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Overdenture

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Prosthodontics in Partial Fulfillment for the Bachelor of Dental
Surgery**

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بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

نَرْفَعُ دَرَجَاتٍ مِّنْ نَّشَأٍ

وَفَوْقَ كُلِّ ذِي عِلْمٍ

عَلِیْمٍ

صدق الله العظيم

(سورة يوسف، الآية 76)

CERTIFICATION OF THE SUPERVISOR

I certify that this project entitled "**Overdenture**" was prepared by the fifth-year student **Fatime Qassem Habib** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervised by
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DEDICATION

I proudly dedicate my graduation project and the summary of my study to the one whom God has crowned with dignity, who taught me without exhaustion, for the one I proudly bear his name (my father).

To the more precious than my heart and my eye, to whom her supplication was the secret of my success, may God reward her on my behalf with the best reward (my mother).

Without their continuous support, I would not complete my studies without them (brothers and sisters).

And lastly,

To the companion of the path, to those who carry with me the hours of hardship and suffering, and share with me the moments of joy and tiredness together, I will always appreciate all they have done.

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List of Abbreviations

RPD	Removable Partial Denture
PVS	Polyvinylsiloxane
ERA	Extra Radicular Attachment

Introduction

Anatomical changes will invariably take place within the alveolar processes of the jaws following dental extractions. When the teeth are present, the pressures exerted on these structures during contraction of the masticatory muscles are transmitted in the form of tension to the bone by the periodontal membrane. This type of stress is acceptable for the alveolar bone and may even serve as a stimulus for alveolar bone remodeling. Once the teeth are extracted, the whole distribution of forces is changed. The load is not directed to the entire bone, but is applied only on its surface. Alveolar bone can only tolerate this compression to a certain extent (**Kaur *et al.*, 2017**).

The necessity of any procedure that can avert or postpone issues in the future is emphasized by preventive prosthodontics. Retaining teeth and/or the roots of one or more teeth for an overdenture has many benefits for the patient, including improved retention, stability, proprioception, support, preservation of alveolar bone, and psychological benefits (**Shinde and Wadkar,2012**).

The functional forces in overdentures are shared between the teeth and the bone, there appears to be a physiologic stimulus to maintain the bone height. The periodontal ligament of the abutment teeth is important in both, retention and sensory innervation. The sensory input from the periodontal receptors helps in increased coordination of muscular contraction, and thereby greater coordination mandibular movement (**De Freitas Borges *et al.*, 2010**).

Also patients showed improving in their chewing efficiency, increases maximum bite force, denture stability, food avoidance and oral health related. Quality of life and it clearly improves satisfaction in comparison to conventional complete denture wearers (**Prakashand Gupta, 2017**).

Tooth-supported overdentures are indicated when only a few teeth remain and are unfavorably distributed for supporting clasp-retained RPDs(Removable Partial Dentures), when abutment teeth have little remaining tooth structure, when the crown-to-root ratio is disadvantageous for the long-term survival of abutment teeth, or when the patient does not tolerate clasp-retained RPDs for aesthetic reasons. In these situations, the remaining teeth may be devitalized, shortened and may provide with retentive precision attachments to improve the retention and stability of the denture (**Berger *et al.*, 2020**).

With advances in osseointegrated implants and the success of fixed dental prostheses has come a change in treatment options for patients who desire removable prostheses but who have completely or partially edentulous ridges. Treatment options include complete or partial dentures retained by single or multiple endosseous implants, and a variety of attachments, such as ball attachments, locator abutments, bar attachments, and even magnets (**Vahidi and Pinto-Sinai, 2015**).

Aim of the Review

- Examine the evidence that an overdenture should become the first choice of treatment for edentulous patients.
- Explain if implants can be used in conjunction with attachments to enhance the retention and stability of overdentures.
- Discuss the potential effect of the different attachments used routinely in tooth and implant-retained overdentures.

CHAPTER ONE

Review of the Literature

1.1. Overdentures

Overdenture is any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth, and/or dental implants. It is found to help in the preservation of alveolar bone and delay the process of complete edentulism (**Taylor, 2017**).

1.1.1 The Important Goals of Overdentures

The overdenture accomplishes three rather obvious, but tremendously important goals. The first goal it maintains teeth as part of the residual ridge. This gives the patient a denture that has far more support than any conventional appliance. Instead of soft, movable mucous membrane, the denture literally sits on teeth “pilings,” enabling the denture to withstand a much greater occlusal load without movement. Retentive devices may be incorporated into the denture-tooth contact, resulting in improved retention as well as support. The second goal achieved by the overdenture is a decrease in the rate of resorption. Alveolar bone exists as a support for teeth. If the teeth are removed, then the alveolar process begins a rate of resorption consistent with the length of time the teeth have been missing. The third goal achieved by the overdenture is an increase in the patient's manipulative skills in handling the denture. With the preservation of the teeth for an overdenture, there is also the preservation of the periodontal membrane that surrounds these teeth. This preserves the proprioceptive impulses supplied by the periodontal membrane; thus a very important part of the myofacial nervous complex is retained when teeth are maintained (**Winkler, 2015**).

1.1.2 Indications of overdentures

- Few remaining teeth are unsuitable for fixed or removable partial dentures.
- Remaining teeth present with unhealthy periodontal conditions.
- Patients with class II or class II Angle's classification - Esthetics & masticatory function improved.

