ANALYSIS OF STATIC AND MATERIAL FATIGUE CONDYLAR PROSTHESIS FROM GRONINGEN TEMPOROMANDIBULAR JOINT PROSTHESIS USING FINITE ELEMENT METHOD

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ABSTRACT

Groningen temporomandibular joint prosthesis is one of the temporomandibular joint (TMJ) alloplastic which is designed to respond the surgical treatment through reconstruction, when the disfunction/disease temporomandibular joint (joints that exist in the head) has been getting worse and can not be handled again through a non-surgical. The components of the design is the Skull part (consisting of basic parts and fittings member), disc and mandibular parts/condylar. This research aims to analyze the ability of the material through static analysis and to predict the fatigue life through behavioral analysis.

The ANSYS software base on finite element method is used as a tool in analyzing the behavior of static and fatigue behavior of materials, because this method is often used in orthopedic biomechanical. Nominal stress-life method (S-N) is one of method of fatigue analysis of materials, used to analyse the fatigue life of materials. Condylar were studied prosthesis with fixation holes in the counter boring and counter shinking model and in each type of bolt holes is also varied to be variable thickness of the plate.

From the results of finite element analysis for both static analysis and fatigue analysis of condylar prosthesis obtained from Groningen TMJ prosthesis is very suitable to use the type of counter boring bolt-hole plate with a thickness of 3 mm. Through static analysis obtained the maximum total deformation 0.000879 m or 0.879 mm and the von-Mises stress 118.50 MPa maximum. Through the analysis of fatigue obtained a minimum age is 1x10^8 cycles (infinite life), the maximum damage ratio is 0.11 (design life is reached), the minimum safety factor is 1.1232 (safe until they reach the age of design) and a maximum equivalent to the alternating voltage is 169, 29 MPa.

Keywords: temporomandibular joint, prosthesis, finite element method, static method, nominal stress-life (S-N)