

Report on a Tour of European Prosthetic Centers

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In mid-August of 1963 I accepted an invitation extended by the Ex-Servicemen's Association of Finland to conduct a two-week course of prosthetic instruction in Helsinki. The course was to be held in the shops of the two major prosthetic firms serving the area, and I was asked to demonstrate and teach the most advanced prosthetic techniques now current in the United States. With this assignment as a base, it seemed a good idea to expand my trip to include additional prosthetic centers in Europe. Arrangements were therefore made through the New York University Prosthetics and Orthotics Education for me to visit centers in England, Denmark and Norway. This trip proved to be a most illuminating and valuable experience, with numerous opportunities for the interchange of ideas on prosthetic practice. Concepts and techniques which I found of particular interest in each of the centers visited are presented in this article.

ENGLAND

On August 23, I visited the Roehampton Limb-Fitting Centre in London. Activities at this center include rehabilitation programs, limb-fitting services, and prosthetic research studies, under the sponsorship of the British Government. I was conducted through the center by Brigadier Norman Swettenham, with whom I had a most profitable exchange of information. We discussed the three major techniques used in America for fitting total contact above-knee sockets, and their advantages and disadvantages.

An experimental fitting method used at Roehampton for above-knee total contact sockets entails the following procedures:

The stump is inserted into a pre-shaped metal container which is several inches longer than the stump and is perforated with small holes (about the diameter of a pencil). The patient bears weight on the brim of the metal "socket" and the stump is checked through the holes. The holes distal to the area of stump and container are then closed off and a light mixture of plaster-of-paris is introduced distally by means of a tube. The hole nearest the distal stump is left open until the plaster reaches this level. This hole serves as an escape opening for the air trapped within the socket and assures good distal contact.

After the plaster sets and the patient removes his stump, a cast duplicating the contour of the metal socket and mold is made. A total contact socket is then fabricated from this model.

With the introduction of the Patella Tendon-Bearing Prosthesis in England, considerable emphasis has been placed on finding a plastic material which would be a suitable replacement for the horsehide leather insert liners used in America. Apparently, the English climate causes leather to deteriorate

even faster than it does in this country. An effort is also being made to develop a plastic material for use as a check socket.

An interesting research program being carried on at Roehampton concerns the study of a cast magnesium ankle, which utilizes a ball-and-socket joint. The item is designed to be laminated into a plastic shank. Many of the features originally incorporated in the United States Navy Functional Ankle are provided in this experimental ankle. A number of pilot wearers are currently testing this device.

In the upper extremity studies section of the research center, the efficacy of externally powered prostheses is being investigated.

DENMARK

My next stop, on August 28th, was Copenhagen. At the Copenhagen Orthopedic Hospital, I was asked to demonstrate the use of the New York University flexible casting brim in the fabrication of lower extremity prostheses. The staff, under the direction of Messrs. Linquist and Kastrup, observed and assisted in the application of this method to the casting of a leg socket for one of their patients. Following this session, a critique was held in which the cast modification and fabrication techniques were analyzed. The University of California, Berkeley, brims have been used successfully at this hospital for some time. The Patella Tendon-Bearing Prosthesis is also fitted on a routine basis there. Altogether, the sophisticated level of prosthetics at this center is noteworthy. It is probably attributable in part to the influence of the various international symposia held in Copenhagen.

FINLAND

I was in Helsinki from September 1st to the 15th as a guest of the Ex-Servicemen's Association of Finland, who sponsored my trip, with arrangements handled by Mr. Johannes Reitamo, Secretary of the Association. My stay in Helsinki was a tremendously rewarding experience. It afforded me a chance to become acquainted with and to enjoy the gracious hospitality of the Finnish people, as well as giving me the experience of sharing with them the knowledge that we in America have acquired through our various research programs.

The number of amputees in Finland is quite large in relation to their total population, primarily because of their heavy involvement in the Second World War, and secondarily because of their climate which is conducive to frostbite, with subsequent amputation. The Finns take a particular pride in showing regard for their disabled citizens. I noticed that when a disabled person walks down the street other pedestrians open a path for him. On one occasion I saw a driver bring his car to a halt to allow an amputee to pass safely by.

During my stay I was given living quarters in the rehabilitation center that the Ex-Servicemen's Association provides for the benefit of its members. This gave me an excellent opportunity to observe the operation of this unique establishment. The Association is dedicated to the continuing well-being, both physical and emotional, of disabled ex-servicemen. To this end, the program of the rehabilitation center provides for a periodic two-week stay for its members, during which time the patient participates in a formal rehabilitation schedule and receives full attention to his prosthetic needs. The physical program is quite rigorous, covering such activities as swimming, basketball, soccer, and body-building exercises. Two therapists are always in attendance. One administers prosthetic training, and whatever therapeutic

treatments are required, to upper and lower extremity amputees. The other supervises the program of physical activities. Each day's program ends with the traditional (and delightful) *Sauna*—the bath in steam formed from water thrown on heated stones, accompanied by brisk strokes from a cedar or birch bough.

Many of the veterans must travel long distances for satisfactory prosthetic service. This is not only time-consuming, but would often impose a serious financial burden. This two-week respite allows each man time for physical and mental rejuvenation. The cost of this all-encompassing program is borne by the government, with no charge at all to the individual veteran.