- Patients presenting abnormal jaw size large maxillary or mandibular bone defects.
- The construction of over-denture is an alternative line of treatment to single dentures opposing a few natural teeth.
- Patients presenting congenitally missing teeth and congenital defects such as cleft palate, microdontia, amelogenesis or dentinogenesis imperfecta, or partial anodontia.
- Overdentures can be useful for patients with a severe ridge defect or bone resorption.
- Patients who have unfavorable tongue positions and muscle attachment for a conventional removable prosthesis. **(Bansal, Aras and Chitre, 2013).**

1.1.3 Contraindications of Overdentures

- Overdentures are contraindicated in case of poor oral hygiene.
- Interarch space inadequate to accept the denture and the abutments.
- Inadequate zone of attached gingiva with grade II mobility of the abutments.
- Patients who cannot psychologically accept any type of removable denture
- Mentally and physically handicapped patients for whom plaque control and good oral hygiene are difficult **(Sarandha et al, 2007).**

1.1.4 Advantages of Overdentures

- Preserving the remaining residual ridge by decreasing the rate of bone resorption.
- Preservation the abutments as part of residual ridge to gain support.
- Preserving the response of proprioceptive exist in the periodontal membrane of the abutment tooth.
- The modified teeth provide a definite vertical stop for the denture base

- Horizontal and torque forces are minimized.
- Stability and support are increased
- Patient acceptance and Psychological Benefits
- A Simple Approach to the Problem Patient.
- fewer post insertion problems.
- Provide retention through the attachments (**Shafie, 2014**).

1.1.5 Disadvantages of Overdentures

- It is more expensive than conventional complete denture.
- It is bulkier and heavier compared to conventional denture.
- Some patients may not accept Removable prosthesis psychologically.
- Caries and periodontal disease can develop in the retained teeth/ roots.
- Endodontic therapy and coronal restorations may be needed for abutments.
- Bony undercuts of the alveolar ridge are often found adjacent to retained teeth over (**Binu George, 2008**).

1.2 Overdenture Classification

Overdentures can be classified into:

- Tooth support
- Implant support (**Krennmair *et al.*, 2016**).

1.2.1 Tooth Support Overdenture

A complete or partial removable denture supported by a tooth or retained roots that are intended to provide improved support, stability, and tactile and proprioceptive sensation and to reduce ridge resorption. The concept of conventional tooth-retained overdentures is a more simple and cost-effective treatment than implant overdentures. When few firm teeth are present in an otherwise compromised dentition, they can be retained and used as abutments for overdenture fabrication. This helps improve the retention and stability of the

final prosthesis significantly (Krennmair *et al.*, 2016).

1.2.1.1 Patient Selection for Overdenture

The decision of making overdenture or not based on several factors as following:

1. Possibility of Fixed or Removable Partial Denture

If the periodontal condition and position of the remaining teeth favor the use of a fixed partial denture or Removable partial denture, then an overdenture should not be considered for that patient. (Deepak Nallaswamy, 2004).

2. Caries Status

Presence of high caries index and the creation of a situation that will easily promote a caries environment are two of the most devastating sequelae of improper Overdenture patient selection (El Mekawy *et al.*, 2021)

3. Patient Age

Overdentures are always recommended for young patients because they have a favorable psychological effect. (Deepak Nallaswamy, 2004).

1.2.1.2 Abutment Selection for Overdenture

- Periodontal and mobility status teeth with a significant vertical bone loss and accompanied by grade 2 or 3 mobility, are not suitable abutments. While periodontally compromised teeth but with a good treatment prognosis are probably regarded as suitable abutments even when horizontal bone loss is present. Slight tooth mobility is not a contraindication because a favorable change in the crown/root ratio after

teeth preparation may improve this sign. A circumferential band of attached gingival, although a narrow one, is popularly regarded as a mandatory requirement for abutment selection (**Resnik, 2020**).

○ **Location and number of abutment**

- Cuspids and bicuspid are frequently selected as overdenture abutments
- As the anterior alveolar ridge resorbs easily under stress, anterior teeth are not usually selected.
- Maxillary incisors can be used as overdenture abutments, if the mandibular arch is intact.
- At least one tooth should be retained in a quadrant to maintain the health of the oral tissues.
- The number and location of the abutment teeth and the status of the opposing one should be evaluated during treatment planning (**Veeraiyan, 2017**).

1.2.1.3 Classification of Tooth Supported Overdenture

the tooth supported over denture classified in several manners based on:

1.2.1.3.1 The Method of Abutment Preparation

➤ **Non coping abutment**

The crown of the abutment is reduced to a height of 2–3 mm, is treated endodontically and the entrance (occlusal section) is filled with silver amalgam, glass ionomers or composite restorations. The occlusal surface should be contoured to a convex or dome-shape and is highly polished

(Fig1- 1) (Rangarajan and Padmanabhan, 2017).

