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Treatment of Some Difficult Cases in Prosthodontics Clinic

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Abstract

The objective of complete denture prosthodontics is restoration of function, esthetic, and the maintenance of patient's health to ultimately improve Quality of life of patient. Continuous diminution of the denture foundation after extraction and healing, have made evolution of various treatment modalities, including dental implant therapy, as a means to improve the denture foundation and biomechanics of prosthesis support, retention, and stability.

Objective: The objective of this review to show some simple non-invasive solutionsto treat some difficult cases in prosthodontics.

Conclusion: Many difficult cases in prosthodontics can treat by simple non-invasive treatment and cheap, such as treatment of patient with heavy resorbed lower ridge with conventional complete denture using the neutral zone approach, treatment of patient with partially edentulous patient with tooth supported over-denture, and finally, treatment of patient with bilateral undercuts on the buccal aspect of the maxillary tuberosity by soft liner at the boundaries in the area of undercut.

Keyword: *Treatment, difficult cases, prosthodontics clinic, heavy resorbed ridge, undercut ridge, partially edentulous patient.*

Introduction

The prime objective of complete denture prosthodontics isrestoration of function, esthetic, and the maintenance of patient's health to ultimately improve Quality of life of patient. Following rehabilitation, the oral cavity has to manage substantial volume of prosthesis. This virtually undetectable 3-dimensional positioning of prosthesis has been debatable topic since long time. Completedentures not only replace missing oral structures but also, serve to structurally redefine potential biometric spaces within the oral cavity. Included in this effort are the fabrication technique used, prosthetic teeth arrangement, occlusion planning, and finally, denture base volume or contour that markedly implicated in prosthesis stability and retention, phonetics, facial tissue support, tongue posture and function.[1,2]

As noted, continuous diminution of the denture foundation after extraction and healing, have made evolution of various treatment modalities, including dental implant therapy, as a means to improve the denture foundation and biomechanics of prosthesis

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support, retention, and stability. Regardless of implant feasibility, physiologically optimal denture contours and physiologically appropriate prosthetic teeth arrangement and selection of appropriate occlusion scheme should be considered to maximize prosthesis stability and hence, patient comfort and function.[3]

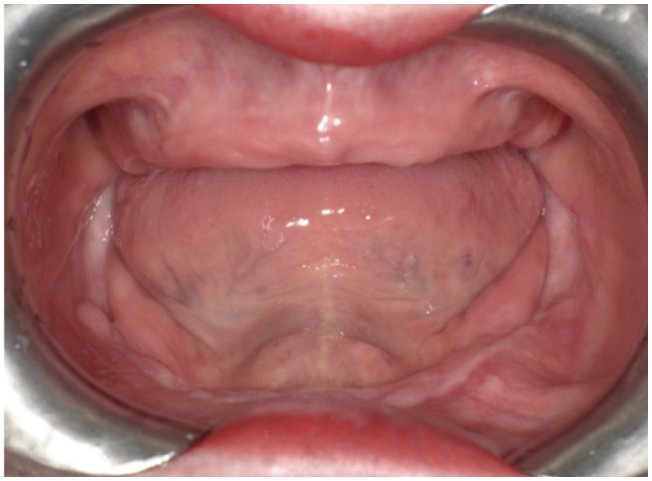
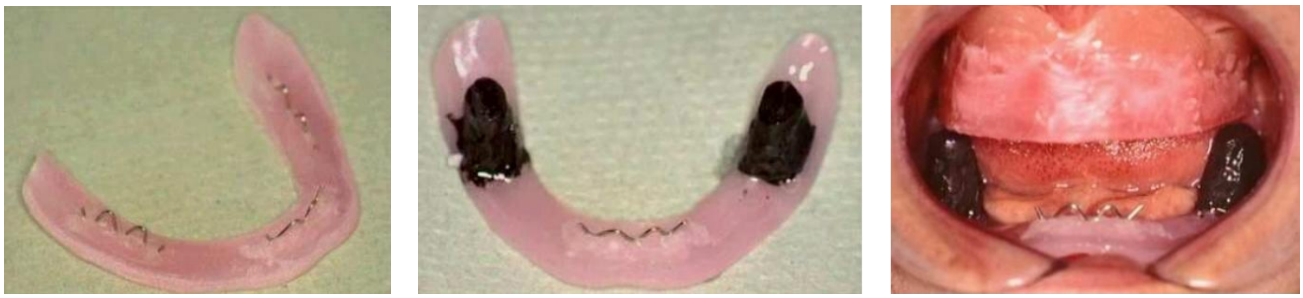


Figure (1): Heavy resorbed ridge, the crest of ridge with the floor of mooth.

