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Custom fabricated castable ball attachments for Tooth- supported Overdenture – A clinical case report

Dr Pardeep Bansal

Professor & Head, Department of Prosthodontics, Dasmesh Institute of Research & Dental Sciences, Faridkot

Dr Manan Gupta

Post-Graduate, Department of Prosthodontics, Dasmesh Institute of Research & Dental Sciences, Faridkot

Dr Preetika Bansal

Professor, Department of Periodontics, Dasmesh Institute of Research & Dental Sciences, Faridkot

Dr Kashish Narang

Post-Graduate, Department of Prosthodontics, Dasmesh Institute of Research & Dental Sciences, Faridkot

Dr Ambuja

Post-Graduate, Department of Prosthodontics, Dasmesh Institute of Research & Dental Sciences, Faridkot

Abstract---Preservation of what is remaining is the primary goal for any prosthodontic treatment plan. In elderly patients with few remaining teeth, Instead of extraction, a clinician can preserve and utilise the remaining teeth as abutments for an overdenture. The main advantages of a conventional tooth supported overdenture are the preservation of the remaining tooth structure along with its proprioception, preservation of the alveolar bone, additional support to the dentures and above all, the psychological advantage to the patient that they still have their own teeth. The concept of overdentures may not be an elixir, but it is a positive means for delaying the process of complete edentulism and helps in the preservation of bone. A step by step clinical case is presented here which describes the intricacies of tooth supported overdenture.

Keywords---Overdenture, Ball Attachment, Overlay Denture, Attachment Overdenture.

Introduction

Tooth supported overdenture is a type of preventive prosthodontics procedure where emphasis is placed on preserving remaining teeth/ tooth or root and to delay future prosthodontics problems. DeVan golden statement: "Perpetual preservation of what remains is more important than the meticulous replacement of what is missing" still holds value. There are many removable and fixed treatment options available for completely edentulous patients. A timely planned root supported overdenture has been a proven mainstay of preventive prosthodontic therapy as it attempts to conserve the few remaining natural teeth/roots and reduce alveolar bone resorption. Alveolar bone resorbs at a faster rate without the support of natural dentition.

To avoid this, two or more, coronally modified or restored retained teeth abutments are frequently endodontically prepared and are used as abutments for an overdenture. The objective is to distribute stress concentration between retained abutments and denture-supporting soft tissues. An overdenture can be defined as "A removable partial denture that covers and rests on one or more natural teeth, the roots of natural teeth and/ or dental implants". GPT-9 According to Prieskel, abutment preparation for overdentures can be done in three ways: The preparation of root surface just above mucosal level (a) bare root face (b) dome-shaped gold coping; the use of attachments, and (c) thimble-shaped gold copings.

The selection of abutment teeth is a very important step in the success of this technique. The selection of abutment teeth must be based on its periodontal status, mobility, location and endodontic and prosthodontics considerations. Teeth which are periodontally compromised but can also be considered suitable as abutments for overdenture as by changing crown root ratio may improve the prognosis. The bicuspid/ canine area in both maxilla as well as mandible is regarded best for overdenture. This is because the anterior ridge appears most vulnerable to time dependent occlusal stress and resorbs faster. The other reason for selecting anterior teeth is that, it is easier and cost effective to preserve single rooted teeth.

Case report

A 54 year old male patient reported to the department of prosthodontics with chief complaint of mobility of teeth and difficulty in chewing food. Intraoral examination revealed multiple missing teeth with respect to both maxillary and mandibular arch. The teeth present were 11, 13, 14, 23, 25, 31, 33, 36, 41, 43, 44. Grade II mobility was seen w.r.t 11, 13, 23, 31, 41 and grossly carious w.r.t 14, 25 and 36. Teeth 33, and 43 were in good clinical condition as compared to the other teeth. Orthopantomogram was done to assess the status of bony support, crown root ratio and pathology (if any) of the remaining dentition. Various treatment options like complete denture, partial removable denture, implant supported prosthesis were discussed with patient. Since the patient wanted to retain a few natural teeth, it was decided to go for tooth supported overdenture in lower arch and complete removable prosthesis in upper arch. Teeth with poor prognosis were extracted and follow up done (FIG-1).

