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STUDIES ON THE FIBER REINFOCRED COMPOSITES FOR CUSTOMIZED DENTAL IMPLANTS

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ABSTRACT
Dentures are prosthetic devices constructed to replace the overdentures and are supported by the surrounding soft and hard tissues of the oral cavity. Many denture designs rely on bonding or clasping onto teeth or dental implants. There are two main categories of dentures, the distinction being whether they are used to replace missing teeth on the mandibular arch or on the maxillary arch. Plastics which revolutionized modern living play a major role in replacing the lost teeth. The particular form and morphology of plastic used in making artificial teeth is acrylic resin. Porcelain is a ceramic material that has some glass-like properties. It is translucent in nature like the enamel of a real tooth, which makes it look more like your natural teeth.

This study aims to use carbon fiber reinforced composite for preparing the prototype.The main objective is to do experiment about overdenture in dental implant. Properties are analyzed by using ANSYS software. Visual defects are identified and studied. Merits and demerits of this dental experiment are studied while preparing the prototype of over-denture.

KEYWORDS:
Dentures, Implants, Prosthetics, Carbon fiber

INTRODUCTION

Over-denture is a complete or removable partial denture that covers and rests on one or more remaining natural teeth, the root of natural teeth, or dental implants. Over-denture offers many advantages over conventional complete dentures in terms of preservation of the remaining alveolar supporting-bone along with increased stability etc. The presence of a healthy periodontal ligament maintains alveolar ridge morphology whereas a diseased periodontal ligament or its absence, might be associated with variable but inevitable time-dependent reduction in residual ridge dimensions. To avoid these two or more coronally modified or restored retained-teeth abutments are frequently endodontically prepared and used as abutments for an over-denture. The objective is to distribute stress concentration between retained abutments and denture-supporting soft tissues.

Over-denture is one of the most practical measures used in preventive dentistry and as a better option in comparison with removable complete denture prosthesis in many ways. Over-denture is indicated in patients with few remaining retainable teeth in an arch. It is also preferred in patients with maltreated ridge cases, patients needing single denture, patients with unfavorable tongue positions, muscle attachments, or high palatal vault, which render the stability and retention of the prosthesis difficult. This clinical case report describes method of fabricating a tooth supported over-denture with metal copping attachments. Preventive prosthodontics emphasizes the importance of any procedure that can delay or eliminate future prosthodontic problems and over-denture is an important part as the preventive treatment modality. Fabrication of tooth-supported over-denture

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is a step in the direction of preventive prosthodontics. According to Zarbetal. The advantages of over-dentures include retention and stability, especially the mandibular dentures. The maxillary over-denture is of great value when it opposes remaining mandibular anterior teeth, because it aids in conserving the ridge against resorption from masticatory stress. Various techniques used in the treatment of teeth to serve as abutment for over-denture ranges from simple tooth modification and reduction, tooth preparation with cast-copping to endodontic therapy with amalgam plug or cast-copping utilizing some form of attachments. Root canal therapy is a necessary phase of preparation for the selected teeth, single-rooted or double-rooted teeth with readily accessible canals are preferred.

METHODOLOGY

The resins are the epoxy resin and bis-GMA. Bis-GMA is a resin commonly used in dental composite, dental sealants. It is the digesters derived from methacrylic acid and the bisphenol. A diglycrylic ether. Bearing two polymerizable groups, it is prone to form a cross-linked polymer that is used in dental restorations. The fibers are woven carbon fiber. The selected materials are purchased. The prototype of over-denture is prepared at expert dental lab. Then over-denture model is analyzed using ANSYS software.

PREPARATION OF COMPOSITES FOR CUSTOMIZED DENTAL IMPLANTS

Master mould, with sub structure is created. This substructure master mould is a teeth shape and made ready to fix with implants in the over-denture.

Fig.1

Preparation of the paper template: Base resin and catalyst in 3:1 ratio is mixed and impregnate the fabric in resin. The excess resin and catalyst are removed. After removing the resin and catalyst the edges are trimmed. Rectangles are cut from the impregnated fabric large enough than the template and overlap the cut fabrics with a minimum of 13 layers by changing the direction of each sheet by 10-15 degrees.

Fig.2

Compress and Trim, the rectangle sheets with a roller. Rectangle sheet template is compressed with the laminated sheet and Place the rectangle template on the laminated sheet and trim them around through scissors. Fine powder with the left resin is mixed and applied to the turrets and counter mould.

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Fig.3

Counter mould, the trimmed sheets are packed in it. For perfect reproduction pack the excess fiber in and around the turrets and the counter mould and Place the fabric on the turrets, create holes near the turrets and fit the fabric. It is the implant with over-denture in the patient mouth.

