

A Commentary on the New England Preparatory Prosthesis

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INTRODUCTION

The major purposes of any preparatory prosthesis are early ambulation and residual limb conditioning. In any discussion regarding components or materials used in preparatory prostheses, it is important to keep these indications in mind.

Early ambulation is essential to prevent complications secondary to immobilization and to help the amputee achieve independent ambulation. Energy consumption during ambulation at lower amputation levels without a prosthesis is considerably higher than the energy used with a prosthesis. In the elderly dysvascular amputee, this is an important factor, as it is the practice of some surgeons to discharge their amputee patient with an appointment to see their prosthetist in two to three months.

Early ambulation may be achieved by immediate postoperative rigid dressings with a succession of sockets attached to a pylon and a prosthetic foot with appropriate suspension. Intermediate fitting occurs three to four weeks postoperatively. Ideally, while awaiting the prosthesis, the amputee is involved in a pre-prosthetic reconditioning program.

Residual limb conditioning is the second indication for a preparatory prosthesis. Edema must be controlled and the fragile soft tissues of the residual limb must be conditioned to provide the maximum protection possible. The diabetic, sensory impaired, dysvascular residual limb requires

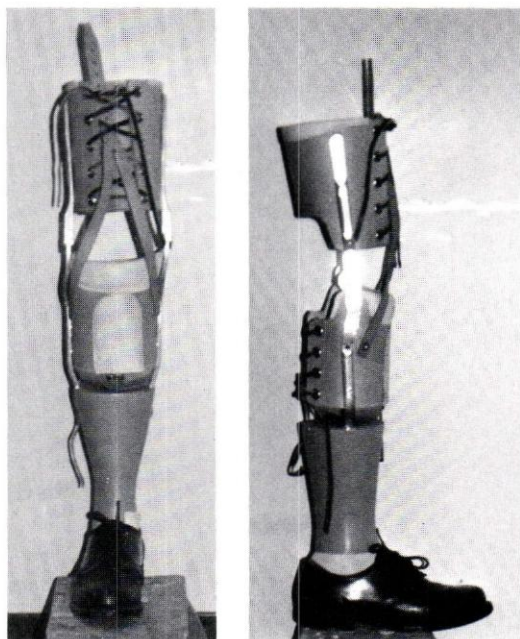
gradual conditioning with an appropriately fitting socket. Volume control with a shrinker is not enough to provide conditioning.

Preparatory sockets and prostheses fall presently into three categories:

- Plaster of Paris sockets attached to pylons with appropriate suspension.
- Plastic sockets of varying materials, either total contact or "adjustable" with appropriate suspension.
- Leather adjustable sockets.

In the hands of a surgeon, a prosthetist, or a well-trained technician or therapist, plaster sockets must be carefully observed and changed as frequently as shrinkage occurs, in order to prevent residual limb trauma. This can be a logistical problem as the availability of a skilled technician is sometimes an issue. Alignment also may vary from one socket to the next.

The use of various types of plastic sockets is presently in vogue. These may be total contact, nonadjustable, or most commonly, they may attempt to achieve adaptation to rapid volume changes by using anteroposterior adjustability. The addition of multiple residual limb socks is used to accommodate volume changes. Because of the eventual loss of proper conformity of the socket to the limb as it conditions, new sockets may need to be fabricated. Suspension can be adapted to the needs of the individual patient.

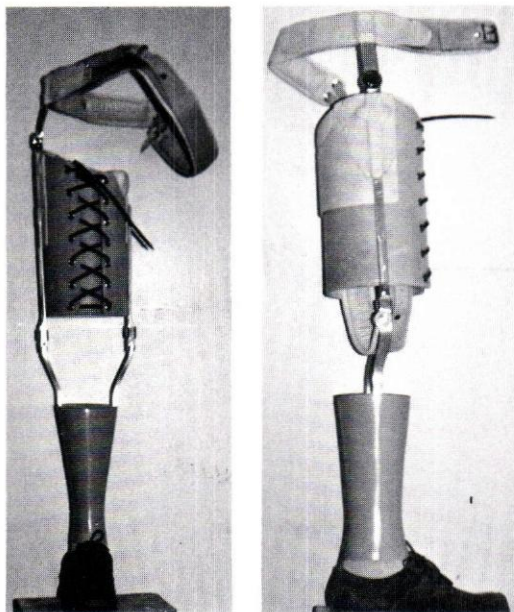


Figures 1A and 1B. Anterior and lateral views of the below-knee variant of the New England Preparatory Prosthesis.

THE NEW ENGLAND PREPARATORY PROSTHESIS

The geographic use of the adjustable leather above the knee or below the knee preparatory prosthesis has apparently been reduced to a few facilities in New England (Figures 1A, 1B, 2A, and 2B), hence the name. With the advent of space age technology, it suffers from an image problem, yet it is the major preparatory prosthesis used at the New England Rehabilitation Hospital. In the past five years, over 500 amputees have been gait trained using this prosthesis.

The New England Preparatory Prosthesis allows early ambulation in the below-knee amputee because of the capability of extending the thigh corset so that gluteal or ischeal weight-bearing can protect an unhealed residual limb (Figures 1A and 1B). The thigh corset in the below-knee and the drop-locked knee joints in the above-knee prosthesis give the stability needed for the



Figures 2A and 2B. Anterior and lateral views of the above-knee New England Preparatory Prosthesis (note the usage of drop locks at the knee).

geriatric, dysvascular amputee population (Figures 2A and 2B).

The laced adjustable socket assures proper fit, not only anteroposteriorly, but mediolaterally. Patella tendon bearing or ischeal weight-bearing is easily maintained.

Residual limb wrapping is not critical, because the adjustable socket becomes the shrinker. Only one residual limb sock is used, as excessive numbers of socks in plaster or plastic below the knee sockets causes all conformity of the socket to the residual limb to be lost, and essentially one is left dealing with a plug fit socket. The adjustable leather socket obviates the need for serial sockets, making the leather socket economical as well.

Major objections to the leather adjustable socket have centered about abnormal sheer forces and the production of edema in the open ended socket. These have not been shown to be factors in our experience.

SUMMARY

In this age of rapid technological advances, the New England Preparatory Prosthesis continues to perform well, and the goals of a preparatory prosthesis are achieved by its use. Its versatility has been one of its prime advantages, especially its easy adaptability which precludes the need for serial sockets. It is simple and durable. Not all amputees progress to definitive prostheses, and in some geriatric amputees, this is their permanent prosthesis. Active preparatory prosthetic users progress to definitive prostheses in six to 12 weeks and usually do not require gait training, except when above-knee amputees receive a non-locking knee unit in their definitive prosthesis.

It requires the work of a true artisan to be able to fabricate this prosthesis. However, the availability of well-trained leather workers is rapidly declining. It would appear that this portends a serious problem for the future of the New England Preparatory Prosthesis.

Based on our experience with the New England Preparatory Prosthesis, we do not wish to condemn progress, but rather to show how, in our experience, there is a place for the leather adjustable socket.

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