JUNE, 1965

ORTHOPEDIC & PROSTHETIC APPLIANCE JOURNAL

The Journal of the Limb and Brace Profession

THEODORE W. SMITH, C.O.
President, 1964-1965
American Board for Certification
in Orthotics and Prosthetics, Inc.

publisher: American Orthotics and Prosthetics Association

OFFICIAL NOTICE

The 1965 National Assembly of the
American Orthotics and Prosthetics Association

will be held August 31 - September 5, 1965
at the Broadmoor Hotel, Colorado Springs, Colorado

PROGRAM DETAILS ON PAGES 111 TO 116

For further information write

The American Orthotics and Prosthetics Association
919 - 18th Street, N.W., Washington, D. C. 20006

The Assembly is open to all who are interested in the rehabilitation of the orthopedically disabled

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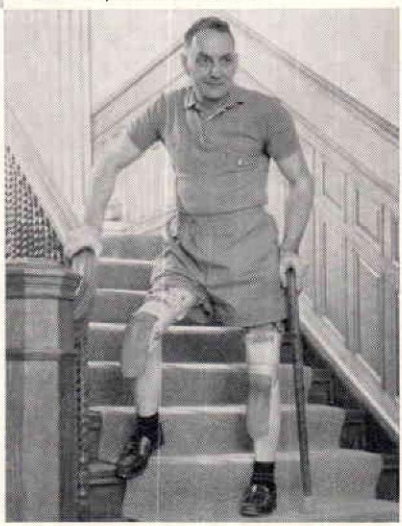

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Orthopedic and Prosthetic

Appliance Journal

(Title registered U. S. Patent Office)

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(Formerly the Orthopedic Appliance and Limb Mfrs. Assn.)

919 18th Street, Washington, D. C. 20006

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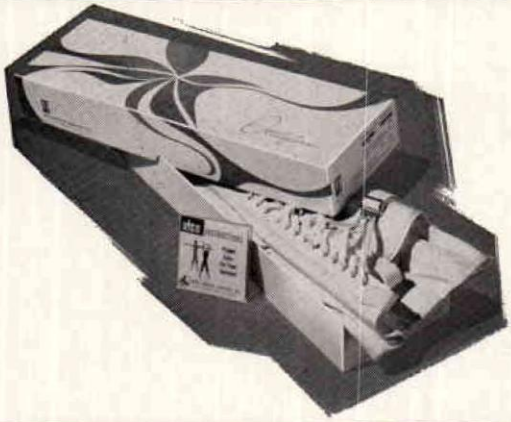

When the fitting begins YOU'RE ALWAYS GLAD IT'S *atco*

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Extra margins of ATCO quality can work hard for you . . . expert design of each support . . . endless search for "perfect" materials . . . master-craftsmanship in construction . . . all contribute to the quality leadership of ATCO's 1570 products.

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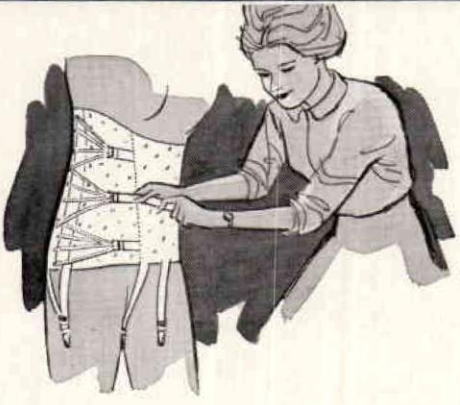

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"During the past several years, there has appeared in the shoe market an ever increasing tendency towards 'stylizing' children's and teenagers' shoes, an apparent attempt by the manufacturers at duplication of the adult female's pointed toe styles. In many parts of the country, only these 'styled' shoes are available for purchase.

Since it is the aim of the Orthopedic Surgeon to 'maintain and preserve' the musculo-skeletal system, then it is his moral responsibility to guide the proper development of the growing child. With this principle in mind, and knowing that this improper footwear can result in various foot deformities: Be it here resolved that the *Academy of Orthopedic Surgeons* decry the influx of these 'stylized shoes' and urge the shoe industry to carefully review this problem and to redesign this footwear to allow the unencumbered development of the growing foot."