Fig.4

Polybath machine is used to heat the material which is mainly used for the dental purpose. Place the flask in water which is covered with the vacuum bag and drawn out air and seal at room temperature and cure it at 80^{o} for 120 minutes. Till the 120 minutes get over there should not be opening of the flask.

Fig.5

Post curing and monomer done after heating. Curing the matt and coat with monomer to the over-denture after built of teeth. It is to hide the material color and looks like the nature of mouth for the patient comfort

Fig.6

Fig.7

ANALYSIS OF CUSTOMIZED DENTAL IMPLANTS

Solid works, the overdenture frame work model is drawn using this software. First the base structure is drawn which means the lower jaw bone of the human facial skull as shown in fig.8. In this base structure, implant is done for the screw tightening. After that, the over-denture design work is done as shown in fig.9. This is the frame work of the over-denture. Same process of implants was made in this frame. Then these two structures were assembled as shown in fig.10.

Ansys Software: The design which is done using solid works were imported to the Ansys software and the material selection is made and load is applied. Imported structure of the over-denture frame work is shown in fig.11. We analyzed for some of the loads which is more relevant to the denture. Material is changed through the engineering data source which contains various materials. We choose composite material for our study.

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Fig.8

Fig.9

Fig.10

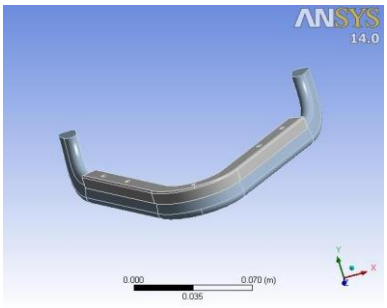

Fig.11

RESULTS AND DISCUSSION

Results of the analysis are exhibited. The minimum load is 0.14946 Pa and the maximum load 1.2142e6 Pa is applied there is no change in the structure. When the maximum load equivalent stress reaches 1.3151e6 Pa frame structure has got deformed.

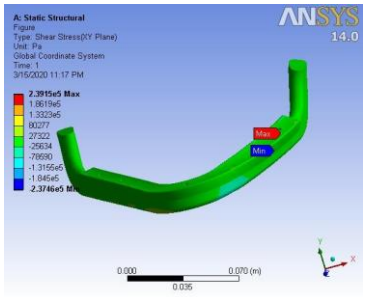

Fig.12

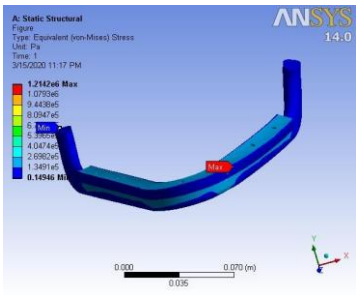

Fig.13

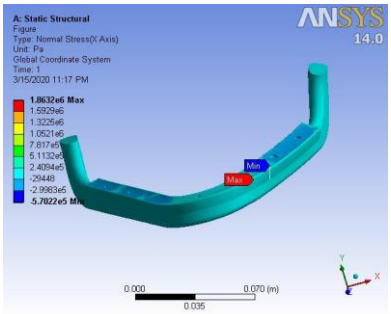

Fig.13

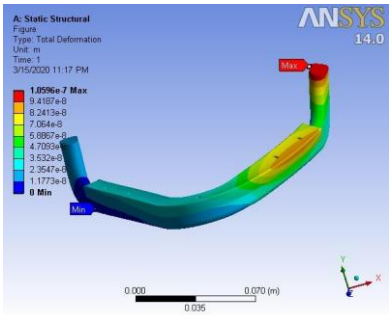

Fig.14

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Bulk modulus, Shear modulus, strain Life parameters, Isotropic Elasticityand Isotropic Relative Permeabilitywere tabulated

Carbon fiber, Isotropic Elasticity

Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
1.277e+011	0.33	1.252e+011	4.8008e+010

Strain-Life Parameters

Strength Co-efficient (Pa)	Strength Exponent	Ductility Co-efficient	Ductility Exponent	Cyclic Strength Coefficient (Pa)	Cyclic Strain Hardening Exponent
9.2e+008	-0.106	0.213	-0.47	1.e+009	0.2

Isotropic Elasticity

Temperature C	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
	2.e+011	0.3	1.6667e+011	7.6923e+010

Isotropic Relative Permeability

Relative Permeability
10000

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CONCLUSION

This paper “The Studies on the Fiber Reinforced Composites for customized Dental Implants” has been analyzed using real time software. The prototype has been built up. The over-denture has successfully improved without any problem. Also, it is found that the work proficiently with the working capacities of the over-denture. The model was analyzed in ANSYS software and the strain life is found which is most important for over denture work.

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