

PROSTHETICS ADVANCES SPEEDING RECOVERY OF AMPUTEES *

American veterans of the Vietnam war who have suffered amputations have far better prospects for quick recovery and rehabilitation than their predecessors in any previous war. New and increasingly sophisticated limb prostheses and revolutionary techniques for applying them are materially shortening the time that must elapse before amputees can return to normal life.

The dramatic progress that has taken place in the last 20 years in the management and rehabilitation of amputees stems directly from the work of the National Research Council's Committee on Prosthetics Research and Development. The genesis of the committee goes back to the closing days of World War II when the Surgeon General of the Army, dismayed by the primitive quality of prosthetic devices available to wounded veterans, the limited amount of industrial effort in the field, and the entire absence of research and development, turned to the National Research Council for assistance. The Council established a board with two committees, one for artificial limbs and the other for sensory devices to aid the blind. The board launched a two-fold attack on the problem, one effort directed toward immediate applications in the form of new and more efficient artificial limbs. With some administrative and functional permutations, the board has continued its efforts during the intervening years and is presently known as the Committee on Prosthetics Research and Development (CPRD) under the Division of Engineering of the National Research Council.

EXPANDED TO NON-VETERANS

Although the plight of the young veteran returning from war stimulated the initiation of the Prosthetics and Orthotics Program, it was the intent of those who created it that any benefits that might accrue should be made available to all who would be in need of them. In addition to disseminating results so that they may benefit all, whether military veteran or not, the program has been expanded to direct attention to the special problems of infants, school-age children, and geriatric patients.

Fiscal support originally came from the Office of Scientific Research and Development. Soon after the end of World War II the Veterans Administration assumed responsibility for support of the program. In the mid-1950's

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the Office of Vocational Rehabilitation (now Social and Rehabilitation Service) and the Children's Bureau received authorization to support research in limb prosthetics and orthotics (orthopaedic bracing) and today all three government services support the activities of CPRD.

Throughout the United States there are approximately 35 research and development projects in prosthetics and orthotics nearly all of which are supported by the Federal government. It is the responsibility of CPRD to correlate and coordinate the work of these projects, to advise its sponsors in the conduct of programs they support, and to disseminate information through the journal *Artificial Limbs*, the *Inter-Clinic Information Bulletin*, and special publications as appropriate. In addition, CPRD advises the Veterans Administration on its projects concerning sensory aids. Every effort is made to keep informed on work being carried out abroad as well as in this country. The committee enjoys an especially close relationship with research groups in Canada.

Through the work of the committee there has been established an orderly process for decreasing the time normally required between the conception of a device or a technique and its application to a patient—the phases in the process being fundamental studies, development, evaluation, production, education, and clinical application. Thus results of the program are based on a sound analysis of the musculoskeletal system, and the clinic team is prepared to meet the needs of individual patients.

LIMBS FITTED IMMEDIATELY

As a result many new devices and techniques are now available for clinical use. Among a host of items emanating from the program are improved sockets for all levels of amputation, control units for artificial knees based on hydraulic principles, easier fabrication methods, and new surgical techniques. Application of the new devices and principles results not only in improved function, comfort, and appearance of the patient but also in reduced costs of providing rehabilitation services to amputees and others with musculoskeletal disorders. A dramatic recent example of what can be done is the case of a young schoolteacher who expected to lose 6 months from his job because of an amputation below the knee. Instead, he was fitted with a temporary limb immediately after amputation and while still under anesthesia (Fig. 1). He was allowed to begin ambulation the next day and returned to a full schedule of teaching 17 days after admittance to the hospital.

These accomplishments could be made only because of excellent teamwork between the engineering and medical professions. Indeed, the Prosthetics and Orthotics Research Program, as the effort is often called, is considered to be one of the pioneering efforts in the now popular field of bioengineering.