Treatment of patient with heavy resorbed ridge: Residual ridge is the term used to describe the clinical alveolar ridge after healing of bone and soft tissues following extractions. Residual ridge resorption is a term used for the diminishing quantity and quality of residual ridge after teeth are extracted. It is a chronic, progressive and irreversible process with the rate being fastest in the first 6 months after extraction. There is increased tendency for mandibular ridge to undergo resorption compared to maxilla.Some patient with heavy resorbed ridge (fig.1) can treated either by mandibular implant retained over denture, but this option remained unfeasible for all patient, as the expense of the treatment was unaffordable to patient. The other choice was that a complete denture would be provided to the patient using the neutral zone approach so that the retention and stability of the mandibular dentures could be provided.[4]

Technique: The principles employed in impression making should be maximal support, retention and stability. After making preliminary impressions by the impression compound, the border molding carried out conventionally, using low-fusing impression compound, and the final impression was made with zinc oxide impression paste.Maxillomandibular relationship was recorded conventionallyand mounting procedure was completed. For neutral zone recording, the mandibular occlusion rim was removed and wire loops then attached to the mandibular temporary denture base,the height of mandibular occlusion rim was maintained anteriorly and posteriorly by impression compound pillar. Evaluation of bucco-lingual position of the wire loops done intra-orally and the free-way space was assessed again(figure 2:A, B and C). A thick mix of temporary soft denture liner prepared and placed around the mandibular temporary denture base. The patient was then told to perform various movements of lips, tongue and the cheeks including swallowing, pursing lips, pronouncing E and O sounds. While the patient performing these movements, the occlusal rims were kept in occlusal contact where possible. Hence, the forces exerted on the soft denture liner material molded it into the shape of the neutral zone. These functional movements were performed for 20 minutes after which the temporary denture base was removed along with the finished neutral zone impression. Vinyl polysiloxane (VPS) putty (Express STD, 3M ESPE AG Dental product, Germany) adapted to make multi-part impression generated matrices. Once



A **B** **C**

Figure 2: A: Lower special tray with metal spurs, B: Impression compound piller tocorrect the occlusal height, C: Recording Maxillomandibular relationship

molded into the lingual, labial and buccal surface of the neutral zone record, it must be ensured that it completely filled in the tongue space, level withthe occlusal plane, and extended up to the posterior land area of the cast. After polymerization completed, the matrices was checked on the cast without record to ensure complete seating and the wire loops along with the soft liner neutral zone record were removed and replaced with base plate wax using the VPS putty matrices. Maxillary and mandibular anterior teeth were arranged to satisfy the esthetics and phonetics, and the mandibular posterior teeth were arranged within the recorded neutral zone, touching the lingual index and at the level of recorded occlusal plane.

The trial dentures were then processed and finished using conventional method. After insertion, the patient was recalled for postinsertion adjustment at 48 hours and then asked to come for periodic follow up. This physiologically based complete denture designing has been especially effective for mandibular removable prosthesis.[4]

Management strategy discussed here emphasize on recording the physiologic dynamics of oral and perioral muscles that helps in developing complete denture contour, prosthetic teeth arrangement and selecting appropriate occlusion scheme for restating and revitalizing the stability of complete denture in atrophic residual alveolar ridges. The fabrication of denture contours to harmonize with aberrant neutral zone dimensions results in increased denture stability and improved oral function. Positioning of the artificialteeth and connection of the polished surfaces with the surrounding tissues are two major factors that determine success in complete denture therapy. When artificial teeth are arranged within the neutral zone, the prosthetic teeth do not interfere with the normal oral function. When teeth are arranged within neutralzone they do not interfere with normal muscular function and normal oral and perioral muscular activity imparts the forces that tends to stabilize the denture. [4]

Treatment of partially edentulous patient with overdenture: 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.[5] It is one of the most practical measures used in preventive dentistry. Overdentures can be either tooth supported (conventional/immediate) or implant supported. It is found to help in the preservation of alveolar bone and delay the process of complete edentulism.[6] An overdenture is a denture, the base of which covers one or more teeth, prepared roots or implants.[7]An overdenture is usually used for elderly patients that have lost some teeth but not all, rendering them suitable for a set of full dentures. The over denture is not fixed in the mouth; it is removable, it's advantages compared to full dentures is that the roots left in the jaw help preserve bone of the jaw, preventing bone resorption,another advantage is that the sensory aspect is improved, as thenerves in the roots are still present therefore sensation is improved greatly.[8] The gums around the teeth must be relatively healthy for an overdenture to not cause any further problems.[8]

The overdenture may be supported by implants. Even though there is no solid evidence to prove how many implants would be ideal to stabilise an overdenture, the most common number of implants used to stabilise a maxillary denture is four implants.For a mandibular overdenture, support was better given by 2 implants than it was when only one implant was present. The patient could also chew much better and was overall more pleased with the overdenture.[9] At first, chewing capabilities are reduced however within 12 months of fitting the overdenture, the chewing cycle improves.[10]

