STRESS DISTRIBUTION ANALYSIS OF 3D SOLID MODEL OF MAXILLA DUE TO BRUXISM USING FINITE ELEMENT METHOD: RECONSTRUCTING MODEL FROM CBCT RADIOGRAPH OF HUMAN MAXILLA

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ABSTRACT

Objectives: To construct three dimensional (3D) solid model of maxilla based on CBCT's radiograph and then to analyze the stress distribution on tooth and periodontal structure of maxilla due to bruxism using finite element method.

Material and Method: 3D solid model of maxilla in this study include the teeth, periodontal ligaments, cortical bones, and trabecular bones. The basic model was constructed from CBCT radiograph of human maxila and improved to be a 3D solid model. To simulate bruxing force, the load were applied to the model with the initial force magnitudes of 570 N for the incisive-canine tooth and 911 N for the premolar-molar tooth as the loading condition.

Result: The principal stress from each movement with a maximum of 200 MPa on the jaw bones, 160 MPa on the teeth, and 80 MPa on the periodontal ligaments.

Coclusions: The highest stress appeared to be found at jaw bones, the result of this study will aid dentists who are attempting to identify the location and magnitude of stress concentration caused by bruxism. Afterwards this information can be used as a source of consideration in making splint or other protocol therapy, also it can be used as a reference for the next step of research in bruxism.

INTRODUCTION

About 45 million people in United States have a problem in parafunctional habbit like bruxism.1 Due to the parafunctional habbit that occurs in long term are tooth attrition, widening the periodontal membrane, alveolar bone resorption, and even led to disruption of temporomandibular joint. It is caused by the presence of the load exceeds normal occlusion and continuously distributed from the surface of teeth to periodontal tissues.2,3,4 There has been research on the movement patterns of bruxism, but there has not been investigated regarding the stress distribution due to traumatic occlusion caused by bruxism.5 Therefore, researchers are interested in conducting research on stress distribution analysis of 3D solid model of maxilla due to bruxism using finite elemen method. Reconstruction of finite element model of human maxilla or mandible now becomes more accurate and simple with the CBCT raddiograph.

RESULT AND DISCUSSION

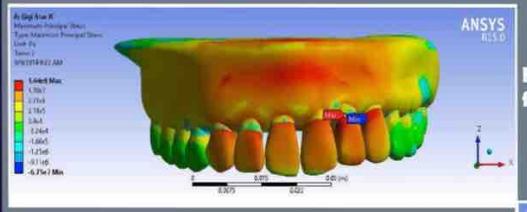

Figure 6. Maximum stress distribution on maxilla for IC movement

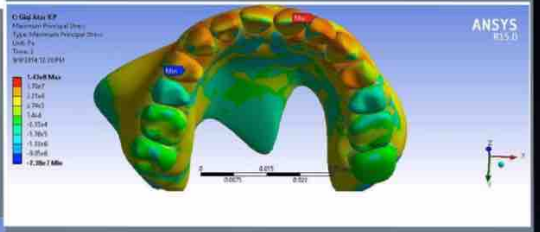

Figure 7. Maximum stress distribution on maxilla for ICP movement

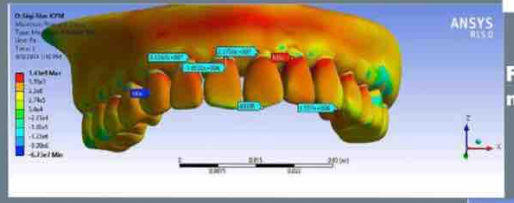

Figure 8. Maximum stress distribution on maxilla for ICPM movement

Figure 9. Maximum stress distribution on

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