Case Report

Innovative Treatment for Rehabilitating Patient Following Maxillary Resection for Ameloblastoma with Magnet Retained, Hollow, and Metal Reinforced Over Denture

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Abstract

Maxillofacial defects compromise the appearance of patients and results in various psychological problems. The purpose of this case report is to demonstrate the benefits of appropriately rehabilitating surgical resection of ameloblastoma with aggregate treatment protocol for enhancing patient esthetics and function capabilities. In the present case, surgical removal of part of the palate and most of the teeth made the labial and buccal mucosa more stretched and fibrous, thus compromising retention and stability of denture. With few teeth left in one quadrant, direct retention from them deteriorates their health, so the magnets were used which offered definitive advantage of retention without excessive deleterious stress acting on the abutments. As resection resulted in mid facial loss, reinforcing lip for esthetics with conventional denture adds excessive weight; to overcome, this hollowness was incorporated in the anterior segment of the denture. Reinforcement of thin metal mesh was done as denture opposes natural teeth in the mandible.

Keywords: Ameloblastoma, Magnet retained over denture, Metal reinforced denture.

Introduction

Patients who underwent surgical resection in orofacial region suffer from compromised esthetics and functional abilities such as mastication, swallowing, and speech. The rehabilitation of these patients with disabilities of the head and neck continues to be a challenge. Maxillofacial defects result in facial disfigurement, thus leading to psychological problems. This, in turn, creates great difficulty in facing and accepting the social consequences. Today, it is possible to restore most patients to nearly normal form and function, enabling them to lead useful and productive lives.[1] Basic prosthodontic principles are followed during the fabrication of obturator prosthesis, while taking extreme care of the more resilient and unsupported tissues. Some principles need to be modified according to the defect, the condition, and the position of the remaining structures. The defect, in conjunction with the remaining structures, must be used to provide support, retention, and stability to the prosthesis.

In cases with few teeth preserved which are restricted to one quadrant, difficulties arise in acquiring adequate retention and stability. Aramany classified maxillary defects based on relation of the defect area to remaining abutment teeth. Present situation comes under class IV that is the defect crosses the midline and involves both sides of the maxillae. There are few teeth remaining which lie in a straight line.[2] Hence, direct retention from abutments expose them to destructing stresses so a unique magnet retained over denture was planned. Dental magnetic attachment systems have been increasingly utilized in prosthodontics to improve the retention of over denture. Recently, developed hard magnetic substances such as samarium-cobalt and iron-neodymium-boron magnets (Fe14Nd2B) provide stronger magnetic force per unit size than the earlier open-field aluminum-nickel-cobalt magnets

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which are susceptible to corrosion by the saliva and provide weak retentive force.[3,4]

In the large maxillofacial defects and in severely resorbed ridges, the available denture bearing area for support, stability, and retention is less. To decrease the leverage forces, reduction in weight of the prosthesis was recommended and was also found beneficial.[5] In this case, resection caused mid facial defect that resulted in concave profile. To restore profile, the use of conventional design results in excessive weight of the denture. Hollowness in the anterior segment solved the problem.

An innovative technique of fabrication of magnet retained over denture with hollowness in anterior segment and metal reinforcement in posterior segment is illustrated here.

Case Report

A 58-year-old male patient was referred to department of prosthodontics, CKS Theja Dental College, Tirupati. His medical history revealed that he underwent surgical resection in maxillary region as he was diagnosed with ameloblastoma. Extraoral examination revealed that the patient has significant bone loss in anterior maxillary region that resulted in concave profile (Figures 1 and 2). Intraoral examination revealed partially edentulous maxilla with resection extending to other side of arch with remaining natural teeth (26, 27, and 28) in straight line, so this comes under typical Aramany class IV. Palpation and orthopantomogram examination, diagnostic impressions, revealed that maxillary bone was resected and resorbed. To improve retention, stability of prosthesis and to preserve long-term health of remaining abutments, an aggregate treatment of magnet retained over denture with hollowness in anterior region and metal reinforcement in posterior segment was planned.

