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CASE REPORT

SINGLE COMPLETE DENTURE INCOPERATED WITH REINFORCED GLASS FIBER MESH- A CASE REPORT

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ABSTRACT

The most frequent fracture in patients with standard acrylic resin maxillary dentures when placed against the opposing entire or partial natural dentition is a midline fracture. This happens due to excessive masticatory forces from the natural dentition against the opposing arch. A glass fiber reinforced denture benefitsin response to fracture of denture. This case report compact with the oral rehabilitation of completely edentulous maxillary arch opposing a dentulous mandibular arch with full complement of natural dentition by integrating a glass fibers mesh into the denture base to counteract the masticatory pressures from the natural teeth and lengthen the life of the replacement.

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INTRODUCTION

A single complete denture presents a difficult clinical scenario, particularly when the opposing natural dentition is not in a normal plane of occlusion. Many patients lose all of their natural teeth in one arch while still having some or all of them in the opposite arch. It's not unusual for a single complete maxillary denture to cover all or part of the mandibular natural dentition. Several difficulties are encountered in providing a successful single complete denture treatment, the most common being repeated fracture of the prosthesis.The following factors may contribute to the occlusal problems and denture base fractures noticed in single full dentures: the location of the mandibular teeth, which may not be adequately aligned for the bilateral balance required for stability or flexure of the denture base, and occlusal stress on the maxillary denture and underlying edentulous tissue from the teeth and musculature of opposing natural teeth. To create a balanced occlusion in patients who require a single complete denture, mal-aligned, tilted, or supra-erupted teeth in the opposing arch are some of the issues that need to be fixed. The midline fracture of complete maxillary dentures happens as a result of fatigue failure brought on by masticatory stresses, and the rate is 2 to 3 times higher than that of mandibular dentures.[1] This fracture happens as a result of stress-focused micro crack propagation. A traditional method of preventing the fracture of dentures is to reinforce them with wire and plates made of Co-Cr alloy or stainless steel. However, since the metal reinforcement and denture base resin frequently separate at the interface due to poor adhesion, exposing the metal color and producing an unesthetic result, the possibility of hypersensitivity cannot be completely ruled out. In addition, because of the metal mass, reinforced dentures are heavy[2-5]. Recently, glass reinforced fiber mesh are advocated to prevent denture fracture. Compared with metal, these fibers adhere better to the denture base resin, provide more pleasing esthetics, and result in a lighter prosthesis that is easy to repair. In addition, the mechanical properties of these dentures, such as their flexural strength and impact strength also increase.In particular, glass fibers have been found to be more effective in increasing the flexural strength of denture base resin than aramid or nylon fibers. Because glass fibers produce a significant reinforcing effect, are less cytotoxic, and are more esthetically pleasing than other fibers, they can be used in various dental fields for posts, splints, and the reinforcement of fixed dental prostheses[6-8]. This case report aim to describe occlusal corrections prior to a single complete denture fabrication and incoperation of reinforced glass fiber to denture

CASE REPORT

A 70-year-old male patient completely edentulous in relation to maxillary arch reported to the department of prosthodontics, kvg dental college, sullia, with the chief complaint of fractured upper denture and needs replacement. Detailed case history was recorded and treatment plan was formulated. History revealed that patient was partially edentulous for the past 1 years and was using removable complete denture which had to be repaired twice with autopolymerizing acrylic resin.

Figure A. intra oral image of maxillary arch

Figure B. retained mandibular teeth

Figure C. Intra arch space

Figure D. OPG

Figure E: primary cast

Figure F: Secondary impression

Figure G: Master cast

Figure H: curvature of ball using to make stone form

Figure I. Fabrication of stone-form with copying curvature of ball

Figure J. Vacuum former machine using for fabrication of template

Figure K. Thermoplastic sheet used to adapt onto the stone-form

Figure L :Template trimmed to shape of arch

Figure M: Occlusal plane template placed on the primary cast and identified interfering cusps.

