

*Prosthesis For Korean Soldier Amputees

by

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On the outskirts of Tong-nae On-Chon, South Korea, situated in a little valley, is an Orthopedic-Prosthetic Laboratory. The mission of this laboratory is two-fold. First, to train Korean Army enlisted men as technicians in fabricating and fitting upper and lower extremity prostheses, and second, to fit with prostheses as many Korean soldier amputees as possible.

The laboratory structure consists of a group of prefabricated buildings. This specialized organization is a United States Army Unit (1st Orthopedic Prosthetic Detachments) but it is actually located within the confines of the 31st Republic of Korea Army Convalescent Center.

The need for this type of orthopedic rehabilitation for Korean amputees came to the attention of Major General George E. Armstrong, Surgeon General, and Colonel Oral B. Bolibaugh, Orthopedic Consultant, Army Forces, Far East, during a routine inspection of United States and Republic of Korea Army medical units in the latter part of 1951.

Following a conference with President Rhee, it became more apparent that some form of rehabilitation program was urgently needed to provide prostheses for the ever increasing number of amputees. The outcome of this conference was a plan to activate this prosthetic unit.

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At the time, there were no adequate facilities in Korea to provide artificial limbs. Colonel Bolibaugh assumed the responsibility for the activation of the 1st Orthopedic Prosthetic Detachment, first of its kind in Korea. Then followed months of planning and working on administrative details to procure proper buildings, personnel, equipment, materials and supplies. Finally, in May 1952, the laboratory was ready.

Although it was designated a United States Army Provisional Detachment, in effect the unit was the result of the cooperative effort of both the United States Army Medical Service and the Republic of Korea Army Medical Department. This cooperation between the Korean and American Army Medical Services resulted in the high success that the unit has attained after more than a year of operation. The Korean Army Medical Department provided the site for the buildings, 30 Republic of Korea Army enlisted men for training as technicians, one orthopedic surgeon as consultant on amputations, two interpreters, one supply and one administrative officer with the necessary enlisted men to assist.

The United States Army Medical Service supplied the prefabricated buildings, machinery, tools, materials to make prostheses, and a teaching staff consisting of one experienced Medical Service Corps officer who was appointed Commanding Officer of the laboratory, and four enlisted technicians.

PROGRAM OF INSTRUCTION

The following program of instruction was set up to include both classroom and on-the-job training:

Basic Anatomy: Osteology, Myology, Neurology and Arthrology — Emphasis of instruction on upper and lower extremities in relation to fitting of prostheses. Study of regional anatomy stressing the skeletal, muscular and nervous system of the body. The study of the inter relationships in the musculoskeletal system as it pertains to body activity and locomotion.

Medical Terminology: To familiarize the student with medical terms commonly used in relationship to amputations and prostheses, and medical terms technicians will find on prescriptions for prosthetic appliances.

Amputations: Lower and upper extremities described, including various reasons for amputations. Types and sites of amputations also discussed. Various stump complications are explained. Clinical training and experience is given on the rehabilitation of the amputee before and following the fitting of the prosthesis.

Plaster of Paris Technique: Instruction on principles and techniques in the use of plaster of paris. Various types of casts and their uses. Lectures and demonstrations in obtaining negative and positive plaster molds in relationship to the prosthesis. Clinical training in use of plaster of paris in the fabrication of prostheses.

Prosthetics (Lectures and Demonstrations): Lectures and demonstration in measuring, aligning and fitting of all types of upper and lower extremity prostheses.

Prosthetics (On Job Training): On-the-job training and practical experience in the measurement, fabrication, alignment and fitting of upper and lower extremity prostheses.

Procurement: Maintenance and placement of equipment and supplies. Instruction in supply requirements of a prosthetic unit. Its initial set-up and its method of drawing, storing and maintaining of supplies and equipment.

The classroom instruction consisting of lectures, demonstrations and conferences, was initiated at the opening of the laboratory and was continued for a period of sixteen weeks. At the end of this time the students had attained a sufficient degree of proficiency so that full time could be devoted to on-the-job training and production of prostheses.

