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Relevance of Finite Element in Total Knee Arthroplasty – Literature Review

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Abstract
Total knee arthroplasty (TKA) is a key surgical procedure for the treatment of severe knee osteoarthritis. Although TKA has very good clinical results, revision knee arthroplasty can sometimes be necessary due to prosthetic components malalignment which leads to early polyethylene wear, instability and aseptic loosening. Currently, the revision risk of TKA at ten years is 5%. The finite element method (FEM) is a numerical technique which allows the modelling of complex geometry and system of loads. This method is a necessity in the field of orthopedics to simulate or predict the conditions that could lead to complications or failure and react to increase the longevity of TKA. The aim of this literature review is to highlight the relevance of using FEM along with TKA. Specialty literature research shows that the use of finite element analysis is widely spread in total knee arthroplasty. It is used to compare insert materials in order to obtain the most effective method and thus decrease the wear rate. Using simulated angles, forces and stress, FEM tests different malalignment conditions in order to apply these results in the pre-operative planning and avoid a possible TKA failure. The finite element analysis has a great potential of further refining TKA alignment outcome and is very important for the analysis of knee biomechanics under different loads. FEM is used to reduce the incidence of TKA revision and to improve patients' satisfaction after TKA.

Key words: finite element method, total knee arthroplasty, polyethylene wear, patient's satisfaction