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A study on the value of the modified KBM prosthesis compared with other types of prosthesis

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Abstract

A study is reported on the value of a modified KBM prosthesis compared with other types of prostheses.

Recently a new type of below-knee prosthesis (the so called modified KBM prosthesis) was introduced in the Netherlands. This prosthesis is now frequently used as a substitute for more conventional types. A study was carried out on the value of this new prosthesis, compared with the more conventional types, by means of a questionnaire sent to a group of patients who formerly used a more conventional type of prosthesis.

Introduction

In the Netherlands each year about 900 patients undergo a below-knee amputation. In rehabilitation practice almost every patient receives a prosthesis.

Development in prosthetics recently has been accelerated by the introduction of a new type of prosthesis, the so called modified KBM prosthesis (Winkler et al, 1978) (Fig. 1).

The modified KBM prosthesis combines the advantages of the PTB prosthesis (Radcliffe & Foort, 1961) (lightweight, full contact, cosmesis) with those of a prosthesis with thigh corset (improved proprioception above the knee). The latter is achieved by means of high "ears" which enclose the condyles of the femur and yet are so flexible that the stump can pass while donning and doffing. This makes it possible to wear the prosthesis without a suspension bandage.

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Fabrication procedure

This has been described extensively by Winkler et al, (1978). The plaster cast is taken with the knee flexed approximately 70 degrees. In this position the musculature is more pronounced and the plaster can be modelled better in the posterior aspect of the knee than when the knee is slightly flexed. The iliotibial tract of the fascia lata will be relaxed which allows the lateral condyle of the femur to be palpated more easily.

During hardening of the plaster a special grip (Fig. 2) is applied pushing the thumbs on the

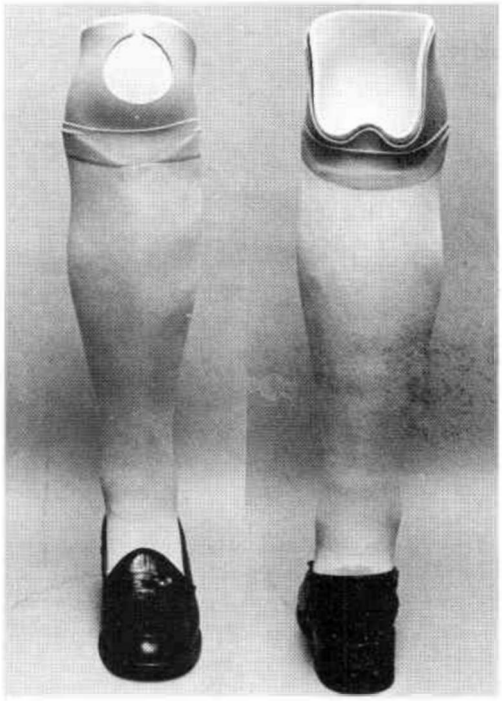

Fig. 1. The modified KBM prosthesis.

Fig. 2. Special grip applied to the plaster during casting of the stump.

patellar tendon, the little finger behind the knee and the three middle fingers just proximal to the condyles. The plaster positive mould is altered according to the directives of Kuhn and Fajal (Kuhn, 1966). On the distal end of the stump plaster will be added or removed depending on the distal load the patient can sustain. The socket must extend quite proximally posterior to the knee to apply counter pressure to the force on the patellar ligament. Enough space should be provided in the socket for the hamstring tendons. The relief for the medial tendon should extend more distally than the lateral (Fig. 3).

Over the modified plaster cast a soft inner liner is formed of polyethylene foam (Polyform®) with a thickness of four mm. The plastic socket is then laminated over the inner liner. The "ears" of the prosthesis are reinforced with carbon fibre (Fig. 4). After curing of the laminate an opening is made for the patella in the outer socket, *not* in the soft inner socket.

The prosthesis is always delivered with one extra inner socket and is worn without wedges, in contrast to the original KBM prosthesis (Kuhn, 1966).

As the plaster cast is made in 70 degrees of knee flexion the soft inner liner will also enclose the knee in the sitting position.

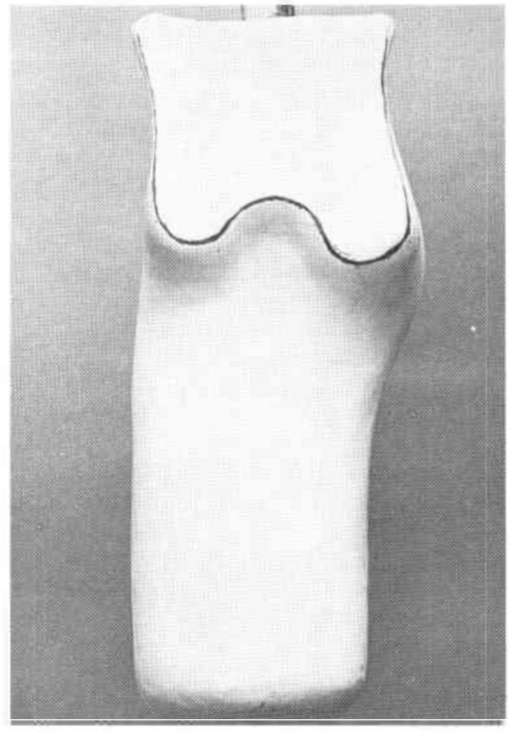

Fig. 3. Positive mould from the rear showing the more distal relief for the medial tendon.