FABRICATION OF PROSTHESES

The laboratory is divided into three sections, one for arm prostheses, one for above knee, and one for below knee prostheses. This is necessary as the various types of prostheses require different principles of construction according to the type and location of the amputation. Each section operates on an assembly line basis and greater production is obtained from this system.

Amputees entering the laboratory for the first time are measured and casted, then the cast and the drawing are routed through the appropriate section. Each technician performs a certain phase of work contributing to the final fabrication of the prosthesis.

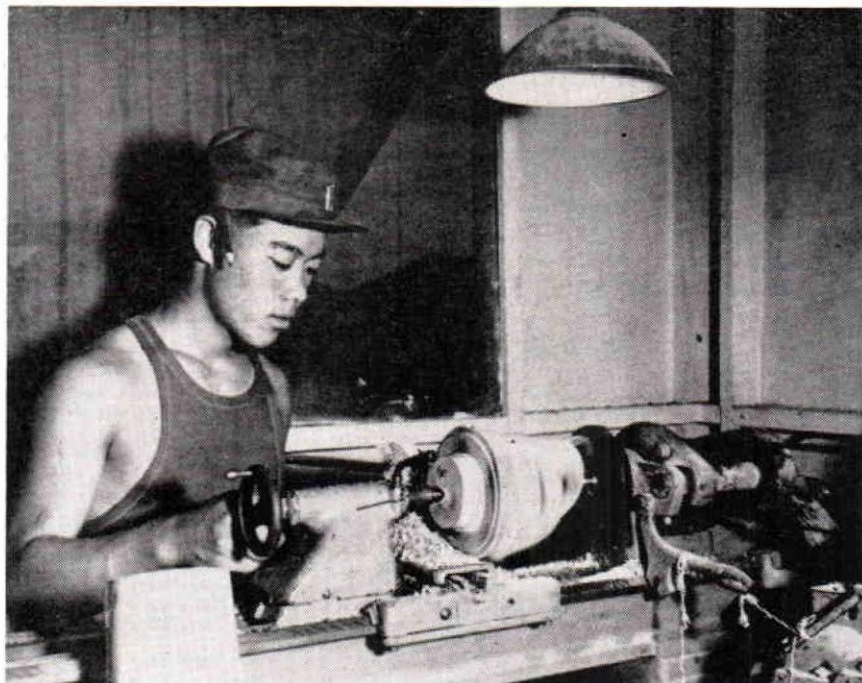
However, the technicians are rotated through each section so that they learn all phases of the work.

When the prosthesis is completed, the chief technician of each section makes the final fitting of the prosthesis to the amputee, in the presence of the commander of the laboratory or one of his representatives and the Korean orthopedic surgeon. If the prosthesis is satisfactory in every detail, the laboratory commander gives his approval.

The amputee is then given a period of instruction in the use of his artificial limb. When the set standard of proficiency is met, he is discharged from the military service to one of the Korea Veterans National Rehabilitation Centers. Here the veteran amputee is further rehabilitated and taught a useful trade or occupation.

The two basic materials used at the laboratory in the fabrication of prostheses are: (1) Polyester thermo setting resin commonly known as plastic and (2) Cotton stockinette (used as the laminated base).

The plastic material is simple and easy to use. No machinery is needed and only a few hand tools and a hot air oven are necessary in the laminating process. Following lamination, the plastic and stockinette combination in its finished form is durable, strong and light in weight. Simplicity in design, and in the fabrication of the prosthesis were recognized as one of the keynote policies to be followed early in the planning stages of the laboratory. Plastic, having the above mentioned qualities and requirements, was selected as one of the best basic materials to use. Instruction was also given in the use of