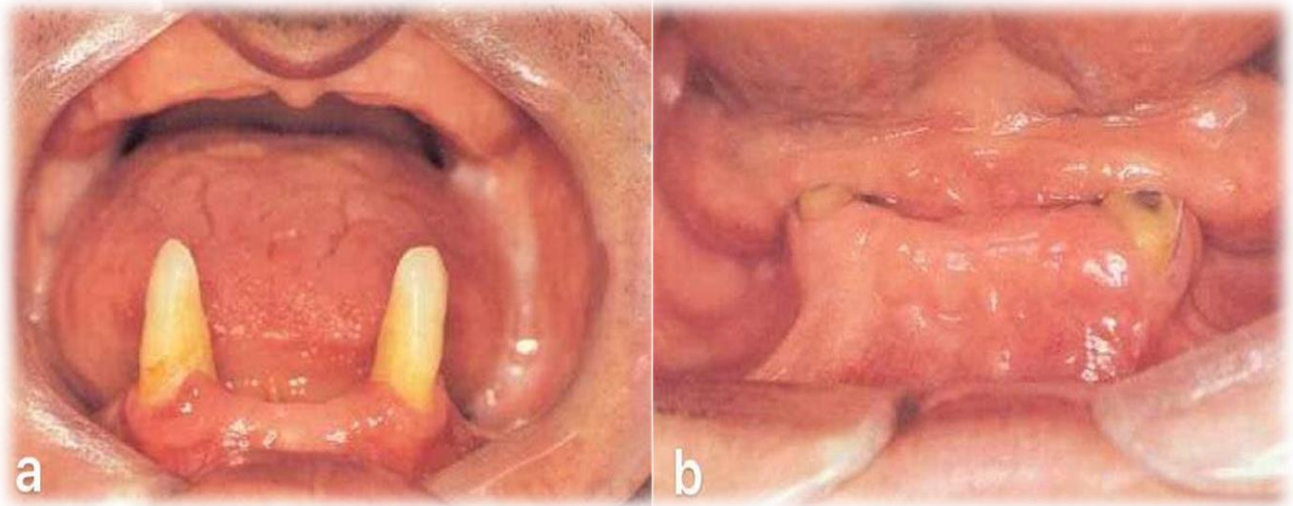


Figure (1-1): Classic presentation of a case suitable for overdentures (a), Reduction of teeth following root canal therapy (b) (Van Kampen *et al.*, 2003).

➤ **Metal copings**

There are several types of metal copings abutment preparation:

○ **The Dome-shaped copings (Short)**

the abutment tooth is endodontically treated and prepared as dome-shaped, extend only 1 or 2 mm above the crest of the ridge to produce a significant improvement in crown root ratio. The contribution of retained roots in retention is negligible but they are used for support against vertical loads. Where employing the dome-shaped copings with a short dowel of 4-5 mm length will be adequate to allow sufficient denture base thickness over the occlusal section, not less than 1.5 mm. The major advantage of a cast coping is that it provides the possibility to solder a precision attachment on top of the coping, leading to additional retention (**Figure 1-2**) (Trakas *et al.*, 2006).



Figure(1- 2) : (A) The abutment teeth are endodontically treated and reduced in height. (B) Dome-shaped cast metal copings 2–3 mm in height with a chamfer finish line and a postare fabricated and cemented (Trakas *et al.*, 2006).

○ **The thimble-shaped copings (Long)**

can be placed on vital abutments. It is required to be prepared with shoulders and the normal flattened of the occlusal portion, it should be prepared in a round or parabolic form. To direct loads of occlusion along the long axis of the abutments teeth (**Rangarajan and Padmanabhan, 2017**).

They are 5-8 mm in height and need considerable space. The retention obtained will vary inversely with the taper of the coping. The abutment teeth require greater osseous Support and may not need to be endodontically treated (**Figure 1-3**) (**Trakas *et al.*, 2006**).

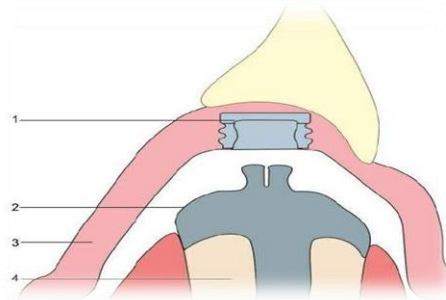


Figure (1-3): (A) Thimble-shaped coping. (B) Extraradicular attachment(ERA):

(1) Female component attached to denture, (2) male component, (3) denture, (4) abutment tooth(Trakas *et al.*, 2006).

○ **Abutment with telescopic crown**

is a prosthesis which consists of a primary coping which is cemented to the abutments in a patient's mouth and a secondary coping which is attached to the prosthesis and which fits on the primary coping (**Figure1- 4**) (**Zoidis, Panagiota and Polyzois, 2015**).



Figure(1- 4): (a) Primary telescopic crown. (b) Secondary telescopic crown in the denture (Zoidis, Panagiota and Polyzois, 2015).

➤ **Abutment with attachment**

A retentive attachment for an overdenture consists of two separable parts - a male part and a female part. The majority of these so-called concealed attachments the male part is fixed to the abutment tooth as primary element, while the female part is imbedded in the denture base as the secondary element. Most concealed attachments are prefabricated. They are less expensive than attachments that are custom fabricated by the dental technician (**De Franco, 1994**).

