

# **Amputee Rehabilitation in the Orient; Report of a World Tour**

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There are about 800,000 amputees living in the United States. Approximately 25,000 amputations are performed yearly. Many of these are the result of the increased life span which medical science has created in the United States. Life has been extended but many diseases of old age have not been conquered. Some of these cause conditions that often necessitate surgical removal of the affected limb.

It is fortunate that an improved amputee rehabilitation program has been developed in the United States through the close cooperation of many governmental bodies, voluntary agencies, medical and other health professions and the Orthopedic Appliance and Limb Manufacturers Association. This program is responsible for better fundamental knowledge, better prostheses, and better education of all who serve the growing numbers of amputees.

I was fortunate to be able to study the amputee problem in a number of areas of the world when I was appointed by the Technical Assistance Administration of the United Nations to conduct a training course for Japanese prosthetic technicians. Following a two-month stay in Japan, I visited prosthetic centers in Korea, Burma, India, Lebanon, Jordan, Germany and Denmark. Reports of these consultations are available from the International Society for the Welfare of Cripples, 701 First Avenue, New York 17, N. Y., and American-Korean Foundation, 345 East 46th Street, New York 17, N. Y.

Leaving San Francisco in March 1956, I made my first stop at Honolulu. An excellent rehabilitation center is maintained there for the Hawaiian Islands, with prostheses and braces supplied by certified prosthetists and orthotists.

When I left Hawaii, the medical director of the rehabilitation center, Dr. Sheppard, bade me farewell at the airport with the words "You are now leaving America." I did not realize then the full truth of his remark. It was true not only of the language and the American culture and way of life, but also of the many problems that face the amputee and others that are physically handicapped.

## **Rehabilitation in Japan**

At Tokyo I was greeted by Dr. Masatora Hiyeda, Chief of Amputee Service in Japan, by Mr. Y. Takase, Director of the National Rehabilitation Center for the Physically Handicapped and by members of their staffs.

The National Rehabilitation Center was the place of activity for most of my work in Japan. When, during the next few days, I was introduced to many officials of the different governmental agencies responsible for the care of the handicapped, I became aware of their interest. I learned of many changes which had taken place in the Japanese philosophy regarding their cripples. Previously the blind and the lame had been the responsibility of the family alone, unknown to anyone but their immediate associates. Now they are accepted as members of society with all legal rights of citizens.

In 1950 the Japanese Government passed a Law for the Welfare of the Physically Handicapped, and in 1952 a Law for the Assistance of the War-

Wounded and Bereaved Families. Under these laws the Government provides many benefits for the physically disabled.

There are at present 785,000 disabled persons registered who benefit from these laws, among them 43,528 amputees. Amputations of the upper extremities account for 24,866 cases, whereas amputations of the lower extremities account for only 17,662. These figures include amputations of fingers, hands, toes, and feet. These numbers are in sharp contrast to the figures in the United States. It is estimated that the ratio of American amputees is approximately three to ten between upper and lower extremities.

The impression gained from discussions with many authorities is that the greatest single cause of amputation in Japan is accidents, whereas in America the majority of amputations are necessitated by peripheral vascular disease.

According to the latest figures available, prostheses are manufactured in 143 shops employing 858 technicians. Ninety-five of these shops, with 579 employees, are privately operated. The rest are maintained by the government and by semi-governmental bodies. Prostheses are paid for by the government under the laws mentioned previously. The standard of the prosthetic art is below that found in the United States. Research in the prosthetic field is carried on by federal and prefectural agencies, by universities, by the Federal Railroad and, to a minor degree, by the prosthetic industry. Results reflect the limited scope and the lack of central supervision.

Prosthetic designs are in many ways similar to those seen in Europe after World War I. The material most widely used is aluminum. Plastics were seen in only two or three shops.

