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Artificial Limbs

A Review of Current Developments

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Aging and Amputation

HAROLD W. GLATTLY, M.D.[1]

THE loss of a part of a lower extremity due to peripheral vascular disease (PVD) incident to the effects of arteriosclerosis with or without the presence of diabetes is today the predominant type of amputation that is being performed in peacetime in the Western World; *i.e.*, the United States and Europe. These ischemic amputations begin to make their appearance in the late forties of life and their incidence increases rapidly in succeeding decades. Lower-extremity PVD cases constituted 85 per cent of all amputations performed at the Massachusetts General Hospital during the period 1962–1964 and the average age of these patients was 70 years.

This predominance of PVD lower-extremity cases in the field of amputation surgery is a development of quite recent origin. A survey of lower-extremity amputations by Doctor Jan Hansson in Sweden for the period 1947–1962 documents this fact. During this period, the incidence of lower-extremity amputations in individuals under 60 years of age remained constant at an annual rate of 4 to 5 per 100,000 population. In males over 60, the rate rose from 34 per 100,000 in 1947 to 129 in 1962. In females over 60 years of age, the amputation rate increased from 24 to 62 per 100,000 during this period. Doctor Hansson expressed the opinion that these rates would continue to rise over the coming years.

One cannot but surmise that these rapidly increasing rates of lower-extremity amputations in individuals over 60 years of age are but a reflection of the change in the character of our older aged population that has occurred over the past four decades as a result of the dramatic advances that have been made in the prevention, care, and management of disease. Before the advent of insulin, it is doubtful that many diabetics lived long enough to develop gangrene of a lower extremity. Countless numbers of people are now reaching the age of 65 or older with medical conditions which, forty years ago, would have been fatal at a much earlier age.

Ischemic amputations of the lower extremity formed an insignificant part of the workload of prosthetic facilities forty years ago. This is borne out by

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Doctor Hansson's Swedish study. In 1926, only 2 per cent of fitted lower-extremity cases were due to PVD amputations, whereas by 1955, they had increased to 57 per cent. Older prosthetists in the United States, whose professional experience dates back to the 1920's, have unanimously stated that this Swedish study accurately reflects their own experience in that forty years ago they rarely fitted a PVD amputee, whereas today these cases form the major part of their workload. The incidence of ischemic amputations was relatively low in 1926 and at that time the mortality rate for these operations was extremely high in view of the fact that no means were available to control infection. Furthermore, it appears that forty years ago very few of these cases were considered as candidates for prosthetic rehabilitation.

Potentially, the Medicare Act for the Aged which became effective in July 1966 can relieve a serious national inequity that in the past has involved the older aged amputees in this country. Over the years federal and state programs have been available to provide financial assistance for needy amputees from birth until they reached the 60 to 65 year age period. The Children's Bureau and the Vocational Rehabilitation Administration of the Department of Health, Education, and Welfare have conducted these assistance programs through their support of corresponding state agencies. Until the Medicare Act, amputees and other handicapped individuals over 65 years of age who needed assistance, except for beneficiaries of the Veterans Administration, have been dependent upon local welfare programs that varied widely in their character throughout the country. The 1964 annual VRA report revealed that only 1.7 per cent of their rehabilitated cases for that year were over 65 years of age. Yet this older aged segment of our population is characterized by multiple disabilities and, as a group, does not have the financial resources to take advantage of the rehabilitation opportunities that are available in most sections of this country. A bulletin of the National Health Survey of the Public Health Service, Series 10, Number 32, reports that 50 per cent of citizens 65 years or older have incomes of less than $3,000 per year and that 50 per cent have disabilities that limit materially their daily activities.

Table 1 compares, in terms of their ages, a study of 12,000 new, fitted amputees that were collected during the two-year period 1961–1963 in the United States with all new cases that were furnished prostheses in Great Britain in 1962. No unfitted or old amputee cases provided with a new replacement device are included in these two groups of amputees.