1.2.1.3.2 On the Type of the Overdenture

➤ Immediate overdenture

Any Removable dental prosthesis fabricated for placement immediately following the removal of a natural tooth/teeth. It is a partial denture constructed before the extraction of unwanted teeth is inserted immediately after their removal. An immediate denture, which may be complete or partial, is constructed to replace teeth immediately after their extraction. **(Bhoyar and Deogade, 2019).**

➤ Transitional or intermediate overdenture

Consist of a modification of partial denture to replace further lost teeth or to cover the roots of overdenture abutments once the teeth have been cut down. **(Alqutaibi and Kaddah, 2016).**

➤ Definitive overdenture

These restorations are usually constructed at least 6 months following extraction of the last teeth and the preparation of the overdenture abutments. They should be planned to provide service for several years. **(Preiskel, 1996).**

1.2.1.3.3 Overdenture Can Be Distinguished By Design

➤ Close design

An overdenture with a close design looks like a complete denture and hence covers the abutments teeth and respective periodontium with a continuous flange, the closed design has been preferred in cases with three or fewer teeth available to retain the overdenture and to facilitate the conversion to a purely mucosa borne prosthesis. **(Staubli, 1993).**

➤ **Complete or partially open design**

Overdentures that do not cover the periodontium of the retained abutments are defined as denture with a complete or partially open design. If more than three abutments are available, the open design has been recommended. **Figure (1-5) (Zarb and Bolender, 2004).**



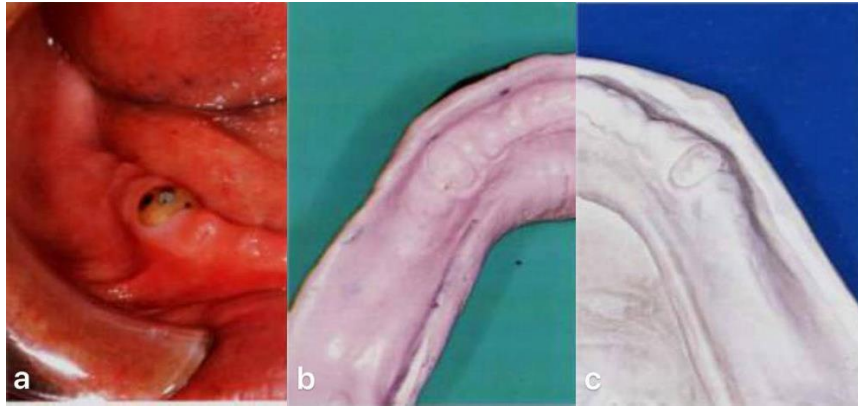
Figure (1-5) open faced maxillary overdenture (Zarb and Bolend, 2004).

1.2.1.4 Impression of The Abutments Teeth

1.2.1.4.1 One–Stage Technique with Supporting Element

For designs that rest on abutment teeth without root copings, the full-arch impression is made as soon as the abutments are prepared. When root copings without retentive elements, the impression is made after the final cementation of the copings **(Mandell, 1995).**

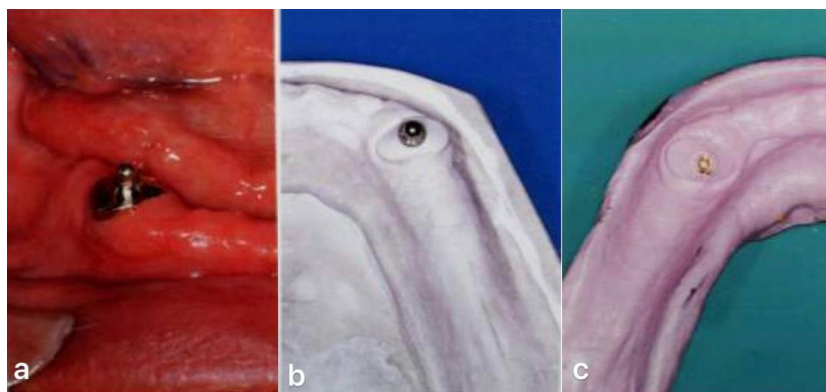
The full-arch impression is made in a custom tray similar to one for a conventional complete denture. It covers the entire ridge except for any undercut areas near the abutment teeth that could not be utilized for the future denture base in any way. The impression is made using Zinc oxide-eugenol paste or elastomer in the same manner as in the edentulous arch **(Fig.1-6) (Mandell, 1995).**



Figure(1-6): Abutment teeth without copings (a), Abutments that have no root copings and those that have root copings with no retentive elements allow the entire impression to be made as if the arch were totally edentulous (b), Copings and roots are duplicated merely as part of the working cast (c) (Mandell, 1995).

1.2.1.4.2 One-Stage Technique with the Existing Retentive Element

A single step full arch impression in Zinc oxide-eugenol paste or elastomer the materials used for overdenture that will rest on Pre-existing retentive elements Transfer matrices are set in place on the involved retentive elements and picked up in the impression. this makes it possible to incorporate retentive elements analogs in the working cast, using a custom tray similar to these used for a complete denture, the tray must touch neither the root coping nor the transfer matrices (Fig.1-7) (Mandell, 1995).



Figure(1-7): Preexisting retentive elements and when a retentive element is already present, the procedure is similar to that in the case described above. The only difference is that a corresponding female attachment element is placed over the retentive element in the mouth before the impression is made (a and b). This serves as a transfer matrix and allows the technician to incorporate a male attachment analog into the working cast in the proper position (c) (Mandell, 1995).

1.2.1.5 Record Base

The only difference in the construction of the record bases for tooth – supported overdenture and conventional dentures is the incorporation of the metal bearing in the record base (**Staubli, 2007**).

