

UDC 612.7

Stuzhuk R.

Abricor Binzel, M. Giessen, Germany

PROSPECTS FOR RESEARCH IN BIOMECHANICAL MODELING

The modern prosthetics and orthotics system faces a number of fundamental problems that can be solved using advanced biomechanical modeling methods: Insufficient individualization, limited functionality, high risk of complications, etc. Therefore, an important issue at present is the development and experimental validation of a biomechanical modeling methodology for creating optimized personalized prostheses and orthoses that provide maximum functionality, comfort, and prevention of complications in patients with various types of amputations and orthopedic pathologies.

During the study, we plan to obtain the following results:

1. Creation of a unified biomechanical modeling methodology;
2. Development of a software module for personalized prosthetics;
3. Confirmation of a 25-40% reduction in the risk of complications;
4. Validation of the cost-effectiveness of the method;
5. Formation of a database of "biomechanical profiles".

To solve the problem, we propose to use a comprehensive approach consisting of: advanced engineering methods, clinical validation, economic justification, social assessment. This will allow us to transfer prosthetics to a new level of personalized medicine, where each product will be created taking into account the unique biomechanical characteristics of the patient.

We believe that our research will form a new paradigm in prosthetics, where each product will be created based on accurate biomechanical calculations, rather than empirical estimates.

For a comprehensive study of biomechanical modeling in prosthetics, the following system of methods is proposed:

- systematic analysis of scientific literature on the biomechanics of prostheses;
- biomechanical modeling;
- clinical measurements: (3D kinematic gait analysis (Vicon/Noraxon), force dynamometry platforms (Kistler/AMTI), surface electromyography (Delsys Trigno);
- material science studies;
- clinical methods (pain scale (VAS), quality of life questionnaire (SF-36), objective functional tests (6MWT, TUG));
- computer methods;
- statistical methods.

This methodology will allow to obtain scientifically based results with a high level of evidence, which can become the basis for new standards in prosthetics.

Analysis and synthesis of sources of information on biomechanical modeling in prosthetics allows to assume a high level of transformational potential for modern rehabilitation medicine. Prospects for further research will consist in testing the proposed hypothesis.