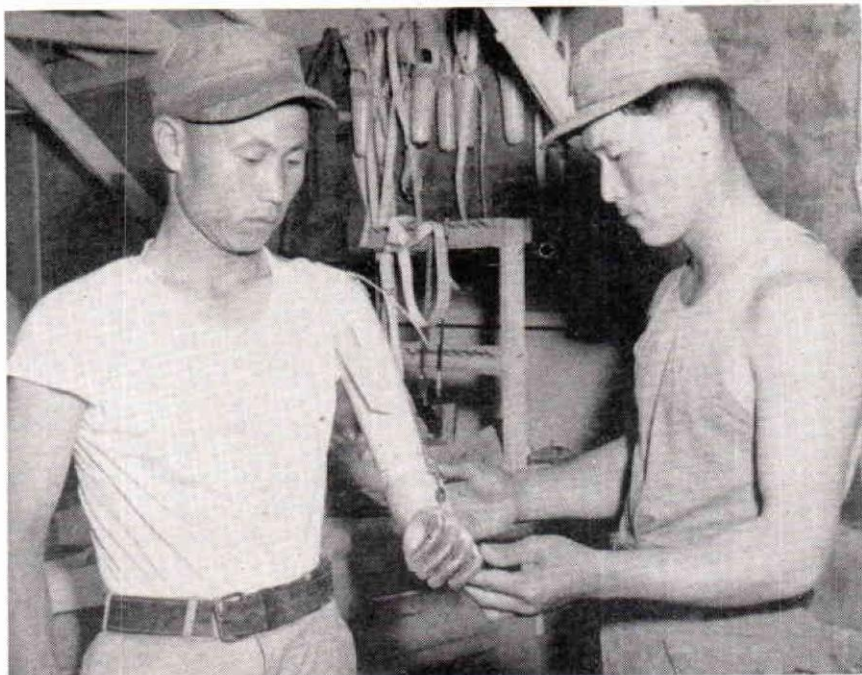


Korean Army Prosthesis Specialist Turns a Wooden Knee Block on a Lathe.

other materials in fabricating prosthesis as follows: (1) Celastic and leather combination for upper and lower extremity prostheses. (2) A thermoplastic resin using fiber glass as the laminated base for both upper and lower extremity prostheses. (3) Willow wood for above knee sockets.

Except for the Syme and Chopart amputations, the foot, ankle and skin pieces of the prosthesis for the lower extremities are constructed in the same manner for both above knee and below knee amputation. The foot is a prefabricated type consisting of rubber and wood combination available in sizes 6 through 8. The rubber portion extends from the distal portion of the toe to the site of the metatarsalphalangeal joint giving the required joint motion at that point. The remainder of the foot is of wood construction.

The ankle is of the straight bolt steel functional type, with standard type anterior and posterior rubber bumpers set in the foot and ankle base. The bumpers are adjustable to give the required 30 degree plantar flexion to the foot. The shin piece is made from a positive plaster mold by covering the mold longitudinally with six layers of cotton stockinette and wrapping gauze bandage between the 3rd and 4th layer of stockinette to give lateral strength. A polyvinyl alcohol bag that resembles cellophane in appearance is then stretched around the stockinette covered mold. The bag is sealed against leaks and an opening made in the top. The proper mixture of plastic is poured through the top opening and allowed to impregnate the stockinette. The air bubbles are then worked out of the polyvinyl bag. Fol-



Prosthesis Specialist Fits Limb to Korean Amputee.

lowing this the entire assembly is placed in a hot air oven to cure. When taken from the oven the shin piece is ready for use following minor procedures in the finishing-up process.

Until recently, the integral parts of the prosthesis such as ankle joints, knee joints, elbow joints, pelvic bands, and wrist disconnects have been procured by the U. S. Army Medical Service from the United States. Now, however, the Korean Army Medical Department has its own blacksmith and machine-shop adjacent to the laboratory. Korean Army technicians are being trained to make these parts and it soon will no longer be necessary to purchase them from the United States or elsewhere. This will make the Koerans independent of United States purchases and products. The same is also true of terminal devices (hooks and artificial hands) for artificial arms. The Korean mechan-

ics already have made a number of artificial hands that will undoubtedly prove satisfactory for their needs.

Monthly production from the opening of the laboratory in May 1952 rose from 28 cases to 198 in June 1953. During this period, 1,528 amputees have been fitted with artificial limbs. These victims of war, who otherwise would have been helpless cripples, now have the opportunity of continuing a fairly normal civilian life. This has been made possible through the efforts of the orthopedic laboratory, which has been one of the few great humane projects to come out of the Korean conflict.

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