1.2.1.6 Denture Base Design

These are some of the basic considerations in designing an overdenture base:

1. The denture base material should be strong and durable to withstand the forces of chewing and speaking. Acrylic resin, chrome cobalt, or titanium are commonly used materials for overdenture base.
2. The denture base should be designed to cover the entire alveolar ridge and extend slightly beyond the mucogingival junction to provide stability and retention.
3. The base should be contoured to mimic the natural shape of the ridge and to provide proper support to the soft .
4. The denture base should be designed to allow for easy access for oral hygiene maintenance. (**Chrcanovic, Albrektsson and Wennerberg, 2014**).

1.2.1.7 Criteria for Designing the Base

- ✓ Not unnecessarily promote plaque accumulation.
- ✓ Not mechanically traumatize the marginal gingival.
- ✓ Not impede the performance of good oral hygiene.
- ✓ Not interfere with the normal function of the tongue, lips, and cheeks.
- ✓ Not interfere with esthetics or speech (**Mustapha, Salame and Chrcanovic, 2021**).

1.2.1.8 Basic Rules of Overdenture Base Design

- ✓ Cover as little of the marginal gingiva as possible.
- ✓ Border the proximal spaces with metal.
- ✓ The greater the number of abutment teeth and the better their prognosis, the more open the construction may be (**Mustapha, Salame and Chrcanovic, 2021**).

1.2.1.9 Denture Base Design and the Periodontium

Denture base design and its relationship with the periodontium is a crucial consideration in overdenture treatment. The following are some important factors to consider in this context:

1. The denture base should be designed to distribute forces evenly across the alveolar ridge and minimize the load on the underlying bone and soft tissues. This will help protect the periodontium from excessive mechanical stress and prevent resorption of the alveolar bone.
 2. Proper fit and adaptation of the denture base to the underlying ridge is crucial to avoid pressure points and irritation of the soft tissues. The denture base should be adjusted accordingly to ensure that it does not rub against or cause discomfort to the periodontal tissues.
 3. Occlusion (the way teeth meet) should be carefully calibrated to avoid overloading the periodontium and to prevent any trauma to the residual ridge
 4. Regular maintenance and adjustments to the denture are important to ensure its ongoing fit and function and to protect the periodontium. This involves periodic placement of soft tissue conditioning materials between the tissues and the denture to prevent pressure sore and bone resorption.
- ❖ Overall, denture base design in the context of overdenture treatment is pivotal in maintaining and supporting the periodontium and proper designing and

regular maintenance of the overdenture are essential to achieve this goal.(Krennmair *et al.*, 2019).

1.2.2 Implants Support Overdenture

An implant-supported overdenture is a type of denture that is anchored to implants that are surgically placed in the jawbone. It is a removable appliance that is held in place by the implants, offering better stability than traditional dentures. The overdenture rests on the implants and is secured using either clips or a bar attachment, allowing the patient to eat, speak, and smile with confidence. This is a popular alternative to traditional dentures as it provides better comfort, function, and aesthetics, enhancing the patient's overall quality of life. It also helps preserve the jaw bone and prevent bone loss, which is common in patients with missing teeth (**Abu-Hussein *et al.*, 2017**).

Implant-retained overdentures may reduce residual ridge resorption and enhance mastication and hence nutritional status, improve speech, and patient self-esteem. (**Doundoulakis, *et al.*, 2003**).

➤ Factors that govern the planning of the overdenture treatment follow:

- The number and length of the implants
- Quality and quantity of the anchoring bone tissue
- Economic constraints (**Hasti, 2019**).

1.2.2.1 Advantages of Implant Support Overdenture

The following are some of the advantages of implant-supported overdentures:

1. Increased stability: Traditional dentures can sometimes feel loose and slip, leading to problems with eating hand, provide a stable foundation that keeps the denture securely in place., speaking, and smiling. Implant-supported overdentures, on the other.

2. **Improved comfort:** Implant-supported overdentures are more comfortable than traditional dentures since they don't use suction or adhesive to stay in place, reducing irritation and sore spots.
3. **Enhanced aesthetics:** Implant-supported overdentures look and function like natural teeth, giving you an aesthetically pleasing smile that you can be proud of.
4. **Improved chewing ability:** Because implant-supported overdentures are more stable, you can eat a wider variety of foods and chew more effectively, improving your overall nutrition and well-being.
5. **Improved speech:** Traditional dentures can sometimes cause problems with speech, such as a lisp or difficulty pronouncing certain words. Implant-supported overdentures can improve speech clarity and allow you to communicate more confidently.
6. **Improved confidence:** With implant-supported overdentures, you can smile, talk, and eat with confidence, improving your quality of life and overall well-being. (Gray and Patel, 2021).

1.2.2.2 Disadvantage of Implant Support Overdenture

The following are some of the disadvantages of implant-supported overdentures:

1. **Cost:** Implant-supported overdentures can be more expensive than traditional dentures due to the cost of implants and specialized denture design.
2. **Lengthy treatment time:** The process of getting implant-supported overdentures can take several months, as it involves multiple appointments for implant placement, healing time, and fitting of the denture.
3. **Surgery:** Implant placement requires oral surgery, which may cause discomfort, swelling, and bleeding.

4. **Maintenance:** While implant-supported overdentures require less maintenance than traditional dentures, they still require regular cleaning, check-ups, and adjustments to ensure they remain stable and functional.

5. **Not suitable for everyone:** Some patients may not be suitable for implant-supported overdentures due to factors such as the condition of their jawbone or overall health.