Three Finnish prosthetics firms participated in the planned program, each sending two qualified prosthetists as active students in the course of instruction in American prosthetic techniques. Their names were:

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| Edward Hannula | Edward Ahlblad |
| Kurt Orlikott | Mikael Bernikoff |
| Martti Santala | Kauko Nicklen |

In addition, four other prosthetists were given permission to observe:

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| Sven Gustafsson | Esko Oksa |
| Kalervo H. Tanner | Helmer Jenstrom |

The two-week program which was planned with the assistance of Dr. Sidney Fishman of N.Y.U. who was present for the inauguration of the course, consisted of a work schedule of approximately seven hours a day for six days a week. In conducting the course, I emphasized above-knee total contact fittings, and the use of porous laminates in below-knee and upper extremity prostheses.

The course was conducted alternately in two major shops in Helsinki. The first day of instruction covered the external finishing of prostheses, and was for my Finnish students an introduction to the use of polyester resins and polyvinyl alcohol sheeting. The materials customarily used for external finishing in Finland are epoxy resins and polyvinyl chloride sheeting.

The level of prosthetics in Finland has risen markedly with the introduction and use of the patella tendon-bearing below-knee techniques. Generally, American prosthetic techniques are in widespread use. Above-knee prosthetic practices, however, are strongly influenced by German open-end socket techniques, which typically employ heavy gluteal bearing construction with a medial sloping posterior wall, and a lowered medial wall. The patients I observed who were fitted in this way were generally quite pleased and comfortable with their sockets, although examination revealed some evidence of adductor rolls. I discussed this finding with the Finnish prosthetists, who told me that the American technique of a horizontal posterior socket wall had generally not been successful because of their patients' difficulty in tolerating concentrated pressure on the ischial tuberosity. In view of their experience with the horizontal posterior socket wall, it did not seem practical to attempt to force this change on patients who had been satisfactorily fitted for long periods with a different technique. I therefore modified our usual above-knee fitting technique by increasing the gluteal support and allowing for a slightly sloping posterior wall. From this experience, I gained the impression that the technique of providing greater gluteal-bearing construction deserves further investigation.

During the two-week period of the course, we fitted nine upper and lower extremity patients with a total of 15 sockets: eight above-knee sockets; five patella tendon-bearing below-knee limbs; one below-elbow porous laminate socket; one below-knee porous laminate socket.

The major problems in the field of prosthetics in Finland are the shortage of skilled prosthetics workers, and the lack of training in anatomy and the medical aspects of prosthetics on the part of the practicing prosthetists. There is also a lack of communication between medical and prosthetic personnel. Those concerned with the field recognize these problems and are taking steps to correct them. Plans are under way to inaugurate a joint medical-prosthetics course of study, which should go a long way toward improving prosthetic practice.

In summary, I found the group to be forward-looking, intelligent and industrious students, and it was a great satisfaction to work with them.

NORWAY

On September 16 and 17, I visited the Sophies Minde Orthopedisk Verksted, in Oslo, at the invitation of Mr. Norloff, the shop supervisor. Here I was asked to give instruction in the use of the N.Y.U. flexible casting brim for fabricating total contact above-knee sockets. Four prosthetists participated in this orientation session. Major emphasis was placed on demonstrating the basic casting technique with only one socket completed and fitted to a patient. This patient was an above-knee amputee who could not be accommodated comfortably with a wood suction socket. He was a difficult case because of extreme sensitivity in the distal area of the stump and an invaginated scar in the adductor longus region. Nevertheless, we did succeed in fitting him satisfactorily with a total contact socket.

The Norwegians had not made any above-knee total contact sockets prior to my visit, and were concerned about distal stump contact. Practical experience in the fabrication of above-knee total contact sockets is one of their greatest needs.

SUMMARY

Without exception, in the countries that I visited, the American influence was extensive, as seen in the widespread use of the patella tendon-bearing prosthesis. However, their chief criticism of this technique concerns the relatively short life span of the rubber insert and liner. To cope with this problem, most of these prosthetic centers routinely fabricate two liners at the outset, and store the lamination cast for future use.

The above-knee fittings that I saw in some of the Scandinavian countries differed from the typical quadrilateral above-knee sockets made in the United States. The posterior lateral corner has a broad flare to accommodate considerable gluteal bearing. The posterior wall slopes medially with a slight dip or pocket for the ischial tuberosity. The medial wall tends toward roundness rather than toward the straight and square shape that we commonly see in the United States. The medial brim is approximately $\frac{1}{4}$ " to $\frac{3}{8}$ " lower than the posterior brim. The anterior region exhibits a rather shallow Scarpa's triangle and blends into the channel of the rectus femoris. The sockets are of an open end type.

Overall, I gained the impression that the organized research and development programs in the United States have furnished great impetus in advancing prosthetic knowledge and practice well beyond the shores of our land. However, there is no doubt that continuing need exists in every country for further prosthetic development and education. This trip demonstrated to me in a very graphic manner how the exchange of prosthetic information and ideas helps us to work more effectively for the betterment of disabled people all over the world.