Procedure

A diagnostic impression was made with Alginate (Algitex, DPI India) and diagnostic casts fabricated. Record bases and rims were fabricated with modelling wax for tentative jaw relation (FIG-2). The casts were mounted on semi-adjustable articulator (Hanau Wide Vue, Teledyne USA) to assess the inter-arch space. It was decided to go for short copings (2-4mm) which will permit adequate space for custom ball abutment and attachments. The abutment teeth 33 and 43 were subjected to root canal treatment and dome shaped crown preparation having 3-4 mm height and chamfer margins were prepared.

Next, post space preparation was done with peeso-reamers leaving 4 mm of hermetic peri-apical gutta purcha seal. Custom post was prepared with the help of orthodontic wire (Gauge 20) and resin pattern (GC, America) (FIG-3). For custom attachment, 2.4mm standard ball abutment was taken and a putty index was made, which was later duplicated in pattern resin. This pattern of prepared Ball Attachment was then attached to custom post copings. Sprues were attached to the resin pattern post coping and casted in base metal alloy CO-Cr alloy in conventional manner. The custom fabricated post with ball attachment was finished and polished. Trial was done intra-orally and fit of custom post was found to be satisfactory. Cementation was done with luting cement GIC-1 (GC, Fuji) (Fig-4).

Upper and lower primary impression was made with Irreversible Hydrocolloid (Zelgan, India). Custom trays were then fabricated with self-cure acrylic (DPI, India) and border moulding completed with green stick compound (DPI, India). Final impression was made with medium body PVS (Reprosil Densply, USA) (FIG-6). Jaw realtion registration was done. Teeth arrangement was done on semi-adjustable articulator (Hanau Wide Vue, Teledyne USA) after facebow transfer. Trial was done (FIG-6) and patient's consent was taken. It was then processed in heat curing acrylic resin (DPI, India). The metal housing and plastic cap (Adin, USA) were placed on ball abutments (FIG-7) and undercut was blocked with carding wax (DPI, India). The intaglio surface of lower prosthesis were selectively relieved in attachment area and checked for complete and passive fit in the mouth. The pickup of housing were completed using self cure acrylic resin (DPI, India). Finishing and polishing was done and final assessment in relation to fit, retention, aesthetics and above all patient satisfaction was done (FIG-8). Post insertion instructions were given to the patient and follow up visits were planned 3 months, 6 months and 1 year. The patient adapted really well to the overdenture and was very satisfied with the function and esthetics.

Discussion

The crest of residual ridge is an important area for support of complete denture. However, bone is subjected to resorption and the process speeds up once the teeth are extracted for whatever reason. Therefore, it can be rightly said that presence of healthy periodontal ligament maintains the integrity of the alveolar bone. In geriatric patients with few remaining teeth, overdenture is a good option as preventive prosthodontic treatment modality. The concept behind the tooth

supported overdenture is to share masticatory load between the abutment teeth and tissue supporting the denture.

Various researchers have found that this technique helps in reduction of the consequences of wearing a denture like: loss of occlusal stability, residual ridge resorption, compromised masticatory function and compromised aesthetic appearance. With the preservation of natural teeth, patient tend to have psychological comfort that they still have their own teeth. This in turn helps patients discriminate better occlusal awareness, biting force and neuromuscular control. Rissin et al. in 1978 compared masticatory performance in patients with complete denture and tooth supported over denture. They found that the overdenture patients had a better chewing efficiency one-third higher than the complete denture patients.

The other treatment options for preservation of residual ridge is placement of endosseous implants as tooth root replicas. This advancement in dentistry has ushered in a new era for treatment of edentulous patients. But at the same time it is expensive, requires surgical intervention and is dependent on the osseointegration between the implant and bone. In the present case study, customized intra-radicular posts were fabricated with ball attachment that helped in extra coronal retention. The decision to place ball abutments was taken after analysing the tentative jaw relation, as there was adequate space available. Patient was very much satisfied with the retention of the prosthesis and the aesthetic outcome. Also, the treatment was cost effective.

Selection of abutment teeth is one of the most important step while planning in such cases. Numerous studies have reported loss of abutment teeth with time. The most frequent cause of tooth loss are periodontal disease, caries and endodontic complications. Therefore emphasis should be given while selecting the abutment teeth, preparing it for receiving overdenture and patient should be given thorough instructions for maintenance and follow up. The principal aim is to prevent accumulation of plaque and adequate denture wearing habits. Therefore, patient education in terms of cleaning habits is very important and needs reinforcement every time patient visits for follow up.