Clinical procedure

Endodontic treatment and preparation of abutment to receive magnetic component

Abutment teeth (26, 27, and 28) were endodontically treated and prepared with diamond rotary instruments (Shofu, Kyoto, Japan) producing a chamfer finish line, and vertical height was reduced such that it is 4 to 6 mm above the finish line in the 26, 27, and 2–3 mm in 28. Access cavity was prepared in 26 and 27 region to receive conventional dental magnets (Ali brother Electronics, Ritchie Street, Chennai, India). Then, magnets were cut to required size using high speed hand piece and diamond burs. Each magnet was cut approximately to fit the prepared cavity and fit was verified. Now, magnets are ready to be cemented into their respective cavities. Prepared cavities are isolated and dried and magnets were cemented (Figure 3) with an adhesive resin (RelyX U100, 3M ESPE, St Paul, MN, USA). Excess cement was removed, sharp dentin edges rounded, and finally smoothened and polished. Impression of abutments and entire arch was made in irreversible hydrocolloid material (Zelgan 2002, Dentsply) using stock trays. Casts were poured

Figure 1: Frontal view before and after insertion

Figure 2: Lateral view before and after insertion

Figure 3: Customized intraoral magnets cemented

with type III dental stone (Kalabhai Pvt Ltd, India). On the cast obtained, wax patterns were fabricated, which were casted to form metal copings. These metal coping were cemented to their respective prepared abutments using type 1 GIC (GC Corporation, Tokyo, Japan) (Figure 4).

Preparation of denture to receive counter magnetic component

Preliminary impressions of maxilla and mandible were made in irreversible hydrocolloid material (Zelgan 2002, Dentsply) using stock trays and cast prepared in dental stone (Kalabhai

Figure 4: Metal copings cementation done

Karson Pvt Ltd, Mumbai, India). Acrylic custom tray (DPI-RR Cold Cure, DPI, Mumbai, India) with wax spacer (Modelling Wax No 2, Hindustan Dental Products, Hyderabad, India) was fabricated. Additional wax spacer was adapted over the abutments. Border molding was done with low fusing compound (DPI Pinnacle Tracing Stick, DPI, Mumbai, India), wax spacer removed, relief holes given and tray adhesive was applied, and final impression was made using light body silicone impression material (Aquasil, Dentsply). Master cast was prepared in dental stone (Kalabhai Karson Pvt Ltd, Mumbai, India). Bite registration was done and transferred to articulator. Teeth arrangement was done accordingly and trail denture was evaluated in patient's mouth. Before flasking procedure master cast was duplicated using agar and on the duplicated cast wax pattern was adapted for the fabrication of metal reinforcement mesh. Later, casting procedure was done and mesh was trimmed, finished, and checked for fit on the master cast. For creating hollowness in the anterior, maxillary region interchangeable flasks were used. Trail dentures are processed in conventional manner until wax elimination procedure. Wax of 2 mm thickness was adapted on to master cast and a second flask was used to invest modeling wax until wax elimination stage. Reinforcement mesh was secured on the master cast and cope was packed and processed with heat polymerizing resin (DPI, Mumbai). The permanent record base was left undisturbed on the master cast. Gauge piece with salt was rolled and placed on the master cast in the anterior region, this acts as spacer. To harmonize the space for heat cure resin, strips of modeling wax were placed on the ridge lap area of acrylic teeth including the buccal and palatal surface in the cope. The two halves of the flask were closed and, then, reopened. The thickness of the wax was, then, assessed with the help of the wax gauge and necessary modifications were done (spacer material was reduced wherever the wax was exposed or thinned out). This process was, further, repeated until the uniform thickness of the wax was achieved and thus ensured uniform space of 1.5–2 mm for the heat cure acrylic resin. Wax strip was then removed from the acrylic teeth. The heat polymerizing resin was then mixed, packed, and processed. Small opening was made with a bur into the denture base distal to most posterior teeth to remove the spacer. The cavity was cleaned and disinfected. Later, these openings were closed with the autopolymerizing resin. The dentures were, then, polished in usual manner. Before insertion of denture counterpart of the magnet was secured on to their respective abutments and necessary adjustment was done in the denture to create room. After final adjustments, relining was done with soft liner (GC Corporation, Tokyo, Japan) so that magnets are embedded completely inside denture. All the occlusal errors were corrected, insertion was done and post-operative instructions were given. The patient was kept under periodic recall. After 1 week, the patient reported an increase in masticatory efficiency and seemed happy with the esthetics.