TABLE 1

Percentage of Total Cases by Age	Great Britain 1962, 3,216 Cases	United States 1961–1963, 12,000 Cases
Over 60 years	57.6 per cent	37.0 per cent
Over 65 years	—	27.0 per cent
Over 70 years	32.5 per cent	13.0 per cent

The basis for this wide disparity between Great Britain and the United States with respect to the fitting of older aged amputees is economic. Any amputee in Great Britain, regardless of his age, can receive a prosthesis at government expense if he demonstrates that he has some useful prosthetic rehabilitation potential.

Table 2 presents the sources of payment for prostheses of the 12,000 new, fitted cases cited in Table 1 above. Cases assisted by welfare agencies are almost exclusively geriatric since the state programs subsidized by the Children's Bureau and VRA are available to younger amputees.

TABLE 2. SOURCE OF PAYMENT FOR PROSTHESES
(12,000 New Cases—1961–1963)

Source of Payment	Percentage
Amputee or His Family	34.5
State Bureau of Vocational Rehabilitation	26.5
Welfare Agency	12.7
Veterans Administration	12.7
Insurance Companies	9.0
State Crippled Children's Services	4.6

The data presented in Table 2 apply to the United States as a whole and vary widely between individual states. This is illustrated by Table 3 that compares the percentage of new, fitted cases over 65 years of age in two states

TABLE 3

State	Percentage of New Fitted Cases Over 65 Years	Percentage of Prostheses Paid for by Amputee	Welfare
A	43.7	30	27
B	6.0	14	2
(National Average, Table 1, above)	27.0	34	12.7

that have, roughly, the same numerical population. The relatively higher economic status of state A and its well-developed welfare programs, as compared with state B, form the basis for the very wide disparity in the fitting of older aged amputees in these two states. The Medicare Act is now available to provide the geriatric amputees in state B with the prosthetic rehabilitation services that have been denied them in the past.

Individuals with peripheral vascular disease of their lower extremities of a severity requiring amputation have, as a group, multiple disabilities that can abridge and even reduce to zero their prosthetic rehabilitation potential. The prosthetic evaluation of these cases, therefore, is critical. They have widely varying rehabilitation goals. Recent studies of these geriatric amputees indicate that, under present management concepts, only about 30 per cent will

ever be able to obtain any use of their prostheses. This percentage could be significantly increased if the surgical community would adopt a conservative philosophy in its management of PVD amputations with respect to the original level of amputation and the indications for reamputation in cases of delayed wound healing.

The study of PVD amputations at the Massachusetts General Hospital, referred to above, documents the fact that the preservation of the knee joint is all important in determining the rehabilitation potentials of these cases. Percentage-wise, twice as many below-knee cases will be able to use effectively a replacement device as those with above-knee amputations. That there are today widely divergent views concerning the level of amputation in PVD cases is indicated by the fact that, in one large metropolitan area, two-thirds of these cases were amputated above the knee and, in another large city, two-thirds were amputated below the knee. A study of all ischemic amputations performed in 1964 at 14 Veterans Administration hospitals reveals this same disparity in surgical philosophy as regards the level of amputation. The two extremes among these hospitals is shown in Table 4.

TABLE 4

Level of Amputation	Hospital A	Hospital B
Transmetatarsal	0	4
Below Knee	0	11
Above Knee	48	3

The study of 12,000 new, fitted cases cited earlier reveals that the reamputation rate in successfully fitted, below-knee cases is almost zero. The reamputation of a BK is nearly always due to wound complications at the time of amputation. Pedersen and others have shown that a high percentage of these cases of delayed wound healing following amputation below the knee will successfully respond to conservative management and, because of the preservation of the knee joint, will become effective users of prostheses.

The percentage of geriatric amputees that can achieve some useful degree of prosthetic rehabilitation would be increased by early fitting and ambulation. There is today an undue time lag between amputation and the fitting of these cases. A recent spot check revealed that this interval averages seven and one-half months. During this period, many of these older amputees will have developed contractures that may preclude prosthetic restoration, or they may become wedded to a wheelchair existence.

It is hoped that orthopedic surgeons who are knowledgeable in the field of amputee rehabilitation will endeavor to inform the general surgeons in their respective communities with regard to modern concepts in the care and management of this form of disability.