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Research paper

Dynamic mechanical properties of oral mucosa: Comparison with polymeric soft denture liners

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ABSTRACT

The purpose of this work was to characterize the viscoelastic behaviour of oral mucosa and compare it with the dynamic mechanical properties of different soft liners. For this purpose, a sample of pig oral mucosa and six commercialized soft liner samples have been investigated. A comparison was also carried with the first suitable hard rubber for dental prosthetics: vulcanite. Creep recovery (CR) and dynamic mechanical analysis (DMA) have been used to determine the mechanical modulus of oral mucosa and soft liners respectively. The Poisson ratio is used to compare mucosa bulk modulus and soft liner shear modulus. The biomechanical concept of conventional complete dentures needs a good adjustment of dynamic mechanical impedance between the base and oral mucosa. The viscoelastic mechanical property of the oral mucosa as a referent biopolymer has been confirmed in vitro. The modulus value, adjusted for old patients in physiological conditions, is in the order of 3 MPa. This study underlines the plasticization effect of absorbed water on the mechanical properties of the underlying tissue. This study allows us to define some characteristics of the most adapted biomaterial according to the clinical exigency. The required biomaterial must display the following properties: compatibility and chemical resistance with biological environment perpetuated mechanical properties during physiological conditions and clinical use, good adjustment of dynamic mechanical impedance with supporting mucosa and easy sample processing.

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1. Introduction

Edentulous people wearing removable complete dentures, and especially old people present frequently painful oral mucosa. These patients are uncomfortable with their complete dentures and even they cannot wear them. The underlying oral mucosa is usually compressed, indeed sheared between

the bone ridge and the acrylic hard base. A prolonged and close contact between the edentulous oral mucosa and the inner surface of the complete denture, associated with the transmission of occlusal forces involve tissue diseases, bone resorption and pain in the short and long term.

To overcome these difficulties and improve the biological integration, the setting of a polymeric soft liner onto the

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