Introduction

Loss of a limb through trauma or disease can be devastating. Fortunately, recent advances in technology are providing amputees with increased prosthetic options, including the use of myoelectrically controlled prostheses. These advances have also created demands on the health professionals working with amputees to increase their knowledge base in this field and to develop better decision-making processes.

Proper identification of the most appropriate prosthesis for a particular amputee is a complex and dynamic procedure. Knowledge of the available prosthetic components, of the amputation level(s) and status, and of the amputee’s skills, life-style, and goals are all aspects that must be considered when developing a plan. For these reasons a team approach with the amputee as an active, central figure on the team is most appropriate for proper decision making. The health professionals most commonly involved on this team are the physician, prosthetist, and therapist. Often psychologists or social workers, rehabilitation specialists, or vocational rehabilitation workers may become involved. The key to successful prosthetic prescription and use is to examine all available information and to remember that this is a dynamic process during which decisions may change.

The true myoelectric prosthesis has existed only since the first crude artificial hand was introduced by the Russians in 1958. Widespread commercial availability did not start until later in the 1960s. Since then, little has been written on training an amputee in the use of these myoelectric prostheses. This chapter focuses on the role of the occupational therapist in training a person with a myoelectric prosthesis. The sequence for training is reviewed, starting with the evaluation process for proper system selection. Once this evaluation and prosthetic selection is completed, pre-prosthetic training is initiated. Prosthetic training then begins upon receipt of either the temporary or the permanent prosthesis. Prosthetic training is a dynamic process that includes orientation, control and use training, and, ultimately, training in activities of daily living.

The procedures described in the following sections are presented in a specific sequence for easier explanation of the process. Clinical experience has demonstrated the effectiveness of these procedures, although alterations to fit the individual amputee and the setting are always appropriate. Remember, the ultimate goal is independence of the amputee; the method is secondary.

System Selection

The decision to use a myoelectrically controlled prosthesis must be evaluated by the entire team working with the amputee, and, particularly, by the amputee. New myoelectric systems are continually being developed, and the use of hybrid systems are also becoming...
increasingly popular. The final selection of the most appropriate prosthesis for an amputee depends on many factors. An evaluation of the total person and of the available resources is necessary for proper system selection. Listed below are the factors to consider in determining the proper prosthesis:

1. Personal data including age, marital status, finances, and insurance coverage.
2. Medical and prosthetic history.
3. Physical status including level of amputation(s), residual limb condition, range of motion of proximal joints, muscle strength and endurance, phantom pain or sensation, sensory status, and hand dominance.
4. Functional status with amputee’s goal for level of independence in all activities of daily living, including self-care, homemaking, communication, and leisure skills.
5. Social/vocational history including patient’s role within the family, support systems, and previous vocational status.
6. Patient expectations of prosthetic function and cosmesis; patient’s motivation and ability to learn new skills; problem-solving ability with capacity to generalize information; and patient goals.

If a myoelectric system appears to be appropriate upon consideration of this information, the following factors should be examined to determine the feasibility of myoelectric use by a particular client.

Advantages of myoelectric use:
- Cosmesis
- Ability to be used overhead and in all planes of movement
- Harnessing may be unnecessary
- Graded grip strength is available through proportional control
- Greater span for terminal device opening
- Minimal proximal body movement and effort is needed for control
- Stronger prehension force

Disadvantages of myoelectric use:
- Cost of prosthesis
- Fragility of prosthesis
- Rate of breakdown
- Complex technical knowledge required by entire team limits the number of good prosthetic centers available; amputee’s proximity to prosthetic shop for service may thus be limited
- Greater weight of prosthesis with maximal pressure on the point of suspension (without harness)
- Intimate fit of socket may cause discomfort and may be hot or harsh on fragile skin

As yet there is no definitive standard by which to determine the ideal candidate for myoelectric use. The most effective method involves a thorough evaluation of the amputee, with input from the entire prosthetic team, and consideration of the factors as well as the advantages and disadvantages listed above. Again, the amputee’s goals should always be forefront in the decision-making process. As indicated, the prescriptive process is dynamic and may change as the evaluation progresses.

Few studies are available that compare the success rate of myoelectric users with that of conventional prosthetic users. The studies that have been conducted have relied on small samplings owing to the recent advent of this technology. A study by Malone et al concluded that there is an optimal time for initiation of prosthetic use. Prosthetic fittings during this “golden period” of 18 to 21 days postinjury have resulted in a 60% to 70% acceptance rate of the prosthesis. Experience at prosthetic centers indicates that an amputee who has not worn a prosthesis for more than 6 months postinjury will not be a good prosthetic user. These amputees have generally converted to one-handed performance in most activities. Because of the importance of an early fit for successful prosthetic use, the prosthetic team must be skilled enough to make appropriate decisions quickly.

Control-Site Selection

If at this point in the evaluation process a myoelectrically controlled prosthesis appears appropriate, muscle sites are tested to determine the potential for activation of a prosthesis. This simple, gross preliminary testing helps determine the residual muscle control and prospec-