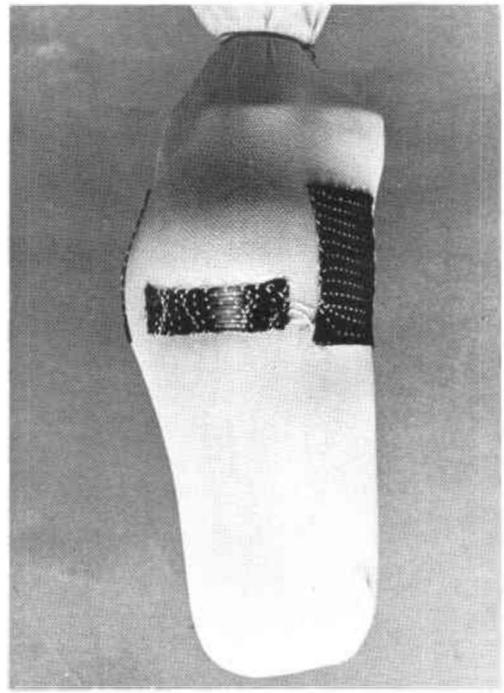

Fig. 4. Carbon fibre reinforcement of the prosthesis.

The socket is set in about 10 degrees of flexion on a tube frame. The alignment of the prosthesis is performed statically first and then dynamically during exercise.

This new type of prosthesis has been used in the Netherlands from 1980, introduced by the "Revalidatie Instituut Muiderpoort" (RIM) in Amsterdam (de Groot, 1983). In the authors' region the prosthesis is now widely used. The aim of this study was to evaluate the usefulness of this prosthesis to patients who formerly wore more conventional types of prosthesis.

Method

In the period from March 1981 to April 1983 in this region 45 patients who formerly wore a different type of prosthesis received a modified KBM prosthesis. The patients concerned were all already fitted correctly according to normal prosthetics standards. Misfitting was in no case the reason for providing the new type of prosthesis. An enquiry was set up to establish the value of the prosthesis to these patients. The patients were sent a questionnaire which explored four areas, function, stability, comfort and cosmesis. Useful answers were returned by 37 patients (82%), 22 of these formerly used a PTB prosthesis and 15 a prosthesis with thigh corset. The ages ranged from 9 to 87 years.

Results

In the categories of function and stability no statistically significant differences were displayed ($p<0.05$). However, there proved to be differences in the categories of comfort and cosmesis (Table 1).

Table 1. Response to Comfort and Cosmesis sections of questionnaire by 37 patients fitted with modified KBM prostheses.

	n = 15 prosthesis with thigh corset	n=22 PTB prosthesis
Comfort		
The new prosthesis:		
is easier to don	*	
is easier to doff	*	
is "more a part of myself"	*	*
causes less damage to clothing	*	
is lighter than the old one	*	*
Cosmesis		
The new prosthesis:		
looks better	*	*
is less visible under clothing	*	*
is less noticeable when not covered by clothing	*	

Comfort

Both groups experienced the new prosthesis to be "more a part of myself" and also lighter.

In the group of patients who formerly wore a prosthesis with a thigh corset a significant number stated that the new prosthesis is easier to don and doff than the older type and causes less damage to clothing.

Cosmesis

Both groups found that the new prosthesis looked better and was less noticeable under clothing and when not covered by clothing.

Discussion

There can be various reasons for providing a patient with a new type of prothesis. Although these reasons were not investigated in this study, commonly in rehabilitation practice these might be: "wear-out" of the old type; the wish of the patient to receive a new type of prosthesis; the conviction of the prosthetist that the new type of prosthesis is better. Not all patients can be "turned" to wearing the new type of prosthesis. Contra-indications for the modified KBM prosthesis are: considerable change in the shape of the knee (for example as a result of arthrosis); instability of the knee joint; a vulnerable skin.

Extra attention must be paid to the fact that a number of patients who formerly wore a PTB prosthesis stated that they suffered more discomfort from perspiration in the socket of the new prosthesis. The number was 16 of 22 and was not statistically significant ($p<0.05$). From the fact however that a number of patients deliberately wrote their complaints of perspiration apart on the questionnaire one can conclude that this problem can be rather serious in practice.

The problem of perspiration, probably made worse by the close contact of the stump in a non-permeable foam inner liner and the use of nylon stump socks, can sometimes be avoided by the wearing of woollen stump socks.

Imminent maceration of the stump by perspiration can be prevented, in most cases, by frequent washing of the stump with cold water.

Our conclusion is that the modified KBM prosthesis as described by Winkler et al, (1978) is an improvement for those patients who formerly wore a different type of prostheses. This is particularly true in respect of comfort and cosmesis.

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