Summary

Customization of attachments in tooth supported overdentures is challenging to execute, also demands perfection both at the dentist and technician level. The results achieved if planned correctly are worth the effort. Patient's attitude and enthusiasm toward treatment should also be assessed as patient selection is crucial for success. Attachment retained overdentures should be chosen carefully for those who understand limitations and benefits of overdentures.

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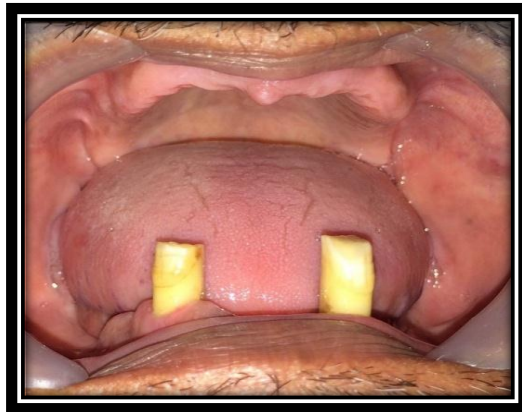


Fig: 1 Mandibular arch showing 33,43

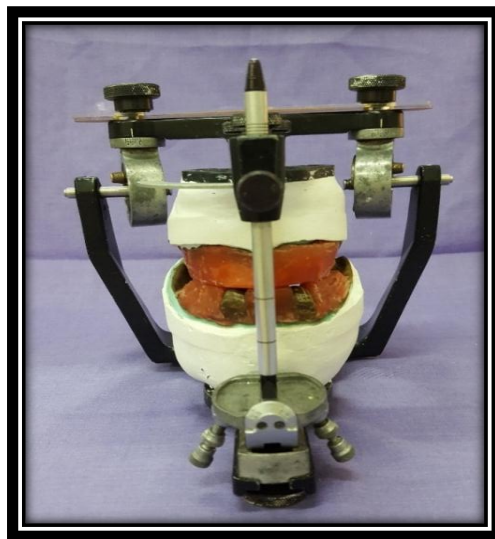


Fig: 2 Tentative Jaw Relations

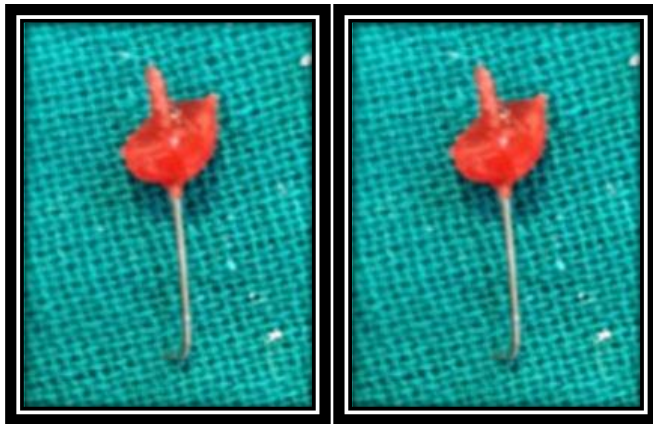


Fig 3: Custom Fabricated Posts for 33,43



Fig 4: Custom Post with Ball attachments



Fig 5: Secondary Impression made



Fig.6: Trial of denture

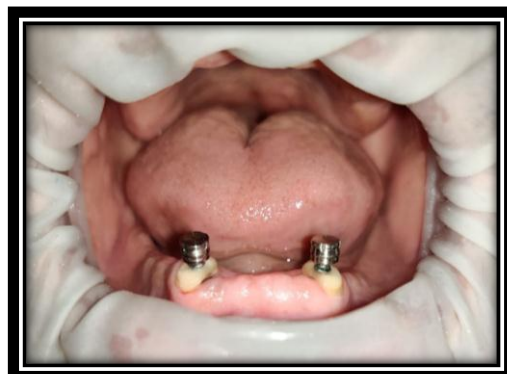


fig 7: Metal housing over ball attachments



Fig. 8 a,b Final prosthesis delivered