denture base of complete dentures covers a larger area of oral mucosa than that of RPDs complete dentures can fulfill all of these functions. Unlike RPD's, with complete dentures connectors are not used as there is no need for space to install a major connector onto the complete denture, and minor connectors cannot be used since no healthy abutment is available.[8]

Retention of a complete denture benefits from both sub-pressure and adherence to the underlying tissue. Sub-pressure will occur between the denture base and oral mucosa if they are attached close to each other and a good peripheral seal is applied. A peripheral seal is the tight contact formed by the marginal surface of the denture with the oral mucosa. The posterior edge of the upper denture (post dam area) is of vital importance during speech. The atmospheric pressure outside the dental base presses it firmly onto the oral mucosa. Good adsorption is mainly ascribed to a thin sticky layer of saliva between the dental base and oral mucosa that contributes greatly to retention. Thus, the large dental base area is important to guarantee retention of the complete dentures. Of course, it should not disturb normal oral function or reduce comfort.[9]

When the prosthetic plan is made, the effects of oral hard and soft tissues on necessary retention should be

considered carefully. If there is large tuberosity, sharp bone apexes, or hyperplastic oral mucosa, the denture cannot remain stable. Sometimes a special oral operation is needed to resolve these problems before prosthetic treatment, as retention of complete dentures would otherwise be dramatically decreased. If the jaw bone, especially the residual alveolar ridge, has been seriously absorbed and becomes narrow and flat, or if the oral mucosa has lost its initial elasticity and thickness, retention is dramatically decreased. In these cases, additional affiliations, like implants, may become necessary.[10]

The stability and longevity of complete dentures are crucial. Commonly used complete dentures are made from composite resins (Figure a). The obvious advantages of these kinds of materials are that they are low-cost, easy to fabricate, and repair. However, low strength and poor aging properties always reduce the longevity of complete dentures made of resins. Alternatives with improved properties can be found among metal materials, especially pure titanium or titanium alloy denture bases (Figure b). Compared to conventional composites, titanium-based denture bases are not as popular. This is mainly due to high price, the complex process of installation, and difficulties with repair. A dental base made from a composite resin strengthened by prefabricated metal meshes or metal wires embedded inside the resin as reinforcement is a good compromise (Figure c).[11-16]

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