I visited several excellent rehabilitation centers in some of the biggest cities in Japan. The main emphasis in their rehabilitation work is on vocational rehabilitation. Most of the patients were relatively young. The facilities and the personnel are present. What is needed is a concerted effort by the medical group to guide the program. In order to obtain a better picture of the physical rehabilitation program some statistics may be of interest.

The National Rehabilitation Center for the Handicapped previously mentioned is the only one that is maintained by the Federal Government. It is a modern structure which was opened on January 16, 1950. Physically it follows the lines of the recommendations made in 1945 by the Baruch Committee on Physical Medicine and Rehabilitation. Its approach to rehabilitation is patterned according to the latest American thinking with consideration for the differences between Occidental and Japanese cultural and vocational patterns.

Up to 150 in-patients can be cared for in small wards or in dormitories. The main object of rehabilitation is to restore the patient to gainful employment and vocational training has a high priority in the Japanese program. When surgery is required it is performed in a well-equipped operating room. On May 22, 1956, 121 persons were patients at the Center. The following table is an analysis of their ages.

#### 1. Patients by Age

Age	Male	Female	Total
15-20 .....	34	17	51
21-25 .....	20	19	39
26-30 .....	11	8	19
31-35 .....	5	6	11
Over 35 .....	1	0	1
Total .....	71	50	121

William A. Tosberg, C.P.&O.



From November 1953 to November 1955, 212 patients were treated and discharged. Table No. 2 shows the disabilities of these patients according to disease.

## 2. Disabilities by Diseases

<i>Diseases</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
Amputation .....	41	9	50
Poliomyelitis .....	30	17	47
Cerebral palsy .....	12	23	35
Purulent osteomyelitis and arthritis.....	12	6	18
Tuberculosis of bone and joints.....	12	9	21
Congenital monster .....	6	1	7
Burn .....	3	3	6
Rheumatic polyarthritis .....	4	1	5
Pachymeningitis adhesiva .....	2	3	5
Congenital dislocation of hip joint.....	1	1	2
Arthrogryposis multiplex congenita .....	1	1	2
Progressive muscular dystrophy .....	0	2	2
Osteogenesis imperfecta .....	2	0	2
Traumatic fracture and dislocation.....	1	1	2
Spinal cord injury .....	1	0	1
Brain damage .....	0	1	1

The following table shows disabilities according to the part of the body affected.

## 3. Disabilities by Region

	<i>Amputation</i>	<i>Infantile Paralysis</i>	<i>Cerebral Palsy</i>	<i>TB of Bone &amp; Joints</i>	<i>Other</i>	<i>Total</i>
Right upper extremity.....	14	3	2	0	2	21
Left upper extremity .....	5	4	2	0	4	15
Right and left extremities.....	10	1	0	0	3	14
Right lower extremity.....	3	6	1	5	4	19
Left lower extremity.....	5	8	2	6	5	26
Right and left lower.....	10	18	10	1	24	63
All four extremities.....	0	4	11	0	9	24
R & L uppers, R or L lower.....	0	0	0	0	2	2
R & L lower, R or L upper.....	1	1	0	0	1	3
Spine .....	0	0	0	2	0	2
Spine & one lateral lower.....	0	0	0	5	0	5
Spine & bilateral lowers.....	0	0	0	2	0	2

#### 4. Causes for amputation in 50 cases

Tuberculosis .....	3	Traffic accident .....	20
Tumor .....	2	Labor accident .....	16
Purulent arthritis .....	1	Other accident .....	4
Spontaneous gangrene .....	1	War wound .....	2
Raynaud's disease .....	1		
Subtotal .....	8	Subtotal .....	42
		Grand Total .....	50

More than half the patients seen required surgery, and the following tables indicate the exact numbers that did and their disabilities, with number of times operations were performed and number of persons involved.