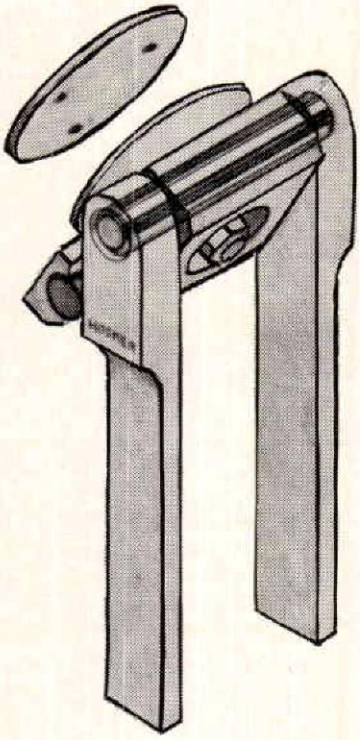
We applaud and endorse this resolution.

Child Life
SHOES

IF PRODUCT OR PERFORMANCE DEFECTIVE
Good Housekeeping
GUARANTEES
REPLACEMENT OR REFUND TO CONSUMER

NEW! NHJ-75

SMALL VERSION OF THE POPULAR ADULT SIZE NORTHWESTERN HIP JOINT



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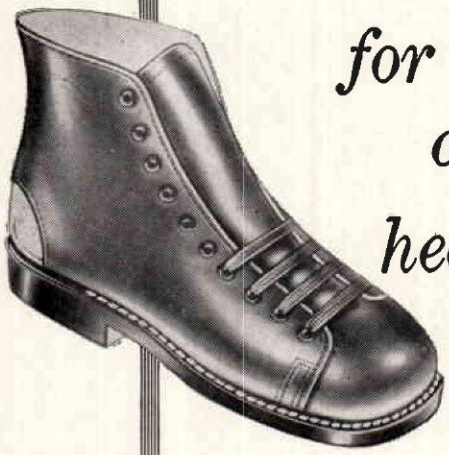
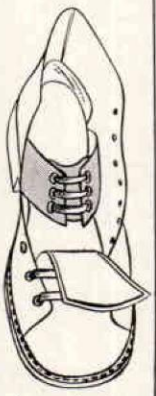


for contracted heel cords...



Inner lacing to bring heel down and hold it in place.

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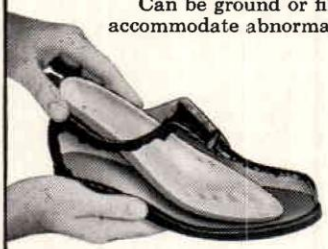

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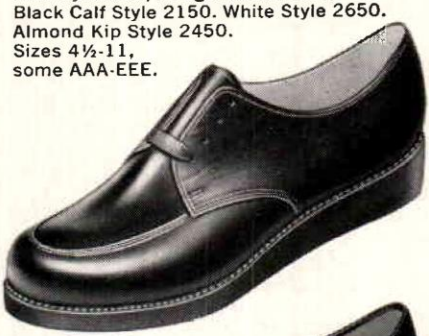

MEN'S:

Two-eyelet Calf oxford. Wedge rubber sole. Black Style 5076. Brown Style 5476. Sizes 6-15, some A-EEE.

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Orthopedic Braces

RATIONALE, CLASSIFICATION AND PRESCRIPTION

By MAXWELL H. BLOOMBERG, M.D., Chief of Brace Clinic, Veterans Administration Hospital, Newington, Connecticut.

Here, at last, is a book long-hoped for by orthotists; a book of help for every doctor, which strips away the confusion that has surrounded braces and provides clearly detailed advice on how to go about ordering them. The author is an orthopedic surgeon, and what he says in this book stems from a lifetime of first-hand experience with braces. Clearly and explicitly he describes the principles underlying the bracing of the spine and the extremities, using helpful drawings to make every point clear. All types of braces, from the simplest to the most involved, are shown in step-by-step sequence with reasons given for each step. The indications for the variations in brace construction are also clarified and a set of combinations is supplied as an additional guide in the prescription of braces for the lower extremity. The author's main endeavor is to promote clearer communication between the physician who specifies the brace and the orthotist who builds it. Toward this end, the writer maintains that a brace should always be requested in prescription form, *without* reference to any of the names of the myriads of braces on the market. The choice of materials, such as steel, leather, etc., he contends, should be left in the qualified hands of the orthotist, whose role as a consultant he constantly champions.

