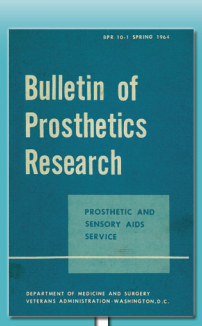

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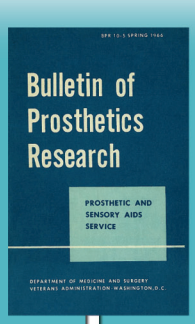

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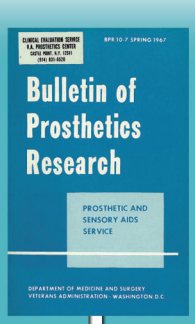

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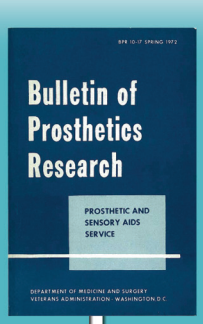

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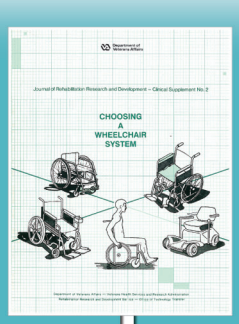
1985



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THEN & NOW

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PROSTHETIC AND SENSORY AIDS SERVICE
BPR Fall 1964

STUMP ARTERIAL CIRCULATION AND ITS RELATIONSHIP TO THE PRESCRIPTION OF A PROSTHESIS FOR THE GERIATRIC PATIENT

BROR S. TROEDSSON, MD

The primary purpose of the Research Program in Prosthetics, inaugurated by the Surgeon General of the Army in 1945 and now supported by the Veterans Administration and other agencies, has been to improve or construct artificial limbs that would enable the amputee to assume his place in society with a minimum loss of function. Although research has been mainly devoted to fitting the young, vigorous soldier, fitting the geriatric amputee has become an ever-increasing problem. Recognizing this fact, the National Academy of the Sciences authorized a special conference on The Geriatric Amputee, which was held in Washington, D.C. in 1961. At that conference, the Panel on Medical Management (1) chaired by Dr. George T. Aitken, recommended that the geriatric amputee be defined as a person over 55 years of age, and that the terms "old amputee" and "new amputee" be used to designated two subclasses. The panel recognized this terms as somewhat arbitrary since age is a matter not only of chronology by also of physiological fitness.

In my experience, the statement credited to Dr. Osler of The Johns Hopkins University, "You are as old as your arteries," is true in the majority of cases; statistics also bear out the adage. Since arteries may be obstructed in the young as well as in the old, the term geriatric amputee should probably be abolished, and the title, "Amputations and prostheses in case of decreased arterial supply in the extremities and in the stump" be used instead. This all-embracing title would also have subgroups, such as nondiabetic and diabetic, and would include consideration of amputation sites and technics.

Statistics indicate that vascular diseases, particularly atherosclerosis, cause more deaths than the next five causes, which include cancer. Certainly in most cases, the degree of lower-extremity function is directly related to arterial condition, such as degree of obstruction. With increasing obstruction, there is a corresponding decrease in function and an "aging" of the limb, which may lead to gangrene, resulting in death. The same symptoms associated with gradually increasing obstruction in the arteries of a limb may also be presented by the stump, i.e., the stump may get tired or develop claudication after a brief walk with the prosthesis; stump abrasions may develop after socket contact during a short walk, and the abrasions may be slow-healing or nonhealing, depending upon the degree of loss of stump arterial circulation. It is evident, therefore, that a prosthesis cannot be properly prescribed unless the arterial circulation of the stump is accurately evaluated. For example, if a patellar tendon-bearing prosthesis were prescribed for a stump with poor circulation, the patient would probably experience serious stump problems in a relatively short time.

The site of amputation and shape of the stump are also factors that profoundly influence the prescription of a prosthesis, and it is the surgeon's responsibility to select a level that will provide the greatest function restoration that the circulatory state of stump and contralateral extremity will allow and, of course, in terms of available prostheses. Unfortunately, few surgeons are expert in both circulatory and prosthetic specialties, so poor rehabilitation often results for many patients.

To continue reading, please visit http://www.rehab.research.va.gov/jour/64/1/2/39.pdf.

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COMMENTARY ON TROEDSSON'S 1964 ARTICLE "STUMP ARTERIAL CIRCULATION AND ITS RELATIONSHIP TO THE PRESCRIPTION OF A PROSTHESIS FOR THE GERIATRIC PATIENT"

JOAN E. SANDERS, PHD

Though the reasons for amputation since 1964 have shifted from primarily disease (93% disease, 5% trauma) [1] to a closer balance between disease and trauma (55% disease, 45% trauma) [2], a major challenge faced by the amputation surgeon continues to be selection of the appropriate level of amputation.

Troedsson recognized the need for an instrument to estimate residual-limb circulation so as to facilitate decisions about amputation level [3]. The oscillometer, a device that measures peak pressure pulse in a segment upon slow release of a blood pressure cuff on the limb, was showing great promise. However, no subsequent reports in the literature demonstrate that oscillometry was developed into a highly effective tool for amputation-level selection. Numerous other instruments were pursued, and today, a number of techniques are used, including angiography, segmental limb pressure assessment, thermography, fluoroscopy, skin blood flow using laser Doppler or radioisotope washout techniques, and transcutaneous oxygen pressure [4]. Though these techniques have dramatically facilitated decision-making surrounding limb-salvage procedures to avoid amputation, none has been adopted as a definitive technique to indicate appropriate amputation level.

One reason no single instrument is effective for selecting amputation level is that many aspects of vascular function affect tissue viability. Each instrument measures a single aspect of vascular health. For example, oscillometers measure arterial distensibility, an important measure because stiff arteries tend to occlude and limit nutrient delivery. Skin blood flow rate and limb arterial blood pressure are also factors, but a patient can have good blood flow and adequate limb arterial pressure but a poor capability to transport nutrients into tissues because vessel walls are stiff and structurally difficult to penetrate. Further challenges are that some patients' tissues adapt well to amputation while others' do not. Thus, data collected before the amputation may or may not indicate tissue health postamputation. A current challenge for the research community is the development of tools to synthesize quantitative measurements from instruments with clinical insight and experience to help decide amputation level.

Many instruments have improved postamputation care. These include sensors and controllers integrated into powered componentry, as well as measurement instruments used to make computer-manufactured sockets. An exciting future prospect is the use of on-board monitoring and communication devices not only to provide important information to practitioners to match prosthesis design to patient needs but also to facilitate communication between the patient, his or her prosthesis, and the practitioner.

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