



Edyta KAWLEWSKA¹, Marta SOCHA¹, Paweł CZARNECKI¹, Wioletta WIELEK¹, Michał BURKACKI¹, Krzysztof DOWGIERD²

¹ Department of Biomechanics, Faculty of Biomedical Engineering, Silesian University of Technology, Zabrze

² Department of Clinical Pediatrics, University of Warmia and Mazury, Olsztyn

NUMERICAL ANALYSIS OF TEMPOROMANDIBULAR JOINT PROSTHESIS

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The aim of the project was to develop a personalized model of the lower jaw with a temporomandibular joint implant in a 16-year-old patient of the Children's Hospital in Olsztyn, who underwent joint reconstruction.

The mandible model was developed on the basis of CT images of the patient, while the implant model was obtained in the process of 3D scanning of a manufactured individually fitted plate (ChM, Juchnowiec Kościelny).

The mandible model was generated from CT images of the patient in Mimics v16 (Materialize, Belgium). The temporal plate was scanned with the Scantech Kscan Magic I scanner (fig. 1). From the obtained surface models, solid models were created in Geomagic DesignX. Models were discretized for numerical analysis in Ansys Workbench.

The project carried out a numerical analysis in which the load on the implant surface was simulated in the form of a vector force directed at an angle with variable values of 50-587 N, reflecting the physiological conditions during chewing food and taking into account the maximum bite force in an adult human. Several simulation variants were carried out in which the maximum stress on the implant was about 400 MPa, with a maximum displacement of about 1 mm.

The procedure of engineering planning of bone reconstruction procedures along with the design and production of individually fitted implants is a modern approach in maxillofacial surgery. The use of modern tools and specialized engineering systems enables simulation of various variants of surgery, analysis of the risk of structural damage during and after surgery, as well as an objective quantitative assessment of the effects of treatment.