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Case study

Seated-popliteal weight bearing prosthesis for a bilateral amputee

S. F. WILSON* and W. E. FISHER**

**Rehabilitation Medicine, Royal North Shore Hospital, St Leonards, Australia.*
***Biomedical Engineering, Royal North Shore Hospital, St Leonards, Australia.*

Abstract

Bilateral lower limb amputees suffer from a lack of stability when seated without prostheses due to lack of ground reaction forces through the stumps. In patients for whom ambulation is not a realistic goal, the seated-popliteal weight bearing prosthesis provides a solution for stability when seated in a wheelchair, without the problem of tibial pressure experienced with patellar-tendon-bearing prostheses.

Introduction

Non-ambulant, wheelchair dependent older patients with peripheral vascular disease and lower limb amputations are often considered unsuitable for prosthetic fitting (Van de Ven, 1981; De Fretes *et al.*, 1987). Standard patellar-tendon-bearing prostheses, cast in 30° flexion, are sometimes prescribed to assist in standing transfers. However in this situation, the patellar-tendon-bearing socket can cause tibial pressure and eventually ulceration, particularly with patients sitting for long periods. This case study presents a successful lower limb prosthesis for improved sitting stability of a bilateral lower limb amputee.

History

A single 80 year old lady with long-standing polyarticular rheumatoid arthritis, a previous left trans-femoral amputation and a recent right trans-tibial amputation was referred for prosthetic fitting. The lady lived in a nursing home and had been using an electric wheelchair following her left trans-femoral amputation in 1988. She had poor visual acuity of 6/60 in spite of cataract extraction and intraocular lens implants in 1984. Her hand function was limited

Fig. 1. Patient in wheelchair: stability in forward leaning was limited.

All correspondence to be addressed to S. F. Wilson, Department of Aged Care and Rehabilitation Medicine, Royal North Shore Hospital, St Leonards NSW 2065, Australia.

by deformity and reduced shoulder abduction. She was able to feed herself and to operate her electric wheelchair and other appliances in close proximity (Fig. 1). Unfortunately, she was not able to lean forward without falling from the chair, which restricted her ability to open drawers or use wheelchair accessible transport. The problems related to the high centre of gravity of the body, compounded by poor hand and upper limb function with decreased visual acuity. The use of a board to support the trans-tibial stump did not significantly improve stability in the chair, nor did the use of a waist belt attached to the wheelchair. A hoist was required for transfers.

Development of prosthetic solution

A patellar-tendon-bearing prosthesis was tried in the hope of improving sitting stability in her chair and assisting in standing transfers from bed to chair and chair to toilet. However, standing transfers were not achievable despite full physical and occupational therapy training of nursing home staff and patient. The patellar-tendon-bearing prosthesis was not tolerated due to pain from pressure on the tibia in the sitting position.

Fig. 2. Finished sitting prosthesis.

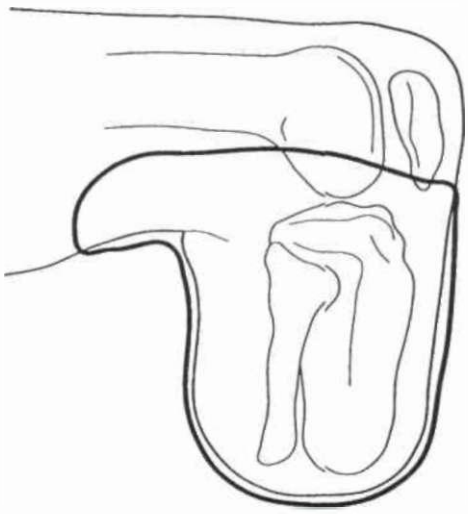

Fig. 3. Socket of plug fit sitting prosthesis showing wide popliteal shelf.

A plug fit prosthesis with extended popliteal shelf, cast in 90° flexion, was fabricated for the right trans-tibial stump (Fig. 2). It was lambswool lined thus requiring no stump sock. A simple supra-patellar stirrup strap was provided for suspension. A pylon with rubber tip was attached to the socket. The wide popliteal shelf of the sitting prosthesis, positioned relatively lower than the posterior lip of a typical patellar-tendon-bearing socket, provided a comfortable support for the flexed limb when seated, and prevented end bearing on the stump (Fig. 3). The combination of a lambswool lined socket and an easy plug fit simplified donning of the prosthesis.

Outcome

At one year follow-up the prosthesis was voluntarily worn by the patient on a daily basis. The only modification had been the addition of a standard supra-patellar-cuff (Fig. 2). The patient was now able to lean forward to open drawers, pick up items from the floor and to travel in a wheelchair accessible taxi without falling from the chair. A hoist was still used for transfers as the prosthesis was not designed for weight bearing when standing.

Discussion

The success of prosthetic rehabilitation for walking in bilateral vascular amputees is poor,

and may be as low as 26% (Evans *et al.*, 1987). Quality of life is thus a major issue for those without functional ambulation, particularly when wheelchair use is restricted due to problems arising from lower limb loss.

Where standing or ambulation is not an option, consideration should be given to a prosthesis designed entirely for function in the sitting position. The seated popliteal weight-bearing prosthesis described here is a prototype designed to increase function, independence and quality of life.

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