

Late Sequelae of Amputation, a Summary

LATE SEQUELAE OF AMPUTATION, an article on the health of Finnish amputated war veterans, by Kauko A. Solonen, H. J. Rinne, M. Viikari, and E. Karvinen in Annates Chirurgiae et Gynaecologiae Fenniae, Volume 54, Supplementum 138, 1965.

Late Sequelae of Amputation reports an extensive investigation of the late effects of amputation on the general health of the amputee. The subjects in the present series were Finnish war veterans disabled during the 1939-1945 wars and made available for the study while attending a government-sponsored three-week course of rehabilitation at the Kaskisaari Rehabilitation Center in Helsinki.

The amputees participating in the study were chosen at random and considered to be representative of the average war disabled. Of the 311 subjects, 48 were upper-arm, 24 forearm, 65 thigh, and 157 lower-leg amputees; 17 were disabled men with two stumps, not identified as to limb. The average time elapsed since amputation was 18-1/2 years, and the average age of the amputee was 45 years.

The control series consisted of 90 nonamputated persons who had fought during the wars and whose average age was also 45.

The orthopaedic examination was given the amputee immediately upon his arrival at the Center, while the medical, radiological, and physiological examinations were carried out during the three-week period of the course. The team of investigators consisted of an orthopaedist, an internist, a radiologist, and a physiologist. Each specialist performed all the examinations in his particular field himself, thus ensuring evaluation of results on a uniform basis.

A surprisingly large number of amputees, 62 per cent, were engaged in heavy or medium heavy labor. Two of the 17 persons with two amputated limbs had undertaken heavy labor. None was reported as unemployed.

The general condition of the amputees was described as "very good" and of the same level as that of nonamputated persons in the control

group. This observation was based on the state of nutrition, arterial pressure, the incidence of specific diseases, and the results of routine laboratory tests and miniature radiography of the chest. Also considered was the number of "healthy" persons in each group as determined by the absence of disease referable to internal medicine, mental disorder, and pathological radiographic or laboratory findings apart from the original injury.

The only statistically significant difference in the series of examinations pertaining to general condition was reflected in the greater number of overweight persons among lower-limb amputees as compared with the control group or with upper-limb amputees who had both legs intact. The authors attributed this finding to the limited mobility of the above-knee amputee and proposed further pursuit of this study, taking into account the constitutional differences of individuals.

The investigation showed that back pain constituted the most frequent complaint among amputees. Pain in the lumbar spine was reported by 65 per cent of the above-knee amputees; by 73 per cent of the below-knee amputees; and by 35 per cent of the control group, reflecting a highly significant difference between the lower-limb amputees and the control group. Pain in the cervical spine was noted by 8 per cent of both above-elbow and below-elbow amputee groups and by 1 per cent in the control group.

Scoliosis of the thoracic spine must be considered a characteristic deformity in upper-limb amputees, based on the investigators' findings in which 92 per cent of the above-elbow amputees and 67 per cent of the below-elbow amputees presented this condition clinically. Radiologically, the frequency of

thoracic scoliosis was significantly greater in upper-limb amputees than in other groups ($P < 0.05$). In all above-elbow amputees and in 87 per cent of below-elbow amputees, the thoracic curve was convex toward the side of the stump.

Clinically, the frequency of lumbar scoliosis was significantly higher in lower-limb than in upper-limb amputees and more common in all groups of amputees than in the control group. Radiologically, the difference was not significant, although a greater percentage of lumbar scoliosis was found in thigh amputees. This greater percentage held true in all groups of amputees as compared with the control group.

Changes in the degree of anteroposterior curves of the spine were frequent in all groups of amputees and more so in amputees than in the uninjured group. No clear correlation could be made between these findings and other factors such as type of amputation, the stump, the use of a prosthesis, or the occupation; nor could the significance of these changes that affected the whole chest be determined in terms of function of the organs of the chest.

The frequency of spondylosis deformans of the lumbar spine was found in 27 per cent of the upper-arm, 50 per cent of the forearm, 31 per cent of the thigh, 34 per cent of the lower-leg, and 35 per cent of the double amputees compared with 14 per cent of the control group. Statistically significant differences between the different groups are not demonstrated in osterchondrosis of the lumbar spine, flattening of the disc, kyphosis, and spondylarthrosis.

In above-knee amputees, flexion contracture of at least 10 deg. at the hip joint on the amputated side occurred in 15 per cent of cases.

Radiographic examination revealed that arthrosis of the hip joint in the intact limb of thigh amputees was significantly higher than in the hip joint of persons in the control group. Chondromalacia patellae was found in the intact limb of 75 per cent of the above-knee group, 62 per cent of the below-knee group, and 53 per cent of the control group.

The incidence of periarthrosis on both the intact and amputated side in the upper-limb amputees was significantly higher than in the lower-limb amputees and the control group.

"Fatigue pain" was also a common finding in amputees. In lower-limb amputees, fatigue pain in the intact limb was reported more frequently than in any other group, the difference being statistically significant and the pain commonest in the knee and ankle area. Thirty-eight per cent of upper-arm amputees and 29 per cent of forearm amputees stated they often suffered fatigue in the intact arm. No such pain was reported by the control group.

Phantom-limb pain was reported as a "great inconvenience" in 42 per cent of the above-elbow, 4 per cent of the below-elbow, 60 per cent of the above-knee, and 26 per cent of the below-knee amputees. This apparently had little bearing on use of the prosthesis by lower-limb amputees, with 98 per cent of the above-knee and 96 per cent of the below-knee amputees reportedly using the prosthesis every day of the week. Of the above-elbow amputees, 44 per cent used their prosthesis every day, and 8 per cent did not use it at all. Prostheses, *per se*, were not investigated in this study.

Physiological examinations included ergometric tests to determine physical condition and also investigation of the circulation in the intact leg and stump by means of a Cameron heartometer. The amputees passed the physiological tests for physical condition practically as well as the persons of the control group, the only exception being the amputees with two stumps. The oscillographic findings indicated that in the intact arm of the upper-limb amputees and the intact leg of the lower-limb amputees the arterial circulation was normal, being considerably weaker in the stump than in the intact limb. The authors observed, however, that the circulation required is less in an amputation stump than in a normal limb.

Additional information on the findings reported in this abstract as well as other aspects of this investigation may be found in the original article, which is being reprinted in the December 1965 and March 1966 issues of the *Orthopedic and Prosthetic Appliance Journal*.

BARBARA R. FRIZ¹

¹ Staff Officer, Committee on Prosthetic-Orthotic Education, National Academy of Sciences—National Research Council, 2101 Constitution Ave., N.W., Washington, D. C. 20418.