As an orthotist, you will find this book exceptionally helpful and well worth recommending or *giving* to every physician who uses your services. It will enable him to specify the most efficient brace for every patient and, at the same time, simplify and strengthen your professional relationship with him.

207 Pages **114 Illustrations** **1964**

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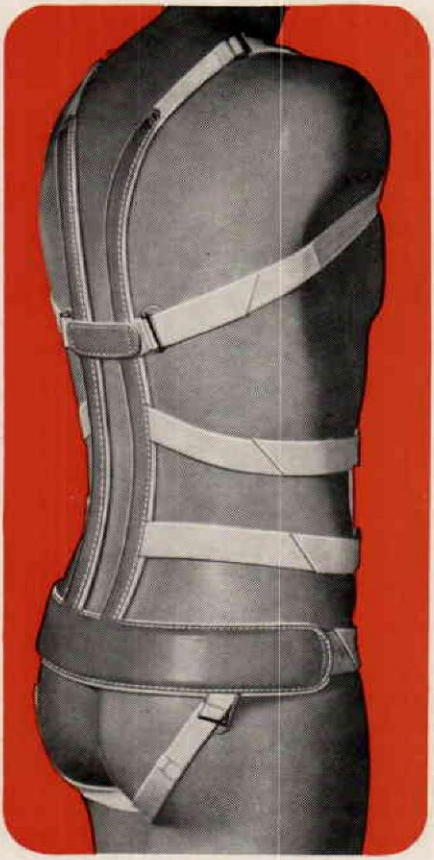

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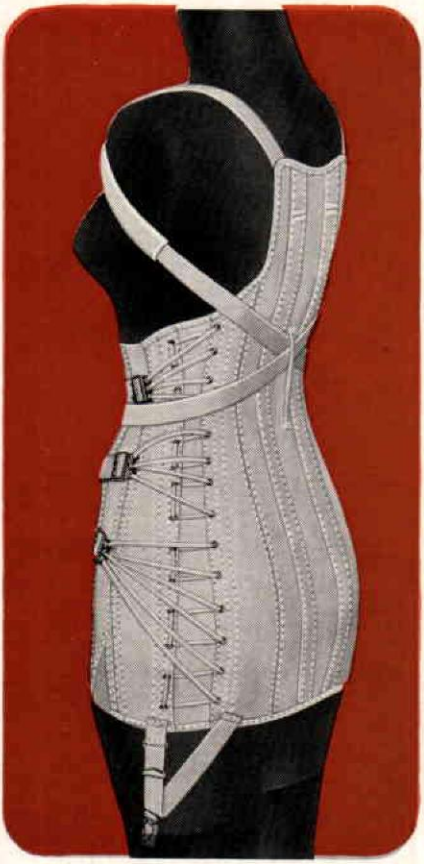

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Invitation to the
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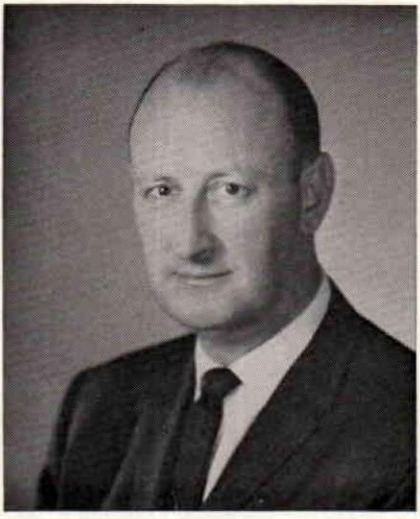
PROSTHETICS ASSEMBLY

Place:	**The Broadmoor Hotel, Colorado Springs, Colorado, U.S.A.**
The Dates:	**August 31 to September 4, 1965**
Preliminary Sessions:	**August 29-31, 1965**
Registration Forms From:	**AOPA, 919 18th Street, N.W. Suite 130 Washington, D. C. 20006**