6. **Risk of implant failure:** In rare cases, implants may fail due to factors such as infection, poor implant placement, or bone loss. This can require further surgery to rectify. (Gray and Patel, 2021).

1.2.2.3 Indications of Implant Support Overdenture

- in patients who have lost all or most of their teeth, have sufficient bone density and volume to support dental implants, and want a stable and functional replacement for their missing teeth.
- Patients with denture-related problems such as instability, discomfort, impaired speech and chewing, and poor esthetics are also good candidates for implant-supported overdentures.
- Additionally, patients with compromised oral health due to periodontal disease or tooth loss may benefit from implant-supported overdentures (Nissan, 2019).

1.2.2.4 Contraindications of Implant Support Overdenture

- Insufficient bone volume and density - If the patient does not have enough bone to support the implant securely, then implant overdenture is contraindicated.
- Poor oral hygiene and oral health - Patients with untreated gum disease or oral infections should not receive implant overdentures since these conditions can increase the risk of implant failure.

- Chronic illness - Patients with chronic conditions such as diabetes, kidney disease, cancer, and autoimmune diseases may not be suitable candidates for implant overdentures.
- Heavy smoking - Heavy smokers are at higher risk of implant failure and may not be good candidates for implant overdentures.
- Active periodontal disease - Patients with active periodontal disease may have decreased implant success rate and are not recommended for implant overdenture treatment until the disease is under control.
- Pregnancy - Implant-supported overdentures are not recommended during pregnancy due to the increased risk of complication for both the mother and child.
- Age - Patients who are very young or very old may not be the best candidates for implant overdentures due to their bone density and other health concerns.(**Gómez-de Diego *et al.*, 2014**).

1.2.2.5 Number and Location of Implants

During treatment planning for an overdenture, it is important to question not only whether there are an ideal number of implants that will maximize the retention of an implant supported overdenture but also how their location (maxilla or mandible) affects the outcome (**Ishida *et al.*, 2017**).

1.2.2.5.1 Maxillary Implant Support Overdenture

Maxillary implant-supported overdentures are a type of dental prosthesis that rely on dental implants to support and retain the overdenture. These implants are placed in the upper jaw, or maxilla, and are typically made of biocompatible materials such as titanium. The number and location of implant support in the maxilla depend on factors such as the patient's bone density, the number of missing teeth and the force of your bite. Generally, four to six implants are placed

in the posterior regions of the maxilla to provide adequate support for the overdenture (**Mañes Ferrer *et al.*, 2020**).

The following are the basis of diagnostic and therapeutic criteria:

1. Minimal number of required implant is preferably four.
2. Evenly distribution of implant throughout the arch.
3. Opposing mandible should be dentate or reconstructed with the fixed prosthesis.
4. Therapy with overdentures is more consistent with optimum placement of the implants with regard to bone quality and quantity.
5. Overdentures may better resolve esthetic and speech problems
6. Labial flange of the overdenture provides lip support.
7. Overdenture may have a horse shoe design, thus more acceptable to the patients (**Figure 1-8**) (**Hasti, 2019**).

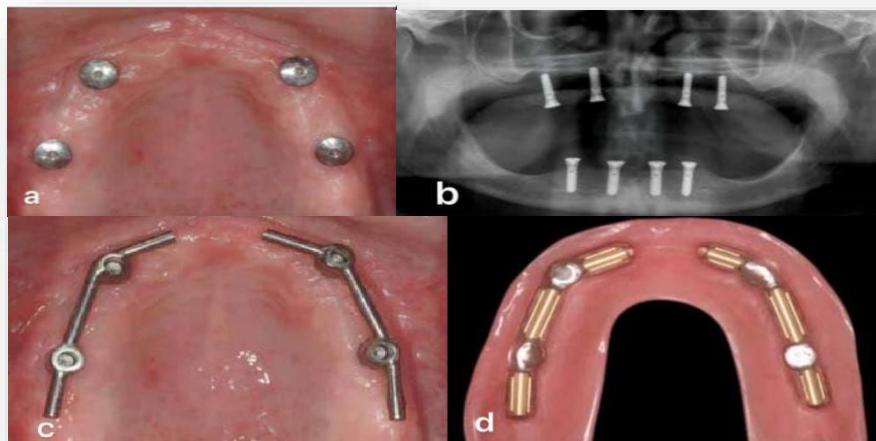


Figure (1-8): Four dental implants with cover screws in edentulous maxilla (a and b), Intraoral view of milled titanium bar fastened to dental implants in maxilla (c), View of inner surface of maxillary overdenture with chromium alloy structure and clips (d) (Slot *et al.*, 2012).

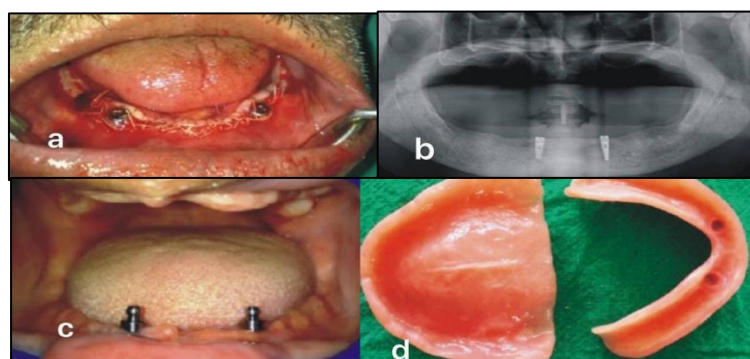
1.2.2.5.2 Mandibular Implant Support Overdenture

is a type of denture that is supported by dental implants integrated into the lower jawbone. This removable prosthesis provides improved stability and retention compared to traditional dentures that rely on only the soft tissues of the mouth for support. The number of implants needed varies depending on the individual's oral health and bone density. Mandibular implant-supported overdentures can significantly improve the patient's chewing and speaking abilities, and also enhance their overall quality of life (Al-Harbi, 2018).