The tooth-supported overdenture, this type of overdenture overlies natural tooth structures. Frequently, elective root canal treatment and coronal modification are carried out on the teeth that are used as abutments. This means that the pulpal tissues and crowns of the natural teeth are removed, followed by contouring of the tooth structure above the gum. This allows even distribution of occlusal stress onto the abutment teeth and soft tissues.[8] Other than that, retention of natural teeth in the jaw helps preserve bone by delaying the process of bone resorption in the jaw.[11]

The abutment tooth location was very important to provide adequate support, there should be one abutment tooth per quadrant and the most favourable abutment was canine.The teeth selected to provide support should be healthy i.e. not decayed and no/manageable gum disease, thus ensuring long term retention in the jaw.If the tooth need endodontic treatment, the crown of the abutment teeth has to be removed to allow space for placement of overdenture without interfering the bite. Therefore, the pulp has to be removed. If the root canals of the abutment teeth are obliterated, endodontic treatment is not required. Teeth with non-negotiable root canals should not be selected as abutments.[5]

The implant-supported overdenturein which edentulous patients with sufficient amount of bony ridge on their jaws can treat with implant supported overdenture.[8] This type of over denture gains support from both the dental implants and intraoral tissues. Having implant-supported overdenture provides better stability of prosthesis and reduce bone resorption.[12] However, a conventional complete denture can be considered as an alternative due to less treatment time needed.[13]Also the overdenture can be classified according to the time into: immediate overdenture, transitional overdenture, and definitive overdenture.

The overdenture was indicated in many cases such as to obtain retention and stability, if prescribing a removable prosthesis and there is limited remaining firm teeth in the dentition an overdenture may aid in retention and stability compared to that of a conventional removable prosthesis.[6]The use of an overdenture delays the process of leaving the patient completely edentulous and assists in the preservation of bone.[6]As a main priority for many dentists and patients, preventative dentistry is a reason for prescribing an overdenture as it retains the natural teeth for longer.[16]Overdentures can be useful for patients with a severe ridge defect or bone resorption.[15]Patients who have unfavourable tongue positions and muscle attachment for a conventional removable prosthesis could find that an overdenture has increased retention and stability.[14]Also if the patient has a superficially placed mental nerve, then the preferential choice of treatment may be to leave certain teeth in place in order to prevent damage to the nerve and prescribe an overdenture for any aesthetic needs.[15]

The overdenture have many disadvantages like: the susceptibility of the overlaid teeth to caries is high, periodontal disease of the retained teeth, bony undercuts of the alveolar ridge are often found adjacent to retained teeth, overdenture construction is time consuming and expensive.[16]

The overdenture was contraindicated in some cases like in patient with: poor oral hygiene, inter-arch space inadequate to accept the denture and the abutments, mentally and/or physically handicapped patient, periodontally involved remaining teeth, class III mobility that is due to the loss of alveolar bone that cannot be corrected, soft tissue and osseous defects, inadequate zone of attached gingiva, patients who will not keep the retained teeth free of plaque. Also some cases of teeth that cannot recieveendodontic treatment like in case of: vertical fracture of the root or roots, mechanical perforation of the root, internal resorption that has perforated through the side of the root, broken instrument in the root canal, horizontal fracture of the root below the bony crest.[16]

Treatment of patient with heavy undercut: Unilateral or bilateral undercuts on the buccal aspect of the maxillary tuberosity are frequently encountered and these may complicate the successful fabrication of a complete maxillary denture. The management in these situations includes alteration of the denture-bearing area, adaptation of the denture base, careful planning of the path of insertion, and the use of softlining materials.[17]The alteration of the denture-bearing area refers to the elimination of the undercut by surgical reduction of the tuberosity. Following surgery, a good border seal can generally be attained . If surgery cannot done in such patient due to time, cost or general health status of the patient, the management of the bilateral undercuts can be done by blocking out the undercut on the cast and finishing the denture to the full available height of the vestibule. Alternatively, the height of the flange of the denture can be reduced to the crest of the undercut (tothe survey line when the cast has been surveyed). A reduced border seal may accompany such a denture base adaptation.[17]

There are several cases of upper complete denture with bilateral undercut such as bilateral big tuberosity or the patient has bony exocytosis or has irregular traumatic ridge due to recently extraction, we should have resolve for this problem .Buccal undercut of the maxillary tuberosity together with reduced width of the buccal vestibule can complicate denture fabrication. the rationale for the design and use of flexible denture flanges in the maxillary posterior buccal vestibule. [18]