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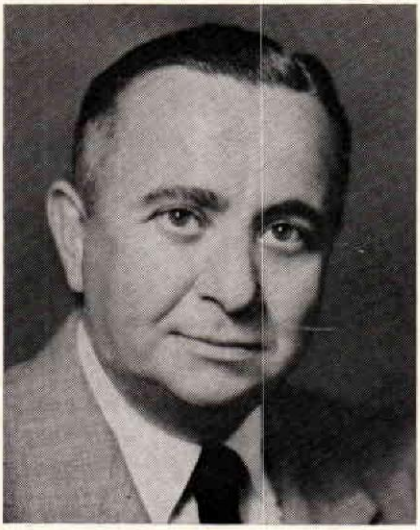

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PRELIMINARY EVENTS

August 29—SUNDAY

Northwestern University - AOPA Business Course on Business and Administrative Procedures for Orthotic-Prosthetic Establishments.

DR. KENNETH JOHNSTON
PROFESSOR FRANK KARABA
DR. JACK ARMOLD

Note: An enrollment fee of $50 is charged for this three day session at which registration is limited.

August 30—MONDAY

9:30 a.m.—Board of Directors of the American Orthotics and Prosthetics Association in session.

10:00 a.m. - 5:00 p.m.—Northwestern University—AOPA Business Course—Second session.

Bus trip tour to Pike's Peak (return by Cog Railway).

August 31—TUESDAY

9:00 a.m.—Board of Directors of the American Board for Certification meet.

10:00 a.m.—Advance Registration desk open all day.

10:00 a.m. - 1:00 p.m.—Concluding session of the Northwestern University-AOPA Business Course.

7:00 p.m.—AOPA Opening Reception for members and friends, followed by a Chuckwagon Supper at the Flying W Ranch with entertainment.

FORMAL OPENING OF THE 1965 ORTHOTICS AND PROSTHETICS ASSEMBLY

September 1—WEDNESDAY

MORNING

9:00 a.m.—Technical, supply and educational exhibits open until 5:00 p.m.

10:00 a.m.—Opening Assembly session—the Keynote Address.

11:00 a.m.—Ladies Auxiliary Meeting.

AFTERNOON

1:00 p.m.—Certification Luncheon.

Speaker: DR. CLAUDE LAMBERT, Chicago, Illinois.

Presiding: TED W. SMITH, C.O., President of the American Board for Certification.

The luncheon meeting is open to all. It will be followed by a Business Session for Certifees and Managers of Certified Facilities.

4:00 p.m.—Tour of the U.S. Air Force Academy and inspection of the Academy Chapel.

September 2—THURSDAY

MORNING

9:00 a.m.—Technical, supply and educational exhibits open until 5:00 p.m.

8:30 - 11:30 a.m.—Two concurrent instructional seminars.

I. Upper Extremity Impairment and the Indicated Orthotic Service: Functional, Connective, Supportive.

THORKILD ENGEN, C.O., Houston, Texas, *Lecturer.*
MARION MILLER, C.O., Indianapolis, Indiana, *Moderator.*

II. The Current Techniques in Below-Knee Prosthetic Fitting.

BERT R. TITUS, C.P.O., Durham, North Carolina, *Moderator.*
Panel to be announced.

AFTERNOON

12:00 Noon—Ladies Auxiliary Luncheon at Dublin House.

1:30 p.m. - 3:30 p.m.—Research and Development in Orthotics.

ROBERT E. FANNIN, C.O., Columbus, Ohio, *Moderator.*

3:45 p.m. - 5:15 p.m.—Presentation of scientific papers.

Hip-Level Amputees

Presentation by EDWARD C. HOLSCHER, M.D., St. Louis, Missouri.

The Use of Pylon Prosthetic Devices for Lower Extremity Congenital Skeletal Deficiencies

RICHARD H. JONES, M.D., Minneapolis, Minnesota.
CHESTER NELSON, C.P., Minneapolis, Minnesota.

Research in Lower Extremity Bracing

PATRICK J. MARER, C.O., Rancho Los Amigos, Downey, California.

EVENING

Entertainment.

Square Dancing Party

September 3—FRIDAY

MORNING

9:00 a.m.—Technical, supply and educational exhibits open until 5:00 p.m.

8:30 - 11:30 a.m.—Two concurrent instructional seminars.

III. Patella Tendon Bearing Bracing

ANTHONY STAROS, New York City, U. S. Veterans Administration Prosthetic Center, and Associates.

