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شبكة المعلومات الجامعية

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التوثيق الالكتروني والميكروفيلم

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التوثيق الإلكتروني والميكروفيلم

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CAIRO UNIVERSITY
FACULTY OF ENGINEERING

A KINEMATIC STUDY OF TRANSFEMORAL AMPUTEES USING A LOCALLY MANUFACTURED FOUR-BAR PROSTHETIC KNEE

By

Amal Samir El-Desokey

A THESIS

Submitted in Partial Fulfillment for the Requirement of the Degree of Master of Science in Systems and Biomedical Engineering

SUPERVISED BY

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ABSTRACT

A four-bar linkage prosthetic knee joint was manufactured locally and was tested on unilateral transfemoral amputees. The research investigates the kinematic gait analysis for this knee at both comfortable and rapid walking speeds. The kinematic results for the manufactured four-bar knee were compared to those of the foreign four-bar knee prosthesis and to the conventional, single axis type of prosthesis. All prosthetic gaits of unilateral amputees using the previous types of prosthesis were compared to normal gait.

Seven males subjects were used in the measurements. Three normal subjects were considered as a reference for normal data. Four subjects had a unilateral transfemoral amputation. Two of them used a conventional single axis prosthesis and were tested with it. The other two subjects used a foreign modular four-bar knee prosthesis and were tested with it then retested using the locally manufactured knee.

Gait analysis system (GAS) using electrogoniometer and foot placement method were used in this study to allow a simultaneous acquisition of data. The data includes both temporal and distance factors in addition to the patterns of body segments motion. It is obtained and averaged over a four strides for each test.

Symmetry of gait pattern was found for the two modular four-bar knee prostheses much more than the conventional single-axis knee. The locally manufactured knee gave a longer stride length than the foreign one, due to higher knee and hip flexion. The shapes and areas of the Greive's diagram of the locally manufactured four-bar knee and the foreign knee were similar, and closer to normal than the conventional single axis knee. Although the manufactured four-bar knee was higher in weight by 20 grams, the performance of the manufactured and the foreign knee was similar.

The cost of manufacturing a modular four-bar knee prosthesis was 22% of the cost of the foreign one.

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