Case Report

Rehabilitation of a rhinocerebral mucormycosis patient

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A 17 year-old boy reported to the Army Dental Centre (R and R) with a disfigured face with ocular and palatal defects due to uncontrolled diabetes and mucormycosis fungal infection. The case was rehabilitated with a silicone eye prosthesis and a hollow-bulb obturator mutually retained with indigenous rare earth Nd-Fe-B (Neodymium-Iron-Boron) magnets.

Key words: Magnets, maxillofacial prosthesis, rhinocerebral mucormycosis

Juvenile diabetes is increasing at an alarming rate. Mucormycosis is a common invasive fungal infection in uncontrolled diabetes and requires strict glycemic control with insulin and extensive debridement. If not controlled properly, this can lead to loss of vital body parts. Eye and oro-nasal defects constitute a major portion of maxillofacial defects due to aggressive, saprophytic and fungal invasion.

A well-retained, user-friendly, removable maxillofacial prosthesis is the key to successful prosthetic rehabilitation in such cases. Providing comfort and protection to the remaining soft and hard tissues should be the paramount feature of rehabilitation. This allows the patient to be accepted in society without being a victim of unwanted sympathy. Indigenously designed 'rare earth magnets, especially Nd-Fe-B (Neodymium-Iron-Boron), if used properly, provide good retention and are also economical. The protocol for rehabilitation of such cases has been discussed in this case report relating to a patient with ocular and oro-nasal defects using indigenously designed magnets as retention tools.

CASE REPORT

A 17 year-old male patient reported to the Army Dental Centre with postoperative ocular and palatal defects. The chief complaint of the patient was facial disfigurement after the surgery and consequent disturbed speech. The patient was severely depressed and had become an introvert due to the resultant psychological trauma and did not continue with his studies [Figure 1].

Extra-oral examination revealed a very large, visible, surgical defect subsequent to radical surgery involving Sub total maxillectomy (right) and enucleation of the right eye, which led to the collapse of the right nostril and nasal wall. Intra-oral examination showed a postsurgical defect of size 6 x 4 cm in the region of the right maxilla and the hard palate extending to the soft palate along with black-colored eschar [Figure 2]. The palatal defect was in continuation with the ocular defect.

History and investigations revealed that the patient suffered from Type I Diabetes mellitus, requiring regular insulin therapy. The patient had poor glycemic control with HbA_1c (glycosylated hemoglobin) of 10%. He showed no evidence of micro- or macro-vascular complications. The case was evaluated by a Board of prosthodontists for maxillofacial rehabilitation. Treatment objectives were limited to rehabilitation of the ocular defect using an esthetically pleasant, natural-looking flexible material, along with closure of the intra-oral defect to facilitate swallowing, phonetics and to separate the oral cavity from the nasal cavity. It was decided to provide a magnet-retained, silicone eye prosthesis and a polymethyl-methacrylate hollow-bulb obturator.

PROSTHODONTIC PROCEDURE

A facial moulage was made to prepare a lab working cast. The patient was asked to relax comfortably in the dental chair tilted at an angle of 45 degrees. Petroleum jelly was applied on the eyebrows and eyelashes. Hydrated cotton ribbon gauze was placed all around the face, which was to be covered in the moulage. Irreversible hydrocolloid impression material was used for the impression. Only the upper lip was covered in moulage because the right nasal canal was

collapsed. Thinly mixed hydrocolloid was applied on the bordering area. Once the material was set, wet plaster bandages were placed over the alginate to provide mechanical strength. The reinforced impression was removed gently after complete setting. The impression was poured in die stone taking care to avoid air bubbles. A plaster of paris (POP) bandage provided good support to the impression material and avoided any distortion while pouring.

The master cast thus obtained was carefully inspected for any surface defects and bubbles. The eye defect was carefully marked. The right eye prosthesis was carved in modeling wax using a prefabricated eye shell button selected after matching color of the papillary and corneal portion of the left eye. During the trial, the prosthesis was checked for orientation of pupil, color, size and volume of sclera visible as compared to the contralateral eye. The eye prosthesis extended from the medial side into the nasal defect area. This extended process was measured and designed to come in overlapping contact with the palatal obturator. A nickel-coated Nd-Fe-B (Neodymium-Iron-Boron) square magnet of 1 x 1 x 0.2 cm size (400 gauss magnetic force) was selected for placement at the terminal medial end of the nasal process of the eye prosthesis [Figure 3].[1]

Once the trial was found satisfactory, flasking, dewaxing and packing were done in multilayers as per prosthodontic protocols and processed in RTV (room temperature vulcanizing) silicone material. Silicone-specific colors were used to match the color of the patient's skin. The position of the magnet was designed to attach it in such a way as to correspond to a magnet of similar size and power placed on the extended part of the hollow-bulb, acrylic obturator in the nasal cavity [Figure 3].[2]

The hollow-bulb obturator was made making a maxillary defect impression in a custom tray using irreversible hydrocolloid impression material. The prosthesis was designed by incorporating a long Adam's and pin head clasps to ensure a well-retained prosthesis with the remaining dental components. Once the prosthesis was fabricated and fitted, the exact position of the magnet on the extended eye prosthesis was traced on the obturator's maxillary body using alginate impression material. A counter magnet with the opposite pole was placed on the obturator with the help of self-curing methyl-methacrylate. The polarity of the magnets was checked properly before placement.[3]

The extended process of the eye prosthesis in the nasal portion was designed in such a way that it would not impinge upon the remaining nasal soft structures and once seated, it would not move with normal functions like swallowing, phonetics and deglutition. Silicone being porous can be a source of infection in such cases and hence, the patient was advised to apply Nystatin antifungal cream on the prosthesis surface coming in contact with the nasal / oral cavity. Once the prosthesis was processed in silicone, cyanoacrylate adhesive was used to fix the magnets with marked polarity to match the counter magnet on the obturator.[3,4]

A long Adam's and pin head clasps was provided for better retention of the prosthesis. The presence of all natural dental components was the main advantage in this case. A snugly fitted maxillary plate with an obturator totally covering the defect was the ultimate goal to restore masticatory function.