#### 5. Necessity for surgical treatment

	<i>Needed</i>	<i>Not Needed</i>	<i>Total</i>
Amputation .....	12	38	50
Infantile paralysis .....	42	5	47
Cerebral palsy .....	10	5	35
Disease of bones and joints .....	24	15	39
Others .....	20	21	41

#### 6. Types of Artificial limbs worn

	<i>Functional Limb</i>	<i>Conventional Limb</i>	<i>Suction Socket</i>	<i>No Limb Worn</i>	<i>Total</i>
Right upper extremity .....	11	0	0	2	13
Left upper extremity .....	6	1	0	2	9
Right & Left uppers .....	16	2	0	2	20
Right lower extremity .....	0	4	0	0	4
Left lower extremity .....	0	7	0	0	7
Left lower & left upper .....	1	0	1	0	2
R & L lowers & R upper .....	1	0	2	0	3
R & L lower extremities .....	0	10	6	2	18
Total .....	35	24	9	8	76

#### 7. Effects of the Training Program for Recovery of Functional Disorder

	<i>Amputee</i>	<i>Polio &amp; Cerebral Palsy</i>
Improved .....	70%	81%
Not changed .....	10%	7%
Regressed .....	20%	12%
	100%	100%

#### 8. Status of Students Who Have Completed the Course

	<i>Employed</i>	<i>Self-supporting</i>	<i>Returned home</i>	<i>Total</i>
Number of persons .....	56	13	40	109
Percentage .....	51%	12%	37%	100%

There are 28 rehabilitation centers established on a prefectural government level and 10 are established for the rehabilitation of crippled children. The society of ex-railroad workers, labor accident hospitals, and welfare insurance hospitals maintain rehabilitation services. Many city hospitals practice rehabilitation for the physically disabled.

The City University of Osaka dedicated its new hospital at the time of my visit. This hospital is in many respects the most modern of the many seen. The section on physical medicine and rehabilitation under the direction of Prof. S. Mizuno has a good prosthetic service.

The Industrial Accident Hospital, Kwasai, also in Osaka, had excellent physical therapy equipment. Their facilities, however, were hardly utilized—probably because of the lack of trained personnel.

The most outstanding fact noted in many centers was the almost total lack of orthopedic appliances and braces. Children were in bed because their paralyzed limbs were not supported. The only physical therapy seen



Check-out and examination at the end of the Prosthetics Course in Tokyo.

was some massage and hot mud baths. Occupational therapy was at a somewhat higher level, but much was along recreational lines. However, with the excellent facilities available, it is only a question of time until these shortcomings will be overcome.

During the training courses, I found that the Japanese technicians are endowed with superior mechanical aptitude and a desire to extend their knowledge in all areas of their field of work. Extended interchange of people and ideas will benefit the physically handicapped of Japan in a relatively short time. The United Nations through the Technical Assistance Administration Board, the United States through the Prosthetic Research Board, and the International Society for the Welfare of Cripples through a comprehensive program are interested in supplying such assistance.

## **In Korea**

Leaving Tokyo, I went to Korea, where conditions in rehabilitation were quite different. Most of the work in this field was initiated from abroad. The American-Korean Foundation and the United Nations Korean Reconstruction Agency have furnished money and personnel to care for many Koreans who have become physically disabled as a result of war. Although physical rehabilitation is only a small phase of the work of the agencies mentioned, it was this part that the writer was interested to see. Since a large part of the national budget must be expended for defense, hospitals, orphanages and rehabilitation centers are only slowly being rebuilt. There is a shortage of skilled personnel in all fields. The World Church Service with Rev. Torrey in charge has partly rebuilt a badly damaged hospital and has installed a prosthetic shop where prostheses and braces are manufactured under the most primitive conditions. The quality is surprisingly high. The World Church Service maintains shops and fitting centers in several cities outside of Seoul. A lecture period had been arranged during my visit for men from all of the shops. The interest in the technical discussion was high, not only among the technicians but also among the physicians and others present. I visited private prosthetic shops where the greatest difficulty was the lack of materials and also the insufficiency of facilities to care for the patients.