Principles of treatment with mandibular implant-supported overdentures rely on the following clinical considerations.

1. Most elderly patients should be eligible for overdenture therapy.
2. Three implants can be placed if the minimum length of each implant is less than 8 mm.
3. Two implants should be sufficient to support an overdenture prosthesis.

Standard surgical procedure should be applied in most situations. (Figure 1-9) (Lambade *et al.*, 2014).



Figure(1-9): Two implants were placed in the mandible (a and b), Healing abutments were replaced by ball abutment into the implant (c), mandibular implant supported overdenture against maxillary conventional denture (d) (Boven *et al.*, 2014).

Different studies have evaluated the high survival rates of implant supporting overdentures. The overall survival rate is 95% in the maxillary arches and almost 100% in the mandibular arches (**Chrcanovic *et al.*, 2014**). The influence of smoking on the failure of implant treatment has been validated in many studies (**Bezerra Ferreira *et al.*, 2016**). Also Peri-implant diseases are more common in smokers because they have increased marginal bone loss (**Chrcanovic *et al.*, 2015**). Further, diabetes has been established as a risk factor for failure of implants supporting an overdenture; however, the exact relationship is yet unknown (**Liddelow and Klineberg, 2011**). Cardiovascular diseases are also a potential risk factor for marginal bone alterations (**Krennmair *et al.*, 2016**).

1.2.2.6 Impression Making Methods of Implants

1.2.2.6.1 Open Tray Impression

The open tray impression technique is one of the commonest impression methods used. This method helps in connecting the impression coping to the fixture in the oral cavity. After the impression material hardens, unfasten the impression coping's screw procedure from the open tray. Remove the impression body, and the impression coping is removed together with the impression body from the oral cavity. The open tray technique reduces the effect of implant angulation, deforming the impression material upon recovery from mouth, and removes the extra concern of replacing the copings into the impression (**Shankar *et al.*, 2016**).

1.2.2.6.2 Closed Tray Impression

A stock tray or a custom tray can be used in the fabrication of a closed tray impression for a fixed complete denture. The impression copings for a closed tray technique are placed on implants or multi-unit abutments and the impression made. The impression material polymerizes the impression is dislodged from the closed tray impression copings. Furthermore, the impression copings are removed

and implant or abutment analogs are attached to the copings. This then goes into the impression body during what is called a transfer process. The combined coping-analog assembly is then inserted into the definitive impression. It is called the closed tray technique since impression is taken through the existing tray or based on the indirect method. Mostly these impressions are utilized for preliminary impressions (**Pandey, 2017**).

1.2.2.6.3 A Trayless Impression Technique

Using this method, which was originally intended to facilitate impression making in the surgery, so the steps of this technique are as follow:

- a- For impressions at the time of surgery, place implant level transfer impression copings prior to suturing.
- b- Leave the upper half of the impression copings exposed, and place fast-polymerizing vinyl polysiloxane impression material.
- c- Place light-polymerized acrylic resin in manageable overlapping increments around the upper half of the impression copings.
- d- Remove the impression and pour in the cast (**Toth, 2005**).

This trayless technique facilitates making impressions in edentulous patients with restricted access. Considering the methodology used and the result obtained the direct impression technique with squared transfer copings with acrylic had better results than the other techniques studied (**Cabral and Guedes, 2007**).

1.3 Precision Attachment

An attachment is a connector consisting of two or more components. One component is connected to a tooth, tooth root, or an implant and the other component is connected to a prosthesis. Precision attachments, allow prosthesis to combine the advantages of fixed & Removable restorations. The precision attachment denture has long been considered the highest form of partial denture therapy. It combines a fixed & removable prosthodontics in such a way as to create

the most esthetic partial possible. It also has the reputation of lasting far longer than the conventional partial.(**Patel *et al.*, 2014**). The precision attachment partial should differ only in the means of its retention when compared to the clasp-retained partial denture. The only reason for utilizing this mechanical device is to replace the visible clasp arm. All other functions of the partial can be performed by conventional means if they are understood & the partial is constructed to the highest standards (**Shetty *et al.*, 2014**).

Attachments are rigid or resilient connectors that redirect the forces of occlusion. They are stress attenuators and absorbers. Their function is to protect & preserve soft tissue and bone, as well as provide retention and cosmetic alternatives (**Patel *et al.*, 2014**).

Implants are devices that are rigidly fixated to bone. This characteristic differentiates from natural teeth. Their long term success depends on bone characteristic, occlusal relationships and loading forces as well as the types of attachments selected (**Shetty *et al.*, 2014**).

1.3.1 Indications Of Precision Attachment

1. Fixed bridge work intra-coronal attachment on non-parallel abutments.
2. Partial denture.
3. Over-denture.
4. Unilateral or bilateral free end denture.
5. Implant prostheses (**Prasad *et al.*, 2016**).