Methyl methacrylate being rigid provides a fixed surface for the magnet in an extended silicone eye prosthesis. When the patient wears the obturator, a fixed position of the magnet is available and once the eye prosthesis is seated in place, the magnet is automatically attracted to the obturator magnet and provides complete retention to both the prostheses. While removing the prosthesis, the patient was advised to remove the eye prosthesis first to prevent the flexible magnet from sliding out. Although nickel coating provides good shelf life to the magnets, they can be replaced as and when required.

The patient was given training in how to wear the prosthesis. The obturator was fitted first followed by the eye prosthesis so that both the magnets could attach to each other at the same height and position [Figures 4, 5]. Trendy goggles were also made to be worn by the patient to support and camouflage the prosthesis [Figure 6].[5]

DISCUSSION

Prosthodontists trained in maxillofacial rehabilitation have consistently faced the challenge of restoring form, function and esthetics in patients with multiple facial defects. The collective effort of maxillofacial surgeons and prosthodontists has given these physically and psychosocially incapacitated patients some level of social acceptance. The remaining natural teeth provide the much needed retention and need to be evaluated for endodontic and periodontal requirements to preserve them. The success of the prosthesis largely depends upon them as these serve as supporting and stabilizing units for the planned prosthesis.

Mucormycosis (zygomycosis, phycomycosis) is an acute, rapid, fatal and opportunistic infection caused by an aggressively invasive and saprophytic fungus found in soil, bread molds. Usual pre-disposing factors are uncontrolled diabetes particularly the presence of ketoacidosis, malnutrition, leukemia, severe burns, prolonged steroid therapy and immunodeficiency. Most cases however, have been reported in poorly controlled diabetics or in patients with hematological,

Figure 1: Ocular defect

Figure 2: Palatal defect

Figure 3: Silicone eye prosthesis and obturator with magnets

Figure 4: Palatal defect rehabilitated

Figure 5: Ocular defect rehabilitated

Figure 6: Patient with magnet-retained prosthesis and goggles

malignant conditions. The mucormycosis patient has to be evaluated by a medical specialist before starting the treatment, preferably by an endocrinologist to ensure suitable protection using a long-acting insulin along with a systemic antifungal so that further manifestation of fungal infection can be avoided during and posttreatment,. Mucormycosis is probably triggered in susceptible individuals by the inhalation of spores. The disease therefore commences in the nose. The fungus has a particular affinity for arteries. The mycelium penetrates the arterial walls, dissects the internal elastic lamina leading to endothelial damage and induces intravascular thrombosis and inevitable infarction. Once the fungus becomes aggressively invasive, the infection spreads from the nasal cavity

in the ethmoidal sinus and then to the orbit to the eye and blindness ensues. Subsequent spread from the orbit may cause thrombosis of the cavernous sinus. Treatment includes control and cure of the precipitating cause with the antifungal, Amphotericin-B and surgical removal of the necrotic material to establish drainage of all involved sinuses. In this case, the patient was put on multiple doses of plain insulin and a night-time dose of long-acting insulin was given under the supervision of the endocrinologist.[6]

Various methods used in the past to increase retention include tissue undercuts and attaching the prosthesis to the patient's eyeglasses or dentures, which help to retain the prosthesis mechanically. In addition, medical-grade adhesives, tapes and retention by the remaining dental structures are commonly employed techniques. Methods for attaching and holding facial prostheses have to be as invisible as possible to make them esthetically pleasing.

Once the diagnosis has been made and the treatment has been planned, the decision to go for an artificial eye and a suitable obturator has to be made to rehabilitate the patient. The clinical procedure used by the treating maxillofacial prosthodontists in this case has been one, which is routinely followed. The major problem encountered is of retention as the defect is continuous and two appliances cannot remain in place on their own without the help of additional devices, which in this case, was done by using magnets.

The introduction of rare-earth permanent magnets made of alloys such as Sm-Co (Samarium-cobalt) and Nd-Fe-B (Neodymium-Iron-Boron) has resulted in magnets of very small dimensions. Nickel, gold and titanium coating of these magnets has overcome the problems of tarnish and corrosion.[7] Availability of various shapes and sizes with required magnetic force and customized polarity in indigenous magnets have added new dimensions to the retention of maxillofacial prostheses.

CONCLUSION

Rehabilitation of a patient with an ocular and palatal defect has been described in detail in this report using rare-earth magnets for secondary retention with primary retention coming from the dental components to achieve a snug fit of the prosthesis. The rehabilitation resulted in improved function, esthetics and comfort to the patient thus enabling him to lead a normal life. These custom-made prostheses are durable and comfortable, requiring only simple care.

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