Rehabilitation has been defined as the process of optimizing the physical, psychological, and social potential of the individual. It is an ongoing process of care that helps patients to maximize their abilities and to reintegrate into society. Lord Holderness, himself a double amputee, summed it up when he said, “Rehabilitation converts a patient into a person.”

The World Health Organization has defined disablement as a continuum between impairment, disability, and handicap.1 “Impairment” is defined as any disturbance in normal structure and functioning of the body. It includes a defect or loss of a limb, or part of a limb. “Disability” is defined as the loss or reduction of functional ability and activity consequent with impairment. “Handicap” is the disadvantage resulting from impairment or disability. It is characterized by the individual’s inability to match the performance of his or her peers. Handicap represents the social and environmental consequences of impairment and disability.

To use the example of the amputee, the long-term effects of diabetes may result in the nonviability of a limb that will require amputation (impairment). The consequences are the inability to walk, move around the house, climb stairs, and other activities; in short, the major limitation of mobility (disability). Viewed within the uniformity of the hospital ward, amputee patients show little variation in their impairments and disabilities. However, after discharge to their homes, each patient experiences individual problems (handicap), as they reenter their personal environment of home, social life, and work place. Active rehabilitation addresses all stages of disablement.

Extent of the Problem

The United Kingdom has abandoned counting the number of amputees referred to the Artificial Limb Center in Manchester since 1989. At the clinic, which serves a population of 3.5 million people, approximately 110 diabetics with major amputations are treated annually. Using smaller regional studies, it is estimated that approximately 4% of the diabetic population have undergone an amputation.² The picture, however, is not all gloomy; Ebskov³ reports a 5% decrease in the incidence of diabetic amputations in the population of Denmark during the years 1980 to 1990. The median survival time after a limb amputation is 3 years, 8 months in a Scottish study.³ Some authors have inferred that the survival period has improved during the last 25 years while others, notably in Denmark, have not seen an increase.³

Another major factor influencing the welfare of the diabetic amputee is the condition of the contralateral limb. Currently, the expectation is that 50% of surviving amputees will lose their second limb within 5 years. It is imperative that this depressing statistic be improved through better foot care: the St. Vincent’s declaration demands it. The St. Vincent’s declaration on diabetes care in Europe, signed in 1990 by most Western European nations, aims to achieve a 50% reduction in amputations in diabetic patients by 1995.

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The facts above suggest two important conclusions: 1) in view of the limited life expectancy, rehabilitation including prosthetic fitting and social reintegration must be carried out promptly and efficiently; 2) preserving the second limb is of the greatest importance and should be seen as an integral part of the rehabilitation process.

**Patient Management**

**Preamputation or Presurgical Stage**

This begins as soon as a decision to perform the amputation has been made. The patient requires a full medical evaluation of his or her physical and psychological status. The general fitness of the patient should be improved, which may include adequate doses of analgesia. Social assessments should be carried out including a detailed evaluation of the patient’s home needs, desires, and ambitions. Wherever possible, the patient should be invited to the rehabilitation center to meet the professionals who will be involved in his or her aftercare. The amputee will benefit from meeting an experienced amputee who is matched for age, sex, and proposed level of amputation.

The preoperative period of stress is helped if the surgical team finds time to talk openly and honestly about the proposed surgery. Together with a counselor or psychologist trained in amputee care, it is important to confront the fears of those approaching surgery by talking positively and honestly about the process and speaking encouragingly about social acclimatization following surgery. Sound advice given before amputation is often remembered and appreciated by patients and their families.

**Surgical and Operative Phase**

The objective of surgery should be to sculpt a limb remnant that is of the correct length and capable of being fitted with a modern prosthesis. In order to achieve the best results, surgeons should be trained in modern surgical techniques, and remain knowledgeable about prostheses and socket technology.

The level of amputation should be agreed upon with the rehabilitation team. In deciding the level, consideration should be given not only to the extent of the pathology, but also to the general health, life expectancy, chances of walking, and cosmetic desires of the patient. It can sometimes be inappropriate to try and persevere with a distal amputation through a partly vascular foot, thus making the patient dependent on dressings, antibiotics, and continued medical treatment as opposed to accepting a compromise and proceeding to a more proximal amputation, thereby allowing quicker healing, earlier discharge, and a mobilization on a prosthesis at the expense of perhaps less fluent mobility.

The cosmetic appearance should be considered, especially when planning a Syme’s amputation. The stump, together with the fitted prosthesis, will never match the girth and shape of the contralateral ankle and may continue to be a source of distress and dissatisfaction.

This is by no means an exhaustive account of the factors to be considered when planning an amputation. It merely intends to emphasize the close cooperation required between the surgeon and the rehabilitation team.

**The Postoperative (Prosthetic) Phase**

The Amputee Medical Rehabilitation Society of Britain recommends that first contact with the rehabilitation team should occur within 3 weeks following surgery. Good teamwork should ensure a seamless transition from the surgical team to the rehabilitation team. Having protocols for analgesia and physiotherapy improves this transfer of care.

Immediate postoperative fitting of a prosthesis was first advocated by Berlemont in France in 1961. Many hospitals have abandoned the technique but have compromised by using a postoperative rigid plaster of Paris cast, to aid wound healing and stump volume reduction. Other centers use elastic socks and mobilize the patient early on various devices such as the Pneumatic Post Amputation Mobility Aid®. The Pneumatic Post Amputation Mobility Aid may be used from the fifth day in a stump that has normal blood supply or after 7 days in the dysvascular patient. It is useful in gait re-education, control of stump volume, and provides a psychological boost to the patient.

