MEASUREMENT OF PRESSURE DISTRIBUTION IN KNEE JOINT REPLACEMENT

Jaromír Volf, Zdeněk Schroll, Jan Strašík*

The aim of our work is to confirm mathematic model of pressure distribution in knee replacement. The mathematic model has been made by A. Donat from CTU. This model deals with pressure distribution in femoral and tibial components which was counted by application ABAQUS. The mathematic model counted areas with maximal pressures. We will verify only these areas.

Key words : *sensor, transducer, pressure distribution, measurement, biomechanics, knee joint*

1. Materials of knee replacement

For component of knee replacement are used different material. The femoral component made of metal material (mostly cobalt alloy – Vitalium), tibial component also made of this material, but contact area (tibial plateau) is from ultra high molecular polyethylene (UHMWPE).

New femoral components from oxide ceramic (ZrO_2, AlO_2) are developing. Metal materials are used for their strength and elasticity but they are not abrasion proof and their life-cycle is shorter. Ceramic is used for temper, bioinert and good friction characteristic. Disadvantage of ceramic is fragility. Ceramic femoral component has different geometric parameters. We use combination of metal femoral component, UHMWPE tibial plateau and metal tibial component.
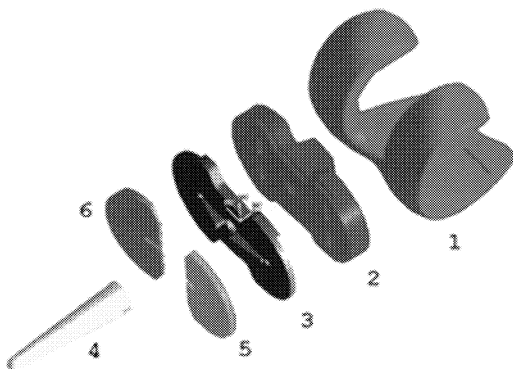

Fig.1: The structure of knee replacement: 1 – femoral component, 2 – tibial plateau, 3 – basis of tibial component, 4 – spindle of tibial component, 5 and 6 – compensatory support

* J. Volf, Z. Schroll, J. Strašík, Czech Technical University in Prague, Faculty of Mechanical Engineering, Department of Instrumentation and Control Engineering, Technická 4, 166 07 Prague 6, Czech Republic