1.3.2 Contraindication Of Precision Attachment

1. In patients who are sick and the senile (prosthesis with attachments must be inserted).
3. Patients with severe periodontitis.

4. Patients with abnormally high caries rate.
5. Where there is inadequate space (teeth that are very narrow faciolingually (**Prasad *et al.*, 2016**)).

1.3.3 Factors Affecting Precision Attachment Selection

The selection of precision attachment depends on several factors as follows:

1. Cost-effectiveness.
2. Amount of retention needs.
3. The expected level of oral hygiene.
4. Amount of available bone.
5. Patient's social status.
6. Patient's expectation.
7. Maxilla-mandibular relationship.
8. Inter implant distance.
9. Status of the antagonistic jaw (**Trakas *et al.*, 2006**).

1.3.4 Types of Precision Attachments

The attachments used to retain implant overdenture include stud, bar, magnets, and telescopic attachments.

1.3.4.1 Stud Attachments

Most of the stud attachments are simple in design, consisting of a male stud type that is soldered to a base. The base is a coping covering the prepared tooth stump, usually having a post extending into an endodontically treated root canal. Fixation is achieved by a female housing that is either

embedded in the acrylic of an overdenture or soldered to a substructure in the overdenture. The female housing can be rigidly attached to the male & classified as a non-resilient attachment. It could also be designed with a spring

load or some other engineered style to provide for a controlled movement & therefore be classified as a resilient attachment. (Hasti, 2019).

1.3.4.2 Magnets Attachments

A special type of concealed attachment not of male-female design. Some metal alloy possess magnetic properties which can be utilized in the retention of overdentures or partial dentures. Two different alloys are used as magnets in dentistry. These are cobalt-samarium & iron neodymium-boron. Both of these rare earth magnets, have strong attractive forces (Angdrijono, 2018).

The magnet is usually cylindrical or dome shaped attached to the fitting surface of the acrylic resin base of the overdenture. The magnetic keeper casted to a metal coping cemented to root surface or screwed over the implant fixture. The second part of the magnetic system is the ferromagnetic keeper which is screwed into the implants (Fig. 1-10) (Anupam *et al.*, 2014). The immediate loading of magnet attachment retained mandibular implant overdentures is considered as a viable treatment option in cases of the complete edentulous patient that increase retention and stability of conventional dentures (Anupam *et al.*, 2014).



Figure (1-10): A magnet attachment (magnet (A) and abutment (B)). The abutment is usually attached to the implant while the magnet is attached to the fitting surface of the overdenture (Bressan *et al.*, 2011).

1.3.4.3 Bars Attachment

have the advantage of spreading the loading between the abutment teeth. However, they impart high loading to those teeth, are difficult to clean, and relining is complicated. The bar is attached to the root face via a post system and the clip or sleeve is held in the denture (**Alqutaibi and Kaddah, 2016**).

- **There are two basic types based on the shape and the action performed:**

Bar joints that permit some degree of rotation or resilient movement between the two components. Spacers should be provided to ensure a small gap between the sleeve and the bar during processing (**Jain, Hemakumar and Sindhu, 2017**).

1.3.4.4 Telescopic Attachment

Telescopic crowns are also known as double crown, crown, and sleeve coping. These crowns consist of an inner or primary telescopic coping, permanently cemented to an abutment, and a congruent detachable outer or secondary telescopic crown, rigidly connected to a detachable prosthesis (**Slot et al., 2012**).

The use of telescopic retainers has been expanded to include implant-retained prostheses to make use of their enormous advantages. These retainers provide excellent retention resulting from the frictional fit between the crown and the sleeve. They also provide better force distribution due to the circumferential relation of the outer crown to the abutment which makes the axial transfer of occlusal load that produces a less rotational torque on the abutment by improving the crown root ratio so preserving the tooth and alveolar bone (**Liddelow and Klineberg, 2011**).



Figure (1-11): Telescopic Overdenture and Implant-Supported Fixed Partial Denture (Liddelow and Klineberg, 2011).

1.4 Maintenance of the Overdenture

An important issue with this type of restoration is that patients must be informed that they will still have a removable prosthesis, the mucosa below the denture bases will still be loaded and continued maintenance of the prosthesis once delivered will be required (**Zhang *et al.*, 2017**).

➤ **The maintenance will include:**

1. Regular relines of the prosthesis.
2. Regular replacement of attachments.
3. Good oral hygiene and prophylaxis of the implants and possible breakage of components (**Zhang *et al.*, 2017**).

The type of attachment system used can influence the frequency of prosthodontics maintenance events required. The cleaning of implants and overdentures is easier when compared with fixed full-arch prostheses. The wearing of overdentures certainly enhances plaque accumulation and the risk of inflammatory soft tissue reactions (**Berger *et al.*, 2020**).

1.5 Objective of Regular Recalls for Patients with Overdentures

1. To check the overdenture for minor denture adjustments, retention, stability, occlusal adjustments, and maintenance of the attachment system.
2. To monitor implant osseointegration with marginal bone loss and the health of the oral and peri-implant tissues (**Berger *et al.*, 2020**).

CHAPTER TWO

CONCLUSION

The overdenture has become the first choice of treatment for edentulous patients. It can be used in conjunction with attachments to enhance the retention and stability. There is a potential effect of the different attachments used routinely in tooth and implant-retained overdentures

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