IV. The Juvenile Amputee Prosthetic Fitting

BASIL PETERS, C.P.O., Philadelphia, Pennsylvania, *Coordinator.*

Special Prostheses for the Juvenile Amputee: Measuring, Casting and Fabrication

VANCE C. MEADOWS, C.P.O., Grand Rapids, Michigan; Instructor in the Northwestern University Juvenile Course.

Research and Development of Special Components

CARL T. SUMIDA, C.P.O., Child Amputee Prosthetics Project, Los Angeles, California.

AFTERNOON

1:30 p.m. - 3:30 p.m.—Immediate Post Surgical Prosthetic Fitting.

Presentation sponsored by the Committee on Prosthetics Research and Development, National Research Council

GEORGE T. AITKEN, M.D., Chairman, and Associates, Grand Rapids, Michigan.

3:45 - 4:45 p.m.—The Geriatric Patient: Orthotic and Prosthetic Aspects.

5:20 p.m.—Business Meeting of the American Orthotics and Prosthetics Association and Election of Officers (members only).

EVENING

Dinner Meeting of the Conference of Prosthetists (members of the Conference only).

September 4—SATURDAY

MORNING

9:00 a.m.—Technical, supply and educational exhibits open until 12:00 noon.

9:30 a.m.—External Power for Prosthetics and Orthotics: Current practical use and future possibilities.

COLIN MCLAURIN, Ontario Crippled Children's Center, Ontario, Canada.

10:00 a.m.—Meeting of Ladies Auxiliary.

AFTERNOON

MEDICARE AND OTHER LEGISLATION WITH REFERENCE TO THE ORTHOPEDICALLY HANDICAPPED.

IMPACT ON PROSTHETICS AND ORTHOTICS.

Panel Discussion—2½ hours—presentation

1. Medicare and its implementation by the Department of Health, Education, and Welfare.

   THE HONORABLE WILBUR J. COHEN, Under Secretary, U. S. Department of Health, Education, and Welfare.

2. The U. S. Children's Bureau—Orthopedic and Prosthetic Care—Legislation and Administration.

   ARTHUR J. LESSER, M.D., Deputy Director, Children's Bureau, HEW, Washington, D. C.

3. The U. S. Vocational Rehabilitation Administration and the Orthopedically Handicapped: Recent Legislation and Administrative Procedures of Interest to Orthotists and Prosthetists.

   J. WARREN PERRY, Ph.D., Deputy Assistant Commissioner, Vocational Rehabilitation Administration, Washington, D. C.

EVENING

7:00 p.m.—Reception and Banquet.

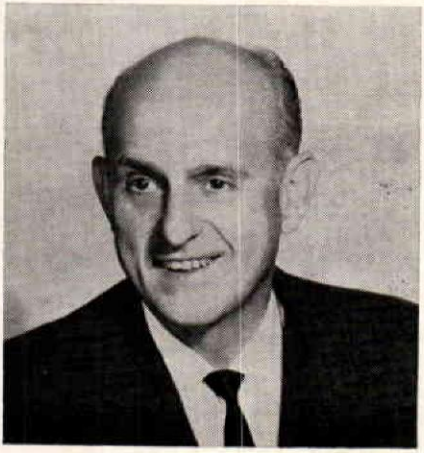
Presiding: PRESIDENT HERBERT J. HART, C.P.O., Oakland, Calif.

Installation of Officers.

Adjournment.

September 5—SUNDAY

9:00 a.m.—Meeting of the AOPA National Board of Directors.



Assembly Exhibits Chairman Kenneth Dodd, C.O., Hollywood, California

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The Body Jacket

By W. FRANK HARMON, C.O., and
JAMES W. STANFORD, C.P.

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For years we have heard of, seen, made and used the Milwaukee Brace and modifications of this brace for the control of Dorsal, Lumbo Dorsal, and Lumbar Scoliosis in both conservative and post operative care of patients, employing the principle of distraction, pressure, and counter pressure areas to fight the devastating effects of spinal curvatures.

Too, for many years, body jackets of one type or another have been used as post-operative means of control after surgical procedures have been utilized to secure partial or maximum correction of pathological or idiopathic curvatures. They are also used extensively for other cases of paralysis, arthritis and osteoporosis.

