

Technical note

An angular alignment protractor for use in the alignment of below-knee prostheses

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Abstract

A device is described which is capable of accurately measuring angular alignment changes made during the alignment stages of the production of a below-knee prosthesis.

Introduction

The term "alignment" is defined as the position and orientation of the socket relative to the foot. This alignment is considered to be important, if not critical, for the optimum performance of the amputee.

In below-knee prosthetics, during static and dynamic alignment sessions, an adjustable shank unit is used to make alignment changes. One of the most commonly used adjustable shank units is the "Berkeley jig". It is capable of precise linear adjustments, that is antero-posterior and medio-lateral displacements using the scale on the unit itself. Antero-posterior and medio-lateral angular adjustments can be made, but unfortunately cannot be quantified.

The angular alignment protractor

A protractor is described (Fig. 1) which is light, simple to attach, easy to use and capable of accurately measuring angular alignment changes. The design is based on a three-dimensional ankle goniometer devised by Lamoreux (1983). It consists of self aligning, parallelogram linkages originally designed for measuring finger joint motions (Long, 1970). The linkages were then adapted for two-dimensional knee and ankle goniometry (Lamoreux, 1971).

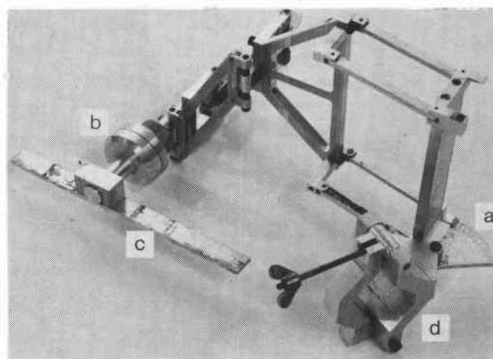


Fig. 1. The angular alignment protractor— a) antero-posterior scale; b) medio-lateral scale; c) fastening strip; d) clamp.

The antero-posterior scale (Fig. 1a) is marked off in 3° increments and can be read to an accuracy of $\pm 1^\circ$. The medio-lateral scale (Fig. 1b) is marked off in 6° increments and can be read to an accuracy of $\pm 2^\circ$.

To make a precise angular alignment change, the flat metal strip at the top of the protractor (Fig. 1c) is fitted into a preformed polyester gutter on the socket. The clamp (Fig. 1d) is fixed onto the pylon tube of the prosthesis. Once the protractor is attached (Fig. 2) the alignment adjustment is made and checked off on the relevant scale and the protractor is then removed. The clamp and lower linkage must be turned round for use with an opposite sided prosthesis. By modifying the pylon tube clamp the protractor may be used with modular systems.

The protractor is simple and quick to use, enabling the user to align a prosthesis, make several alignment changes and still return to the

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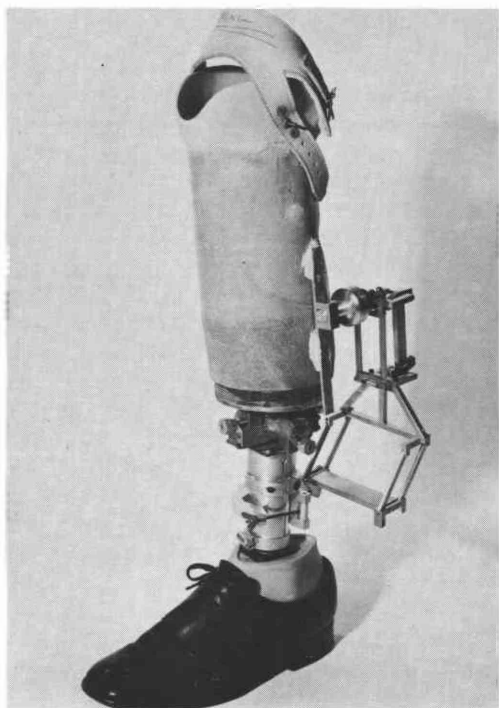


Fig. 2. The protractor fitted to a BK prosthesis.

same alignment (Saleh, 1981). Its use is advocated for making or recording precise angular alignment changes. It may be useful in the training of prosthetists, routine clinical work and research.

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