Figure N. Checking occlusal discrepancy using template intraorally

Figure o: selective grinding done and occlusal discrepancy eliminated

Figure P. primary cast of before and after selective grinding

Figure Q. Face bow transfer done and mounting of semiadjustable articulator

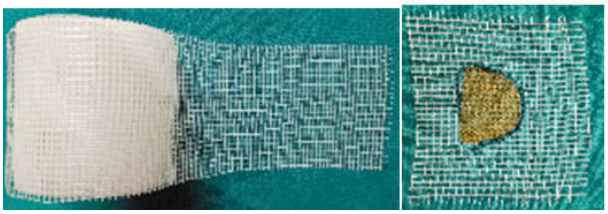

Figure S. Resin reinforced glass fiber mesh cut it to the shape of arch

Figure T. Denture incoperated with resin reinforced glass fiber mesh

Figure U. before denture placement,after denture placement,follow up after 6 months

On intra oral examination, well rounded maxillary ridge and periodontally compromised retained teeth were found in relation to mandibular arch(fig A,BC). When creating the treatment plan, careful thought was given to the frequent history of removable single complete denture fracture. Our intention was to enhance the fracture resistance of the denture without compromising esthetics of the denture. Patient was explained about various other treatment options, a) Implant supported hybrid prosthesis. b) Implant supported over denture. c) Metal mesh reinforced denture. d) Glass fiber reinforced denture. With consent of the patient, it was decided that the denture be rehabilitated with reinforced glass fiber Preliminary impression for maxillary and mandibular arch using perforated edentulous metal stock with alginate impression material and the impressions were disinfected and poured using type Gypsum product. The preliminary casts were obtained and groomed. Custom tray was fabricated on maxillary cast using dental wax (fig E). Border molding procedure was carried out conventionally using low fusing impression compound and then final impression was recorded with zinc oxide eugenol impression paste using selective pressure technique(fig F). Beading and boxing of the impression was done and it was poured in type III gypsum product (fig G). supraerupted teeth in the opposing arch makes it difficult to achieve a harmonious balanced occlusion with the complete denture. For the correction of occlusal plan, fabricated a occlusal plane template based on the guidelines given by Muley et al. (2014). Its Transparent occlusal plane template made of vacuum formed polymer material where it can be adjusted according to various jaw sizes and shapes for direct intraoral evaluation and being a transparent material, it facilitates easy examination.

Correction of occlusal plane: A ball with a circumference of 63-64 cm and diameter of approximately 2032 cm (8 inch) was procured. These dimensions were matching to the Monson's sphere which has a

diameter of 8 in. (Glossary, 2005; Monson, 1920, 1922). The curvature of the ball resembling the monsoon curve was made in gypsum type 3 dental stone(fig h).The concave stone-form was then trimmed to appropriate size to certify that it fits easily into the vacuum former machine.(fig i). A 1.5 mm thick, hard, thermoplastic sheet was used to adapt onto the stone-form in the machine to fabricate the occlusal plane template(fig j). After cooling, the occlusal template was removed from the vacuum former and trimmed into a shape of suitable size to fit the average dental arch[9](fig k, fig L).Occlusal plane template was placed on the primary cast to identify interfering cusps and access the amount of reduction required (fig m,fig n). Selective grinding was used since there was only a little quantity of reduction required, and it was done within the enamel. Grinding was done until occlusal plane template touches all teeth uniformly (fig O). New impression made using alginate after correcting occlusal plane and poured in type 3 gypsum product(fig p).

Record base was fabricated by sprinkle on method with selfcure acrylic resin material (DPI). Maxillary occlusal wax rim was made and adjusted. jaw relation was recorded and face bow transfer was done. Maxillary occlusal rim with jaw relation record was articulated with the mandibular dentulous cast and then mounted on Hanau wide view articulator (fig Q). Maxillary teeth selection and shade matching was done by taking help of the remaining lower natural teeth. Teeth arrangement was done and maximum intercuspation was achieved. After try in patient was found to be satisfactory (fig R), then the flasking and dewaxing procedures were carried out. Before packing, the glass fibre mesh was cut in dimension of maxillary arch, The glass fibre mesh was adapted on the maxillary cast using slight finger pressure(fig S), Packing, bench curing and the acrylization procedure was carried out. The prosthesis was then finished, polished and delivered to the patient (fig T). Post insertion instructions and regular follow up was done. After 6 months' patient was satisfactory with reinforced glass fiber mesh denture (fig u)