One of the earlier products used with only negligible results was a material known as Castex. Castex, as best we can recall, was an impregnated type of bandage that was applied in much the same manner as plaster bandage, but being much thinner, the subsequent bulk encountered with plaster bandage was eliminated and the finished jacket, when cut off the mold, lacquered, and applied to the patient, was very light and only a fraction of the weight of a conventional plaster jacket or corset. There were disadvantages, though, that eliminated its continued usage.

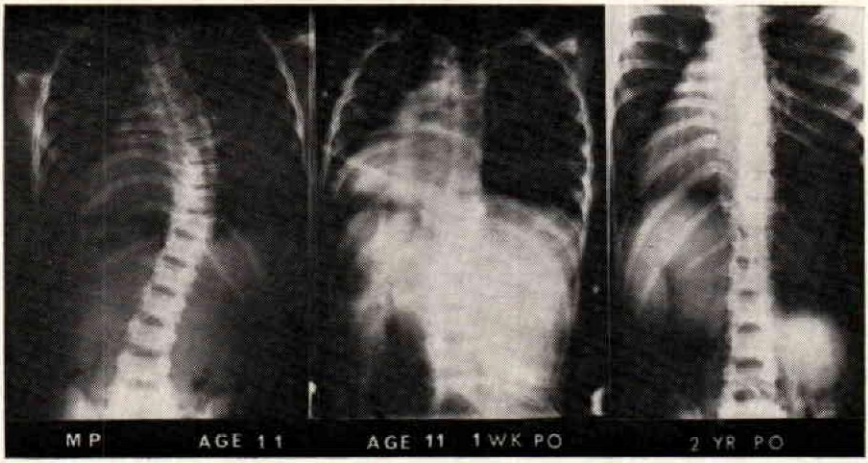

FIGURE 1—Typical scoliosis, surgically corrected, to which plastic laminated jacket was applied. (X-ray photo courtesy Darius Flinchum, M.D., Atlanta, Georgia.)

1. The cut edges and borders had a definite tendency to curl, thereby causing it to lose its original shape or contour.
2. We were unable to provide a support from Castex that would be rigid enough to give the required support and at the same time be sufficiently flexible to permit easy application and removal.

After the experimentation with Castex, we found that jackets made of Cellulose Acetate and stockinette over the prepared mold worked fairly well.

In this procedure from five to seven layers of cotton stockinette were pulled over the mold and each layer was impregnated and built up by dipping or painting with cellulose acetate before a succeeding layer of stockinette was applied. Since each layer of stockinette and acetate must dry thoroughly before the succeeding lawyer could be satisfactorily applied, the procedure was time consuming both from the standpoint of labor and elapsed time before the jacket could be cut off the mold.

After removal from the mold, it was fitted, trimmed, padded, bound, boot hooks and a metal slide tongue were added to hold the front edges in alignment.

Certain disadvantages were characteristically found in the cellulose acetate jacket. Normally, if the patient needed a permanent or semi-permanent support, this jacket would have to be replaced after an approximate year of wearing because moisture from perspiration would cause discoloration, cracking, and checking. This, combined with increased brittleness, resulted in too rapid deterioration. Labor was a highly significant factor as excessive man hours were consumed in the laminating and finishing processes.

As a result of post war experimentation by or in cooperation with research teams from the National Research Council, the Veteran's Administration and other interested personnel, the use of synthetic resins have revolutionized the materials, processes and procedures used in making the modern body jacket.

Currently the plastic laminated appliance offers many advantages over previous models supplied. By carefully controling the mixtures of rigid and flexible resins, jackets of excellent support can be fabricated. It can be made as flexible as leather or as rigid as may be desired. The weight is moderate, certainly no heavier than the previously used cellulose acetate jacket. It will retain its molded shape or contour indefinitely without subsequent warping or curling at the edges. It is easily worked, trimmed and requires no binding or padding over bony prominences or cut edges. These edges can be rounded and polished as smooth as molded or cast glass. Moisture absorption is reduced to a minimum and the finished product can be washed or cleaned with a damp cloth. The patient can even take a shower or go swimming with this support.

A second significant factor is the labor involved. Whereas, originally, days were consumed in the lamination, fitting and finishing processes, it is now reduced to hours. The lamination can be made and the following day it can be finished and applied to the patient.

