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Ankle-foot orthosis design between the tradition and the computerized perspectives

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Abstract

This study focuses on the drop foot case related to hyperthyroidism of the ankle joint resulting in the relaxation of the toes during walking. This condition requires treatment using an ankle-foot orthosis. Traditional orthosis techniques lack precision and depend on the skill of the fabricator. This research aims to make a bias in ankle-foot orthosis design and analysis methods, where a complete methodology of numerical design and testing has been proposed using advanced engineering software. A numerical model of the patient's foot was generated and used to design an ankle-foot orthosis model using SolidWorks. The designed model was mechanically analyzed by the finite element method using ANSYS Workbench 16.1 under different static and dynamic loading conditions. The ankle-foot orthosis model was numerically designed and analyzed before the manufacturing process. This is believed to reduce time and material loss and foster the use of numerical models in biomedical applications. This study suggests focusing on the design and analysis of orthoses according to the patient's measurements. This is expected -to increase the comfort and raise the level of treatment. Numerical design methods also enable precise manufacturing using computerized devices such as three dimensional printers.

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