

Pressure Relief in Prosthetic Sockets through Hole Implementation Using Different Materials

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Abstract : Below-knee amputees commonly experience asymmetrical gait patterns. It is generally believed that ischemia is related to the formation of pressure sores due to uneven distribution of forces. Micro-vascular responses can reveal local malnutrition. Changes in local skin blood supply under various external loading conditions have been studied for a number of years. Radionuclide clearance, photo-plethysmography, trans-cutaneous oxygen tension along with other studies showed that the blood supply would be influenced by the epidermal forces, and the rate and the amount of blood supply would decrease with increased epidermal loads being shear forces or normal forces. Several cases of socket designs were investigated using Finite Element Model (FEM) and Design of Experiment (DOE) to increase flexibility and minimize the pressure at the limb/socket interface using ultra high molecular weight polyethylene (UHMWPE) and polyamide 6 (PA6) or Duraform. The pressure reliefs at designated areas where reducing thickness is involved are seen to be critical in determination of amputees' comfort and are very important to clinical applications. Implementing a hole between the Patellar Tendon (PT) and Distal Tibia (DT) would decrease stiffness and increase prosthesis range of motion where flexibility is needed. In addition, displacement and prosthetic energy storage increased without compromising mechanical efficiency and prosthetic design integrity.

Keywords : patellar tendon, distal tibia, prosthetic socket relief areas, hole implementation

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