Discussion

This article highlights functional rehabilitation of maxillectomy patient with magnet retained over denture. Magnets have generated great interest within dentistry, and their applications are numerous. The reason for their popularity in prosthodontics since 1960's is related to their small size and strong attractive forces; these attributes allow them to be placed within prostheses without being obtrusive in the mouth.[6] There are two different types of alloys used for the manufacture of small dental magnets. The first alloy used was cobalt-samarium magnets introduced in the sixties. A second alloy based on iron-neodymium-boron became available in the eighties.[7] Both these rare earth magnets have high attractive forces. However, they are brittle materials with a low corrosion resistance.[8] To overcome these problems, the magnets are encapsulated in stainless steel, titanium, or palladium. If wear of this coating occurs, then the alloy will come into contact with saliva. The combination of saliva contact and wear has a deleterious effect on the corrosion resistance of the material[8] and may be increased by the presence of bacteria such as Streptococcus sanguis.[9] This corrosion problem is well documented and can significantly affect the useful life span of intraoral magnets.[10] This is the single most important area of research into the effectiveness of intraoral magnetic systems.

The effects on biological tissues have shown that static magnetic fields do not appear to result in any changes to the human dental pulp or gingival tissues adjacent to the magnets. An *in vitro* study on osteoblasts failed to show any differences in the cell cultures when exposed to the static fields associated with these magnets.[11] Magnetic retention offers many advantages as it serves to dissipate lateral functional forces. There is less need for parallel abutments as a rigid line of insertion is not as critical. Furthermore, the technique is simple, involving minimal time at the chair side and in the laboratory. Magnets have been used as a retentive element for overdentures.[13,14] Hence, the use of magnet retained over denture is planned in the current situation for long term health of few abutments left.

Extreme resorption of the maxillary denture bearing area may lead to problems with prosthetic rehabilitation. Regular maxillary denture fabrication in this patient may

result in heavy denture that may lead to decreased retention and resistance.[15] To decrease the leverage, reduction in the weight of the prosthesis would be beneficial. It improves the cantilever mechanics of suspension and overtaxing of the remaining supporting structures. The method followed in this case report showed significant advantage of reducing weight of the denture.

In the present case, as denture opposes natural teeth conventional acrylic denture does not fulfill the desired tolerance to occlusal forces generated, to compensate that metal mesh reinforcement was given which significantly increased fracture resistance. After adjustments in the denture, final occlusal refinement was done to have uniform contacts. After a follow-up for 1 week, patient exhibited significant improvement in functional abilities and is very much satisfied with esthetics.

Conclusion

Surgical and prosthodontic rehabilitation of the maxillary and mandibular defects has the potential of being extremely gratifying to clinician as well as to quality of patient's life. The concept of overdenture retained by magnets was detailed in this case report. This method offers various advantages and convenience over their conventional counterparts. Magnet-retained overdenture preserving natural abutment teeth has better proprioception and satisfaction and also is psychologically beneficial as teeth are not extracted. The magnetic denture retention system is not advocated as a replacement for conventional precision retainers, but as a useful alternative, for reasons of convenience, cost, patient motivation, or poor prognosis, conventional retainers are unsuitable.

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