A short visit to Pusan was arranged under the guidance of Dr. James Petrie, Medical Officer of UNKRA. The trip was made in a DC-3 plane which, judged by the many bullet holes, must have seen considerable war service. When I paid a visit to the hospital maintained by the Maryknoll Sisters I became aware of the extensive need for medical care. Although it was late in the day, long lines of children and adults still formed outside of the gates waiting for treatment. This hospital maintains a small brace shop staffed by one technician. The machinery, supplied by the American-Korean Foundation, was good but there was a deplorable lack of material even for the simplest supports.

The chief reason for my trip was a visit to the Tongnae Rehabilitation Center. The prosthetic facilities were certainly the most modern and the most elaborate that the writer has seen outside of America or Europe. The machinery was imported from England, as were most of the prefabricated parts and the tools and materials. The layout of the shops was excellent and the production potential appears to be sufficient for most of the Korean needs. The shops are part of a well-designed rehabilitation and training center. Korean rehabilitation teams are now trained in modern techniques in technically more advanced countries. Prospects for the disabled Koreans appear relatively bright if real peace can be restored and the physical facilities can be rebuilt. Training of personnel seems to be the key in this undertaking.

## **Report on Burma**

The prospects do not seem quite so good in Burma. Mr. Kurt Janssen, Chief of the United Nations Rehabilitation Unit, had made a visit to this country in order to investigate the problems faced. One of his recommendations concerned the need for prosthetic service, and it was my intention to investigate any possibility for a reasonable solution. I found the people shouldered with the responsibility for the care of the disabled, devoted and able. Mr. U. Khin from the Directorate of Social Welfare guided me during my stay in Rangoon. This center was recommended for the establishment of a demonstration unit for care of the physically handicapped. Some facili-



Modern American prosthetic techniques being taught to Japanese students.

ties exist and others are in the process of building. Plans for a prosthetic shop had been provided by me previous to my visit, as well as a list of tools, machinery and material.

Since my return to the United States a team of five—a doctor, a social worker, a nurse, a physical therapist, and a prosthetist—has been sent to the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center for training under fellowships granted by the Rockefeller Foundation. The United Nations Technical Assistance Board has appointed a German-trained prosthetist to Burma to equip the shop and to initiate the training of local technicians. In this way it is hoped that the amputees of Burma in the foreseeable future will enjoy the benefits of international cooperation.

## Report on India

Prospects for rehabilitation appear brighter in India, the next stop on my trip. I was a guest of Mr. Sidney Robbins, Administrator of the Rehabilitation and Training project for the Physically Disabled at the King Edward VII Memorial Hospital in Parel, Bombay. This project is supported by the United Nations, World Veterans Federation, and several Indian agencies. It is under the direction of an orthopedic surgeon from Bombay who had studied rehabilitation in the United States. The project also employed a physical therapist from England and an occupational therapist from Belgium. A prosthetist from Great Britain has been added to this team. Machines and tools for this center are provided by UNICEF. The present plans call for the establishment of a demonstration and training center for complete rehabilitation services. A building is to be erected which will contain all facilities needed.

I visited the Children's Orthopedic Hospital which is under the auspices of the Society for the Welfare of Cripples. This hospital is providing a very good rehabilitation program for its children not only on an in-patient basis but also for out-patients. Braces are made at the shop of another hospital. These braces are well constructed and designed. Many problems of measuring and fitting do exist because the number of well-trained personnel is limited. Although the new center cannot satisfy the existing need, it will be utilized to teach accepted techniques in all areas of rehabilitation.

The Indian Government is supporting a prosthetic center at Poona where complete rehabilitation services are extended to veterans. This center has been utilized for civilians under special circumstances. Veterans from Burma have been fitted with prostheses in Poona also. This arrangement has not been entirely successful because of a lack of follow-up service.