Functional forces are transmitted to the basal seat mucosa through a hard denture base during mastication. Such hard base dentures are not comfortably tolerated in patients with fragile oral mucosa and will cause sore spots, masticatory pain, and further resorption of alveolar bone. Soft liners materials can be advocated successfully to manage such clinical situations. The soft liner material absorbs masticatory forces by means of the cushioning effect and distributes occlusal forces uniformly to prevent trauma to compromised residual ridges.[18]

We can either do surgical extractions of one of this bilateral under and blockout the other and change the path

of insertion,an Oral Surgeon usually performs a tuberosity reduction, in coordination with a general dentist or a dentures specialist (prosthodontics).In some people, the sinus cavity (antrum) extends into the tuberosity. The Oral Surgeon needs to know where your sinus cavity is in relation to the tuberosity, so you may need X-rays before the procedure.[18]Or use denture with soft liner material ‹soft liners will spring around these undercuts and allow for greater retention . Denture soft lining materials provide a spongy, cushioned interface between the hard base of a denture and the oral mucosa.[19]

The Soft liner material is helps to absorb shock and to improve the fit of a denture. There are several types of liners available, each made from materials which offer unique benefits. A dentist or prosthodontics can determine the need for a liner, as well as the appropriate type, based on a patients anatomy, concerns and goals, and the fit of their existing denture, if applicable. With this attention to detail, soft liners can allow dentures to fit more comfortably and securely while restoring normal oral function. Many patients find it easier to adjust to a denture when it is fitted with a soft liner. [19]

There are two categories of soft liners: those that are used in temporary or transitional situations, and those that are used on a more permanent basis.[20]Morphological irregularities, persistent mucosal irritation, and complaints of looseness despite an intimate fit of the denture base are reasons to consider a soft denture liner.[21] It Indicated in case of patient with pronounced bone or gum erosion, which can result in a loose-fitting restoration, an uneven jawbone, especially jagged edges in one or more locations, sores on the soft tissue that fail to heal or gum inflammation, and in patient who finds it difficult to chew while wearing his current denture. [20]

The soft liner have many advantages as improving the health of the gum tissues by absorbing some of the pressures of mastication (acts as a tissue conditioning material), helps to determine the maximum retention possible by utilizing undercuts in the bone and gum which hard liners may not be able to negotiate without causing irritation, virtually all patients respond well to soft liner materials. [21]

The chemical composition of soft liner: Spectroscopic analysis showed that the main component of soft liner was vinyl-terminated poly(dimethylsiloxane), and the adhesive was 3-methacryloxypropyltrimethoxy silane. NMR results revealed that other components included benzoyl peroxide as initiator for polymerization and also silicilic acid. Surface analysis by XPS provided interesting insights about the nature of adhesive bonding, as well as diffusion of silicilic acid through the matrix of the processed material and leaching-out. DMA results showed a two-phase character, and that the cured polymer was highly elastic.[22]

We should give the patient instructions about the home care to clean the lined denture, rinse it under running water and brush it lightly. Do not soak the denture in a denture cleaning solution. [23]

Soft liners fall into one of two categories of materials: Plasticized acrylic resins,the primary benefit of these liners is their softness. However, they are designed for short-term use and typically last only three to six months. Often, prosthodontics will use a plasticized acrylic resin liner for first-time denture wearers. These liners can also be a good solution for patients who have recently had an extraction. Silicone elastomers: although these liners are not as soft as those made from plasticized acrylic resins, they are much more durable and can last up to a year. This type is often appropriate for patients with thin or flattened soft tissue. If patients are thinking about getting a different denture, a silicone elastomer liner can allow them to try out the fit before committing to a brand new restoration.[21]

The temporary soft liner has some limitations, since the reline material is applied to the tissue side of the denture base, the addition will ergo cause a change in the vertical dimension. Excessive material may also cause the denture bases to shift during the reline procedure. It is imperative that the depth of the material applied not be excessive enough to cause the interocclusal space to be decreased causing a change not only in occlusion and aesthetics, but also in comfort.Soft liners have also been shown to promote the growth of candida albicans. Denture cleanliness is stressed to prevent fungal growth and subsequent staining and bad odor. [24]

Conclusion

Many difficult cases in prosthodontics can treat by simple non-invasive treatment and cheap, such as treatment of patient with heavy resorbed lower ridge with conventional complete denture using the neutral zone approach, treatment of patient with partially edentulous patient with tooth supported over-denture, and finally,

treatment of patient with bilateral undercuts on the buccal aspect of the maxillary tuberosity by soft liner at the boundaries in the area of undercut.

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Ethical Clearance: The Scientific Committee of the Department of Prosthodontics,Faculty of Dentistry, University of Babylon, Iraq are approved to perform this study.

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