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Use of the Femurett adjustable prosthesis in the assessment and walking training of new above-knee amputees

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Abstract

The Lic Femurett(Tm)[1] adjustable training prosthesis was evaluated on 51 above-knee amputees attending the Oxford Disablement Services Centre. In the elderly it proved superior to the Pneumatic Post-Amputation Mobility Aid (P.P.A.M.-Aid)(TM)[2] in the assessment of their ability to use a prosthesis, and is useful for walking training once the stump is fully healed; it does not replace the P.P.A.M-Aid at the early post-operative stage.

Object

The purpose of the study was to evaluate the Femurett adjustable training prosthesis for above-knee amputees, and to compare its use and role with that of the Pneumatic Post-Amputation Mobility Aid.

Introduction

A recent study showed that less than 30% of elderly dysvascular above-knee amputees were regularly walking with a prosthesis two years after amputation. (Sethia et al, 1986). There is therefore a need for thorough assessment before supplying a prosthesis. A physical examination is often not sufficient and some new amputees have unrealistic expectations. A multi-use early walking aid should save a prosthesis having to be made on a 'try it and see' basis. The P.P.A.M.-Aid, as described by Redhead (1983), is very useful for below-knee amputees, but it does have limitations in the accurate assessment of above-knee amputees. The Femurett can be used on above-knee, through knee and Gritti Stokes levels of amputation. It is manufactured by Lic Orthopaedi (Sweden) and is available in the United Kingdom from R. Taylor and Son (Orthopaedic) Ltd. of Walsall. It is a multi-use adjustable pylon which, like the P.P.A.M.-Aid, is used in the hospital environment and is *not* issued to individual patients for use at home. It consists (Fig. 1) of a neutral uniaxial ankle and foot, a tubular lower leg section adjustable for

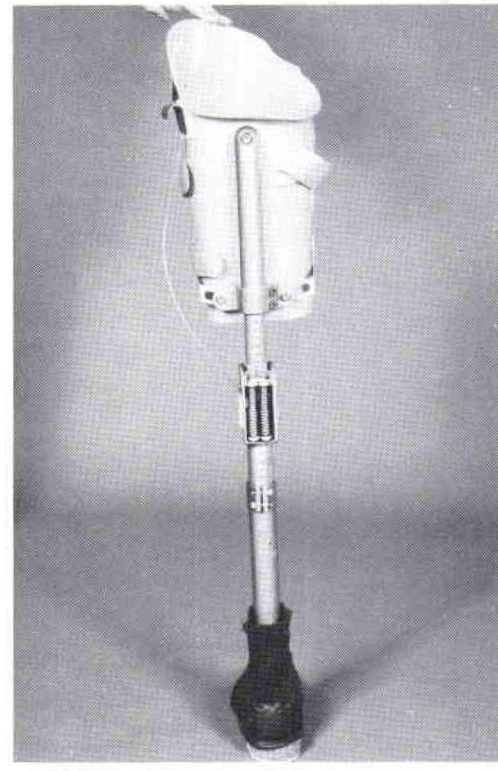

Fig. 1. Femurett prothesis showing adjustable components.

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[1]The Femurett is manufactured by Lic Orthopaedi, S–171 83 Solna, Sweden, and distributed in England by R. Taylor & Son (Orthopaedic) Ltd., Compton Works, 49 Woodwards Road, Pleck Walsall, WS2 9RN.

[2]The Pneumatic Post–Amputation Mobility Aid is manufactured by Vessa Ltd., Paper Mill Lane, Alton, Hampshire, GU34 2PY, England.

length and toe out, a single axis knee joint with extension spring and lock, a thigh section adjustable for length and rotation and different sizes of adjustable (laminated plastic quadrilateral) sockets which are readily interchangeable. The sockets are available in three sizes: small, medium and large and in left and right fittings; a simple adjustment permits the correct amount of socket ab– or adduction. It is not possible to adjust the 5° of socket flexion. All the adjustments are made using one Allen key. For the purpose of this study, it was decided only to purchase the small and medium sized sockets as the measurements of the large sockets seemed abnormally large. A single shoulder strap, attached to the socket, is the only suspension (Fig. 2).

Method

All the patients who used the Femurett in the first two years after it was acquired by the Oxford Disablement Services Centre (previously Artificial Limb and Appliance Centre) were included in the study. The majority of these had used a P.P.A.M.-Aid in the early post-operative period before their first visit to the Limb Fitting Centre. After examination by the Medical Officer the patients were introduced to the Physiotherapist who then fitted the Femurett between parallel bars. The patients who used the Femurett fell into two categories: those who needed further pre-prosthetic assessment because their ability to cope with an artificial limb was in doubt, and those who were waiting for supply of their first prosthesis and whose stump was sufficiently healed to start walking training with a rigid socket. For patients in the assessment category, their ability to walk between parallel bars, under instruction, was tested (along with comprehension, balance, ability to transfer and exercise tolerance). For those in the walking training category, a programme of training was given similar to that employed for patients starting with a conventional temporary prosthesis. The effect on the duration of rehabilitation until safe independent ambulation was achieved was noted. Patients were reviewed six months later.

