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The use of laser scanning in the procedures replacing lower limbs with prosthesis

Short Title: Laser scanning in the prosthetic lower limb

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Abstract

The aim is the elaboration of the procedure supporting preparation of the prosthetic lower leg after the amputation of one limb, using a scanning laser and numerical modeling shape. The procedure was presented on the example of prosthetic left leg. The contactless measurements were made with coordinate measuring arm with laser scanner. Supporting the development of a functional prosthetic of left leg required assessments of biomechanical axis in the right leg and its replication in the traumatic limb. Adjusting the stump consisted of its displacements according to the normal vectors to the median sagittal plane and the vectors passing by the center of the femoral head, the tip of the patella and through the center block of the talus. The model of the prosthesis was developed on the basis of the difference between the numerical models: a mirror image of the healthy leg and the matched stump. The lower limb prosthesis using scanning laser provides the required distance from the ground to the axis of the ankle and knee, mapping the shape of the stump, anatomical course of the biomechanical axis and the size of the foot.

Abbreviations

CMA, coordinate measuring arm; CAD/CAM, Computer Aided Design/Computer Aided Manufacturing;

Keywords: laser scanning, modeling, stump leg, shape, biomechanical axis of the limb

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