Rehabilitation is best delivered through a multidisciplinary team. Interdisciplinary working between the surgical team, the medical team, the social services team, and the rehabilitation unit is additionally required. These artificial divides are of no interest whatsoever to the patient and there can be no doubt that, under ideal circumstances, all involved in the care of the amputee patient should work together with the objective of producing the optimum rehabilitation plan for each individual.

The functions of the team should be to assess and treat; to provide psychological and emotional support; and to provide ongoing care and prosthetic maintenance. Assessment includes general health and fitness (including higher function assessment),

®1 Vessa Ltd, Oulton, England.
stump assessment, psychological and social assessment, and environmental assessment. The general health of the amputee should be appraised in detail. It should be remembered that the more proximal limb amputations require considerably higher energy-expenditure levels in order to mobilize with a prosthesis. The average above the knee amputee expends 60% more energy and the below the knee amputee will increase his or her energy expenditure by 20%.

The psychological effect of amputation has been documented in many articles. Murray-Parkes noted that there were four main consequences of amputation: 1) the loss event and the individual’s reaction to it, which is not dissimilar to the process of bereavement; 2) the loss of a limb represents a form of deprivation in absolute terms and relative terms, i.e., as compared with previous levels of mobility; 3) the enforced change in the role that the patient plays within his or her family circle and society. Even interpersonal and marital relationships are profoundly affected by amputation with role reversal being commonly observed; and 4) as limb loss is so externally obvious, it has always been the source of stigmatization and sometimes segregation. The constant fear of failure and loss of function affect many activities and decisions of the amputee.

Society at large tends to have a slightly ridiculous view of the amputee, often associating them with popular myth such as “Long John Silver.” Employers similarly view the amputee as being unreliable and requiring considerable periods off from work in order to get attention to their stump and prostheses.

Of greatest importance is the amputees’ perception of themselves. Wittkower studied the personalities of traumatic amputees and found that they exhibited a range of response from euphoria at one extreme passing through indifference, melancholy, sadness, and depression. However, after some time, he noted that many had returned to their premorbid personalities.

Fishman noted that the receipt and subsequent use of a prosthetic device produced a major boost to the personality of the amputee. He concluded that there was a decrease in negative feelings and frustration and an increase in feelings of confidence, effectiveness, and functional independence. He went on to suggest that a considerable service could be rendered if the amputee could be made aware of the realities of prosthetic wear by appropriate counseling prior to the time of the fitting of the prosthesis, as it tended to minimize disappointments.

Psychological healing must occur simultaneously with physical mobilization. The family can benefit through understanding and accepting the situation and being involved in the plan for therapy and mobilization.

An assessment of social and environmental needs is carried out by the occupational therapist during a home assessment with the individual. These visits should be timed to occur toward the end of the patient’s rehabilitation period in hospital.

Employment and employability of amputees should be addressed by the rehabilitation team. The aim should be to return amputees to their premorbid profession. For the manual worker, this may not be possible, and the reality is that those who depend on physical labor for their livelihood very often suffer through long-term unemployment. Retraining may not be an easy option because of poor literacy and communication skills.

The Prosthesis

There is a wide array of prosthetic hardware available to match nearly all of the demands of most amputees. Generally speaking, the diabetic amputee should not indulge in vigorous sporting activity and the emphasis should be to prescribe the lightest possible equipment appropriate to the individual.

The major components of a prosthesis are as follows: 1) the socket, which applies directly to the residual limb. The importance of socket fit and comfort cannot be overemphasized. It is dependent on the stump quality and customization of socket design carried out by the prosthetist; 2) suspension is by means of specialized straps and suction; 3) a shank usually made of carbon fiber or titanium; 4) replacement joints to substitute for those that have been ablated; 5) alignment devices to allow translation and rotational adjustment; and 6) cosmesis for which various materials are used including silicon, foam, wood, or stockings.

It is beyond the scope of this article to deal with prosthetic hardware. Instead, readers would be advised to visit an artificial limb center and view the range of hardware available. Physicians should be cautious in their prescription of hardware in order to ensure compliance with medical directives and consumer protection laws.

Problems particular to the amputee with diabetes include the following: 1) fluctuation in the stump volume making socket fitting difficult; 2) neuropathy and stump anesthesia. This is particularly seen in the patient with the partial foot amputation and may lead to secondary neuropathic ulcers; 3) poor vision making walking and self-care more difficult; and 4) cheiroarthropathy, where the hands are badly deformed causing difficulty with donning and removing the prosthesis. For those living alone, it is not uncom-
mon to see the prosthetic socket becoming loose, sometimes to the long-term detriment of the stump.

Conclusion

Ongoing care of the amputee is required in order to maintain his or her level of mobility. The rehabilitation team must be aware of the changing and often progressive nature of the disease, as many complications may be prevented or treated. Care of the contralateral limb and prevention of skin damage that may lead to neuropathic ulcers should be integral to the philosophy of the team.

Social and vocational reintegration of amputees should be encouraged and supported. Rehabilitation teams have a wider duty to influence the politics of disablement in order to help create an environment more conducive to the reintegration of the disabled person.

Ultimately, rehabilitation is a concept that is difficult, if not impossible, to measure. Most amputees achieve a great deal and make valid decisions regarding their future activities and desired lifestyles. Increasing abilities over time allows for greater freedom and opportunity to lead a fuller life. When amputees can sustain a lifestyle whereby their perceptions of themselves are in harmony with their actual physical abilities, then perhaps rehabilitation has been successfully achieved.

References