The effect of altering the fitting surface of maxillary complete denture using air-particle abrasion on *Candida albicans* growth.

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Contents

List of figures

List of tables

Introduction

Complete denture prosthesis involves the replacement of the lost natural teeth and the associated structures of the maxilla and the mandible. One of the goals that the dentist has to achieve is to produce a denture that is retentive and stable in place which in turn enhances both function and esthetics.

Physical retention of a denture depends on adhesion of a salivary film to its fitting surface and supporting tissues. Adhesion is influenced by the texture of the fitting surface of the denture. Therefore a modification of dentures by making the fitting surface more hydrophilic and wettable (rough) may affect denture retention. This can be accomplished after the fitting surface is air-particle abraded.[1]

Candida albicans is a component of the normal oral flora, but local and systemic factors can transform this commensal *C. albicans* to a pathogen. Surface roughness is known to be a factor in the entrapment of microorganisms on the surfaces and their protection from shear forces and oral hygiene measures.[2]

The question raised in this study is, will the air-particle abrasion of the fitting surface of the denture affect the adhesion of *C. albicans* significantly?

Review of literature

Complete denture:

The human teeth are lost with age as a result of the cumulative effects of periodontal disease, trauma, dental caries and dental treatment. With increased awareness among the people, use of fluoride, better professional and home dental care the prevalence of the complete tooth loss has been reduced. However, the total number of patients requiring complete dentures is increasing rapidly nowadays. Complete dentures are the most common prescription which is globally offered to the edentulous patients by the dentists. The most common reasons for seeking denture therapy by the patients are to improve aesthetics and function.[3]

The major problems in patients treated with complete dentures are those related to stability and retention, prosthesis intolerance, chewing problems, speaking and esthetic problems, mucosal irritation, and food accumulation under the dentures.[4]

Retention of complete denture:

Definition:

It is the resistance of a denture to dislodgment.[5]

It is the quality inherent in a denture that resist the force of gravity, the adhesiveness of food, and the forces associated with the opening of the jaws. Retention is the means by which dentures are held in position in the mouth.[6]

Factors affecting denture retention:

Many physical factors have been credited with causing or enhancing retention, e.g. Atmospheric Pressure, Vacuum, Adhesion, Cohesion, Wettability, Surface Roughness, Gravity, Surface Tension, Viscosity, Base Adaptation and Border seal.[7]

a) Adhesion:

It is the property of remaining in close proximity, as that resulting from the physical attraction of molecules to a substance or molecular attraction existing between the surfaces of bodies in contact.[5]

b) Cohesion:

It is the force whereby molecules of matter adhere to one another, it is the attraction of aggregation or molecular attraction by which the particles of a body are united throughout their mass.[5]

Adhesion and cohesion play important roles in denture retention. Adhesion of saliva to mucosa and saliva to acrylic resin denture base

material, and cohesion of saliva molecules to one another can be enhanced by an impression that provides the most intimate contact with the surface mucosa, and the greatest feasible area coverage .[8]

The adhesion forces influence the wetting of the denture and the mucosal surfaces while the cohesive forces maintain the integrity of the salivary film. These intermolecular forces form a chain between the denture and the mucosa which tends to retain the denture in position.[6]

To produce adequate denture adhesion to the underlying tissues, saliva must flow easily over the entire surface to ensure its wetting. The extent to which the saliva will wet the denture surface depends on several factors including wettability of the base materials.[9]

c) Wettability:

It is the ability of the adhesive to flow easily over the entire surface of the adherent and come in contact with all of the small roughness that may be present.[8]

The ability of a denture material to be wetted gives an indication of the degree to which the lubricating effect of saliva will be enhanced, thereby promoting denture retention and patient comfort.[10]

Wettability properties of denture base and denture soft-lining materials are important, because they give an indication of the ease that saliva will spread over their surfaces, thus forming a lubricating layer for extra comfort .[11]

The chief factors involved in the retention of a well-adapted denture are the forces related to the wetting of the denture and of the mucosal surfaces and cohesive or intermolecular characteristics of the saliva. It has been suggested that improvements in denture retention may be obtained by making the surface more wettable. Wetting measurements can give an indication of the degree of denture retention.[12]

d) Surface tension:

It is a property of liquids in which the exposed surface tends to contract to the smallest possible area, as in the spherical formation of drops. This is a phenomenon attributed to the attractive forces, or cohesion, between the molecules of the liquid.[5]

It is found in the thin layer of saliva between the denture base and the mucosa and is quite similar in its action to cohesion and capillary attraction. It is also effective in direct proportion to the area of the basal surface of the denture.[6]

The retentive force is attributed to surface tension where it acts continuously. A retentive force is generated by resistance to the flow of saliva resulting from the viscous properties of saliva and the dimensions of channel through which it is flowing. Therefore, the narrower the channel and the greater the viscosity of saliva within limits, the more effective will be the retention.[13]

e) Capillary attraction:

It is that quality or state which, because of surface tension, causes elevation or depression of the surface of a liquid that is in contact with the solid walls of a vessel.[5]

When the adaptation of the denture base to the mucosa on which it rests is sufficiently close, the space filled with a thin film of saliva acts like a capillary tube and helps retain the denture. This force like the others is directly proportional to the area of the basal seat covered by the denture base.[6]

f) Atmospheric pressure:

It is the physical factor of hydrostatic pressure due to the weight of the atmosphere on the earth's surface. At sea level this force is 14.7 Psi.[14]

When the pressure of the air between the denture base and the underlying tissue is less than that of the atmospheric air pressure, excellent retention of the denture is expected, and patients often refer to this retention is suction.[15]

For atmospheric pressure to be effective, the denture must have a perfect seal around the entire border.[6]

g) Border seal:

It is the contact of the denture border with the underlying or adjacent tissues to prevent the passage of air or other substances.[5]

The border should be shaped so that the channel between it and the sulcus tissue is as small as possible for optimum retention.[13]

h) Oral and facial musculature:

The oral and facial musculature can supply supplementary retentive forces, provided that the teeth are positioned in the neutral zone between the cheeks and tongue, and the polished surface of the dentures is properly shaped.[6]