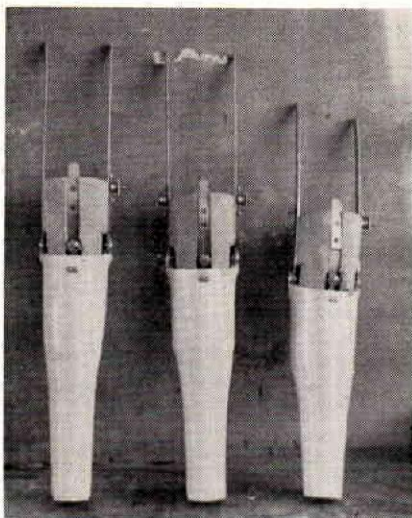
Despite the fact that most of the work in the interest of the physically handicapped in India is only in the initial stage, it can be assumed that there will be progress on a sound basis due to the interest shown by all concerned.

## Lebanon and Jordan

Lebanon offers another example of international cooperation for the benefit of cripples. It was at the Sixth World Congress of the International Society for the Welfare of Cripples that plans for the establishment of a rehabilitation center there took concrete form. With the help of several United Nations agencies it was possible to build such a center at the "Cite des Apprentis." This Cite is a training center, mainly for orphans, under the able direction of Father Cortabawi. Training for several trades is given in well-designed and equipped shops. The rehabilitation center is at present utilized for children on an in-patient basis. All beds of the wards were made at the various training shops. The Physical Therapy Department, supervised by a British physical therapist, uses most modalities, including hydrotherapy. A British orthopedist is the medical director and the prosthetic shop is in charge of a French technician. There was still a shortage of materials needed for braces and prostheses. Several avenues of supply were explored and considerable progress has been made. The Lebanese Union for Child Welfare is the most active agent in the interest of the handicapped. There is a severe shortage of trained personnel and of suitable facilities. Much work remains to be done.

This is even more true of Jordan, which I visited for only a few hours. Jordan has about 400 amputees. Many of these are victims of fighting in

Pre-Fabricated Plastic Shins with knee blocks  
for use in Okinawa.



Palestine. The Union of the Invalid Monadoline is trying to provide service to their members, but since no prosthetic facilities exist in Jordan, it has been necessary to obtain prostheses from Egypt. This leads to the same complications that had been observed in Burma. Even the best made artificial limbs do not maintain their fit after the normal changes have occurred in the stump. The writer saw several cases where severe medical stump problems were the result of such changes. It was therefore recommended that a Jordanian with technical aptitude should be sent to Lebanon for training in the repairs and adjustments of prostheses. A suitable room is available that could be converted for such a purpose. Since only a minimum of equipment would be needed, such a recommendation was favorably received by the Minister of Social Affairs. A technician is now training in Beirut, Lebanon.

My visit to Jordan also included a visit to Bethlehem, where an American nurse gives outstanding service in the aid of crippled children at the Christian Approach Mission. She was caring for 36 of these children at the time of my visit. Her work enjoys an excellent reputation but is not supported financially by the government. It is estimated that more than 1,000 children of Jordan are in need of rehabilitation services. A brace maker and a physical therapist are most urgently needed. The facilities presently available are inadequate and the prospects for the care of the physically handicapped do not appear bright in Jordan, despite the interest expressed by many agencies.

#### Side Trip to Berlin

Returning to the United States, I interrupted my flight in Germany at the request of the International Society for the Welfare of Cripples. *The Deutsche Vereinigung zur Bekämpfung des Kruppeltums* had become affiliated with the International Society at the last World Congress of the ISWC and it was my intention to meet their President, Professor Dr. K. Lindemann. This society depends upon its income from private sources. *The Yearbook for the Care of the Physically Handicapped* contains a collection of the best articles written for people interested in all phases of rehabilitation.

First practice in the use of pulling tools  
by students.