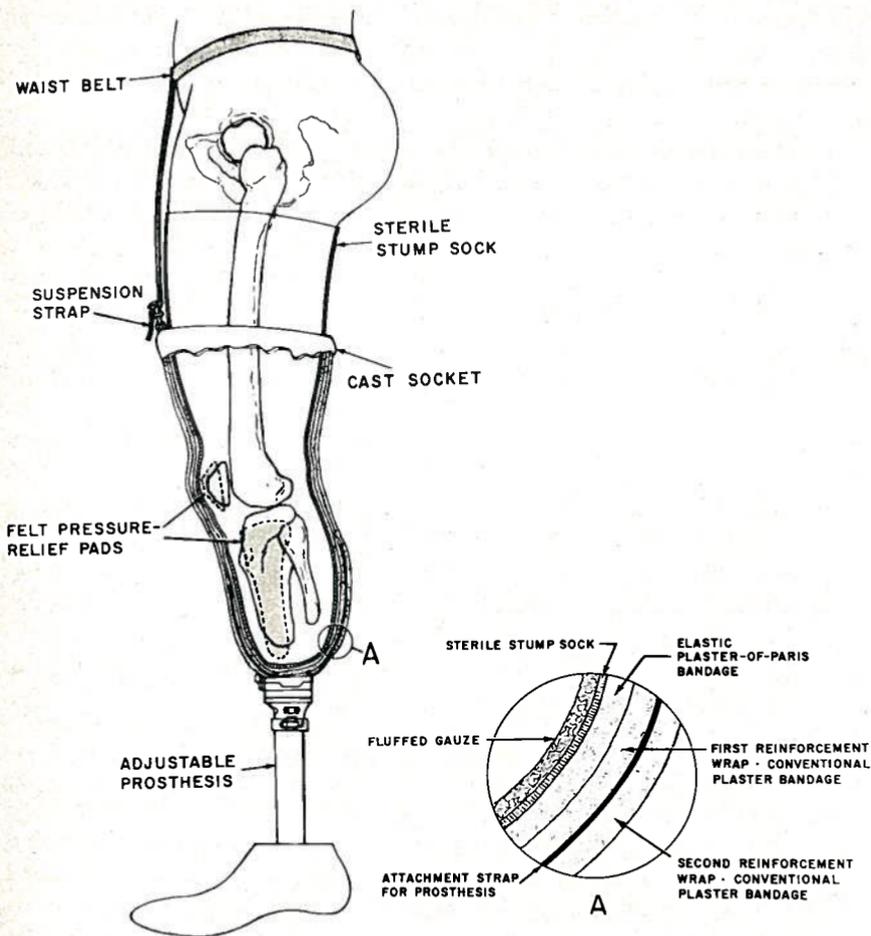


FIGURE 1.—Cross section shows most of the elements of the application of prosthesis to a below-knee amputee immediately after surgery.

The leaders in the early days of the program soon recognized that for the results of research to be effective on a broad basis some means would have to be established for an orderly introduction of devices and techniques into the field. In 1953 a pilot education program of short-term postgraduate-type courses was set up at the University of California, Los Angeles, for clinical teams consisting of surgeons, physicians, therapists, and prosthetists. So well received was this effort that similar programs have been established within the medical schools at Northwestern University and at New York University. The postgraduate courses are now supplemented by two- and four-year courses for the training of young people to be prosthetists and orthotists.

FORMED EDUCATION COMMITTEE

To encourage the introduction of prosthetics and, later, orthotics into the curricula of physical and occupational therapy schools, undergraduate medical schools, and residency programs for orthopedic surgery and physical medicine and to help disseminate information to practitioners, the National Research Council in 1958 established within the Division of Medical Sciences a group that is now known as the Committee on Prosthetic-Orthotic Education.

This committee has been active in pinpointing educational needs in prosthetics for various health groups. It also evaluates educational materials on the subject and stimulates the development and distribution of additional education information.

Over a 2-year period ending in the fall of 1963, the committee, in cooperation with the member facilities of the American Orthotics and Prosthetics Association, conducted a survey that collected data on more than 12,000 new amputees from all 50 states. One of its findings was that below-knee amputation was performed in 2,431 cases of disease of the lower extremities in patients over 40 years of age (most of whom had peripheral vascular disease). The data indicated that the incidence of reamputation in successfully fitted below-knee cases was almost zero. This was despite the fact that many surgical textbooks warned against below-knee amputation in cases of gangrene due to vascular disease because of the supposed likelihood of reamputation. Thus the relatively large number of amputees that had been successfully fitted at the below-knee level threw doubt on the validity of the textbook principle.

The study also found a wide variation in the proportion of above-knee to below-knee amputations in different large metropolitan areas, apparently due primarily to differing philosophies of proper practice.

EMPHASIZES SAVING KNEE JOINT

In view of this kind of evidence and because of the many advantages of preserving the knee joint, the committee has been trying to encourage the practice of amputating below the knee rather than above in cases in which there are not other overriding factors.

To help carry out its work the Committee on Prosthetic-Orthotic Education has established five subcommittees in the areas of educational materials, prosthetics clinical studies, orthotics, special education projects (working with prosthetists and orthotists), and paramedical education (working with nurses, physical therapists, and occupational therapists).

These two NRC committees, whose efforts complement each other, are pioneering across a broad front to give new hope and new usefulness to those suffering from musculoskeletal deficiencies.