

## THE STAIN-STRESS ANALYSIS OF HIP JOINT WITH TOTAL HIP RESURFACING ARTHROPLASTY

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*Possibility of substituting the affected hip joint with endoprosthesis is – for many people all over the world – the only way for returning to the normal life without pains and significant motion limitations. But the age limit requiring the application of replacement becomes lower and lower. The endoprosthesis applied to young patients must be replaced several times during their lives and the application and repeated replacements affect the bone so that it may happen that the next application may not be possible any more. For such cases the surface replacement the purpose of which is to postpone the need of the first application of the classic total endoprosthesis, has been invented. So that the objective of the contribution consists in creating a computing model of the healthy hip joint and the hip joint with the classic total hip replacement and with the surface replacement, in carrying out the stress-strain analyses, and in mutually confronting the results obtained. The problem has been solved as a direct task by means of computational modelling, by the method of finite elements in the ANSYS. The computational model consists of these components: sacral, pelvic and femoral bone, muscles, cup, and femoral component.*

Key words: *biomechanics, resurfacing prosthesis, total hip replacement, hip joint, finite element analysis, contact problem*

### 1. Introduction

Possibility of substituting the affected hip joint with endoprosthesis is – for many people all over the world – the only way for returning to the normal life without pains and significant motion limitations. But the age limit requiring the application of replacement becomes lower and lower. As the number of patients with joint replacements increases, the number of those requiring the endoprosthesis replacement logically increases, too. But the endoprosthesis applied to young patients must be replaced several times during their lives and the application and repeated replacements affect the bone so that it may happen that the next application may not be possible any more. For such cases the surface replacement the purpose of which is to postpone the need of the first application of the classic total endoprosthesis, has been invented. The surface replacements – in the branch of orthopedic implants suitable for restoring the hip joint – have appeared from the very beginning of the hip replacements, but their remarkable development was not perceived until the 90th of the last century.

The classic total hip replacement (THR) has been the prevailing surgical treatment of painful joint disorders. In the classic THR, both parts of the joint junction (acetabulum and femur head) are substituted with prostheses. In the last years, the operating procedures

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