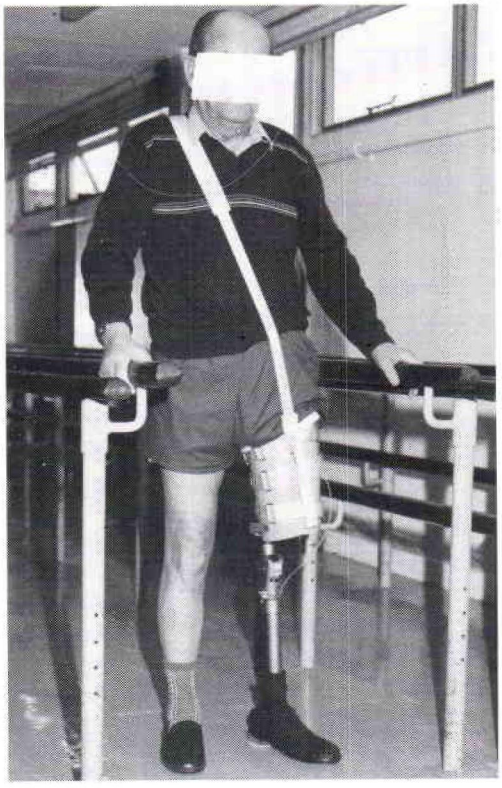

Fig. 2. The prothesis in use.

Results

Fifty-one patients were studied. These were 32 men and 19 women. The age range was from 19 to 89, all but 3 were between 50 and 89 years. The Femurett was used by 47 patients for pre-prosthetic assessment; of these, 34 were considered able to benefit from a prosthesis and were measured for limbs. Thirteen were not initially considered able to benefit from a prosthesis, but three of these were successfully fitted at a later date. Of the 37 measured, 33 were successfully using a prosthesis six months later. A total of 13 patients used the Femurett for walking training.

For three patients the fit of the Femurett was not satisfactory, but in two of these the fit was still sufficient to assess ability. In two cases the Femurett was not short enough (the shortest length from ischium to floor is 0.67m). The other misfit was due to the stump being too large for the medium size socket so in this case it would have been useful to have the large socket available.

Subjectively, all the patients who had previously used the P.P.A.M.-Aid commented on how light the Femurett felt. The presence of a foot was of psychological benefit in terms of

appearance, as well as assisting in balance. The comfort of the socket was preferred to that of the P.P.A.M.-Aid by most patients due to greater rigidity and security. On one occasion the ischial seat was too uncomfortable but padding with Plastazote relieved this.

The rigid socket greatly improved stability, especially for those with short above-knee stumps, thus giving a clearer picture of the patient's walking potential than the P.P.A.M.-Aid, which can be misleading when the stump is not well contained in the inflated bag. Because the Femurett has a foot, the amputees' balance could be assessed more accurately. For the Gritti Stokes amputation level the Femurett did not provide any end-bearing, but the open ended socket allowed for the extra length as did the posteriorly placed knee joint. The application of the Femurett, including the necessary adjustments, did not take long, and with practice the whole assessment was completed in approximately 15 minutes. The fit and function of the Femurett being similar to that of a prosthesis, it gave patients a more realistic impression of what a prosthesis would be like than the P.P.A.M.-Aid, and made the initial practice on the first custom-made prosthesis easier, but did not speed the overall walking training in the elderly. The younger patients who used the Femurett purely for walking training, were all able to progress from parallel bars to sticks, resulting in a speedier transition to independence. For the majority of patients it was possible to adjust the chosen socket to provide an adequate fit with one wool sock, but in the others either an extra sock, or a folded stump sock placed anteriorly in the socket was required to locate the ischial tuberosity accurately on the seating. The lack of adjustment for socket flexion was not detrimental to alignment in the patients studied, due mainly to the flexibility of the uniaxial ankle. However, the Femurett would not be suitable for patients with fixed flexion of more than 30° at the hip.

The single shoulder strap was not adequate as the only means of suspension, and a second 'yoke' strap looped round the shoulder strap and placed around the chest wall assisted in keeping the shoulder strap in place. The knee flexion, available by pulling the unlocking lever, enabled the patients to sit down while wearing the Femurett. The extension spring, which enabled an easy locking movement when standing from sitting, proved too strong to enable the patients to walk with a free knee (although in most of these patients this was not an objective). The P.P.A.M.-Aid was more effective in reducing stump oedema, and more comfortable and less traumatic for stumps which were still tender and not fully healed.

Conclusion

The hard socket and positive ischial seating are important factors in the timing of the use of the Femurett; the stump must be fully healed before the socket can be safely applied. The P.P.A.M.-Aid remains the walking aid of choice in the early post-operative stage and provides better control of oedema. Once the stump is healed, the Femurett proved superior; it is a valuable aid in assessing an above–knee amputee's ability to walk with a prosthesis, and more closely reflects the properties of a custom-made prosthesis than the P.P.A.M.-Aid. It is also a useful walking aid while the patient is waiting for delivery of his own prosthesis.

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