Since Professor Lindemann is the Director of the Department of Orthopedics at the University of Heidelberg, I had an opportunity to see the "Heidelberg Pneumatic Arm" prosthesis. This prosthesis utilizes compressed gases for its power. The expanding gases activate the different component parts of the arm and are controlled by tiny valves which are under the control of the amputee. The action of this arm resembles the action of the electrical prosthesis which was developed by the International Business Machines Corporation in the United States under contract from the Prosthetic Research Board, but the forces created are much greater. Some of the functions of the arm might be utilized in bracing of severely disabled upper extremities resulting from poliomyelitis or other causes. (See a report on The Heidelberg Arm in the March, 1957 issue of this *Journal*, pages 49-51.)

The orthopedic workshops maintained by the University are well organized and the standard of their work is high. This is especially true of the different brace constructions for nonfunctioning upper as well as lower extremities.

The writer paid a visit to Professor O. Hepp at the University of Muenster who is a member of the Committee on Prosthesis, Braces and Technical Aids (of the International Society for the Welfare of Cripples). Dr. Hepp visited the United States during 1951 as chairman of a study group concerned with amputee rehabilitation. This study group recommended research on upper extremity prostheses along the lines carried on in the United States. A shop was established by Dr. Hepp and is supported by the German government. A manual for the construction of functional arms was published recently. At the time of my visit the shop was experimenting with an elastic plaster-of-paris bandage. This would have numerous applications. One other item of interest was the use of plastic material in

the manufacture of braces. This material would open a wide field of application if it could be adopted for orthopedic appliances. Any results of their studies and experiences would be of interest to all those making appliances for the physically handicapped.

The German Orthopedic Appliance and Limb Manufacturers Association held its annual assembly and since the Berlin Regional Association was celebrating its three hundredth anniversary at the same time these two meetings were combined. Members of the Eastern German District were invited as well as visitors from foreign countries. The meeting was combined with field trips to some of the rehabilitation centers in Berlin. The oldest and best known is the "Oskar Helena Heim" founded by Dr. Bisalski. This center offers complete rehabilitation for all physical disabilities. It also has shops for the training of the disabled, including a prosthetic shop where all braces and prostheses for the center are designed and made.

One session was devoted to a discussion relating to international cooperation in amputee service on a technical level. A six point program was proposed to create an international body, if possible, within the framework of the International Society for the Welfare of Cripples. These questions were discussed at a seminar attended by representatives of Germany, the United States, Belgium, Holland, France, Denmark, Sweden and Italy.

Leaving Germany, I went to Copenhagen where Dr. Knud Jansen is Chairman of the Committee on Prostheses, Braces and Technical Aids, a Committee of the ISWC. American members of this committee include Glenn E. Jackson, Executive Director of the Orthopedic Appliance and Limb Manufacturers Association, and the author. The objective of this committee, is to collect and to disseminate information pertaining to artificial limbs, braces and all those devices that will increase the function of the physically handicapped. Several approaches towards these ends were explored. Questionnaires, distributed by the Committee, show that there is considerable need for technical information and exchange of personnel. There is a shortage of skilled technicians in many areas of this world. Training on a regional basis in conjunction with other international agencies might be of some help. People from countries where rehabilitation services are still in the initial phase are presently trained in countries where these services are highly developed. This has accomplished some good results. Other possibilities are to be explored.

### Summary

In summarizing impressions of this trip to many countries around the world, I would say that the obstacles at present seem almost insurmountable. Nevertheless, the need for extensive services is realized by many agencies in a position to contribute to a gradual solution. The greatest need concerns the almost complete lack of trained technicians. Suitable materials and supplies can be secured in most areas, although only a limited amount of specialized machinery is required in many countries. The best solution to the problem at this time appears to be the establishment of demonstration and training centers, staffed by experienced technicians. Another temporary solution might be the introduction of mobile units to take care of the immediate needs. The cooperation of all agencies in every country will be needed for many years.