DISCUSSION

An edentulous maxillary arch with mandibular natural teeth is one of the most frequent clinical scenarios involving a single complete denture. An edentulous arch is negatively impacted by the forces created when a dentate arch opposes it. Natural teeth can resist or deliver bigger magnitudes of force without discomfort or displacement because they are firmly and rigidly maintained in the bone. On single molar teeth, forces as high as 198 lb have been observed. Contrast this with a complete denture, which is set to have a maximum static load of 26 lb6, resting over the sensitive mucosa of the ridge.Due to forces from teeth, musculature, and opposing natural dentition, the maxillary denture and the underlying edentulous tissue may experience occlusal stress. Flexural fatigue brought on the opposing natural dentition frequently leads to the midline fracture in a denture[10]. The resilience of the denture base to mechanical stress can be increased using a variety of techniques. Several types of fibers, including carbon, aramid, woven polyethylene, and metal mesh, have been used to reinforce acrylic resin denture bases in the past, but each has its own disadvantages. PMMA is strengthened by carbon and aramid fibers, however they can lead to clinical issues such polishing difficulties. Woven polyethylene fibers are challenging to process because they need to be etched. Additionally, it is challenging to prepare and position the layers of woven fibers, which makes them unsuitable for dental offices. Metal mesh provides mechanical adhesion between acrylic material and the mesh, often leading to separation of resin from mesh.Exposure of the metal mesh causes unesthetic appearance as well as leads to hypersensitivity reaction to oral mucosa, not to mention the increasedbulkiness of denture[11,12]. Glass fiber mesh was more effective than metal mesh in reinforcing the fracture resistance and toughness of complete dentures.it adhere better to the denture base resin and provide more esthetically pleasing appearance than metal.its is less cytotoxic,lighter prosthesis and ease to repair and reline[13,16]. One study likewise reported that poor bonding between metal and denture base resin could account for the lower mechanical properties of the metal group. The good bonding of the reinforcement with the polymer matrix is important to increase the strength of the complete denture as a composite material. The fracture resistance of the glass reinforced mesh group was significantly higher than that of the metal group, and the toughness of the glass reinforced group was significantly higher than that of the metal group[14]. Tsue et al reported similar results, Although the study evaluated the compressive strength of complete dentures with partial reinforcement, the glass fiber groups showed significantly higher compressive strengths than the metal group[15].

Adding for betterment of denture,occlusal plane correction was done. The occlusal and incisal surfaces of the teeth combine to generate a curve that is known as the plane of occlusion. Anteroposterior curve of Spee and mediolateral curve of Wilson combine to form the Monson curve.The Curve of Monson assists in achieving the ideal curve of occlusion that has been postulated, in which each cusp and incisal edge meets or abuts a section of the surface of an 8-inch sphere with its center in the glabella. The occlusal plane can be assessed and corrected using a variety of tools and techniques, including the Broderick's occlusal plane analyzer (BOPA), the Yurkstas metal occlusal template, and custom-made occlusal plane templates, all of which have been documented in the literature based on the Monson curve. Despite the fact that the BOPA's use is extensively covered in the literature, specific holding devices are needed to make it function with various articulators. Metal templates, like the Yurkstas template, cannot be altered to accommodate varied jaw widths and may not fit intraorally in comparatively smaller or asymmetrical arches. Transparent occlusal plane template (OPT) made of vacuum formed polymer material has been described by Muley et al where it can be adjusted according to various jaw sizes and shapes for direct intraoral evaluation and being a transparent material, it facilitates easy examination.in this case report establishment of occlusal plane is done by using transparent occlusal plane template. The occlusal plane irregularity was minimal and ease to establish. Amount of reduction needed was minimal and within the enamel, selective grinding procedure was carried out.

CONCLUSION

Under certain restrictions, glass fiber mesh was used in this case report as reinforcement to resist fracture if PMMA was to be used as the denture base. The fiber mesh is less bulky and has good aesthetic qualities. The use of glass fiber mesh in maxillary dentures provides an added benefit because it improves the denture's strength and longevity while also increasing patient satisfaction.

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