It might be advisable at this point to give the step by step procedure for the entire process.

I. Cast and Mold Preparation

1. The patient normally comes to the shop some 4 to 5 months fol-

lowing fusion of the dorsal, lumbo-dorsal or lumbar spine wearing the cast that was applied immediately following the surgical procedure.

This cast is removed and whenever possible a shell or negative cast, for the mold that is to be made, is made with the patient standing with cervical traction by means of an overhead suspension with a head halter with 15 to 30 pounds of vertical traction depending upon the size, weight, and condition of the patient.

2. This cast or shell is made by or under the supervision of the surgeon, and will be heavy enough to hold the plaster that will be poured to make the negative mold.

Six inch plaster bandage is wrapped with the patient under traction so that the shell will extend up under the axilla, over the breast and scapulae and down below the coccyx posteriorly and pubis anteriorly.

FIGURE 2—Cast for the mold is made while the patient is in traction.

As soon as this has hardened sufficiently to hold its shape, is is cut down the front from top to bottom and removed from the patient.

3. Just prior to the application of the previously referred to cast or immediately following its removal, measurements are taken directly from the patient while still under traction.

Circumferences are recorded for the thorax at the nipple line, waist, crest of the ilium, and the trochanter. These measurements are followed with anterior-posterior and lateral measurements at the same torso levels.

4. The physician then applies another cast to his patient, somewhat lighter and less bulky than the original, to be worn while the jacket is being made.

5. This temporary cast or shell is closed, sealed and permitted to harden before the molding plaster is poured into the shell to make the negative mold. As the mold is poured, an iron pipe, usually 18″ of ½″ water-pipe, is imbedded to serve as a handle or means of supporting the mold when it is being dried or being held in a vise while it is being dressed and the jacket being laminated.

6. Modifying and dressing the mold is most important.

a. The abdomen is flattened, the area from the axilla to the rib cage laterally is flattened and the excess, if any, is removed from the prominence of the buttocks. During this procedure the measurements noted above are observed and followed.

b. Frequently there will be noted on the posterior-lateral aspect of the mold, a bulge that may be from something barely noticeable to a quite conspicuous hump. This will largely depend upon the original degree of curvature and how much had been surgically corrected. *It is imperative that this bulge or hump be removed or reduced on the mold so that a corrective force will be applied in the finished jacket. The Orthopedist should*

indicate to what extent or degree this is to be modified. At the same time the mold is corrected to remove excessive hyperextension.

7. The mold is now ready for an additional modification in the area of the ilium and elsewhere. To eliminate pressure over bony prominences, a layer of ¼" felt is fitted and cemented directly to the mold over these prominences, then the edges are skived to blend into the adjacent surfaces.

8. After the mold is modified and smoothed to satisfaction it is desirable to oven dry it before the laminating is started. If this is impossible or impractical, the mold is sealed against moisture with 3 coats of parting lacquer, allowing each coat to dry thoroughly.

II. Laminating the Jacket

The success of this new plastic laminating technique depends upon a properly shaped mold and a thorough knowledge of the laminating procedures, and best results are obtained by the use of a vaccum system in the fabrication technique in order to assure that the finished jacket will follow the exact contours of the mold.

It may take some experimentation on your part to determine the degree of rigidity or flexibility required for a particular individual. We, however, have found that as the size of the mold is increased the thickness and rigidity of the jacket must also be increased proportionately. For a child age 4-7, 5 layers of stockinette is sufficient and the resins would be mixed 60% Flexible to 40% Rigid: ages 8-14 (average weight) may require 6 layers of stockinette and a 50-50 mixture of flexible and rigid resins, while a large adult may require 7 layers and 50-50 mixture or even 55% rigid to 45% flexible.

1. Drill two holes, approximately ⅛" diameter in the pipe that protrudes about 12" above the brim of the mold. The first hole will be 1-1½" from the brim and the second one, 1-1½" distal to the first hole. These holes or Air Vents will be used with the vaccum equipment.

2. Pull one cotton stockinette over the mold. This will serve the dual purpose of insuring a smoother finish on the inside of the finished jacket and serve as an escape route for air inside the inner PVA bag.

3. Pull one dampened PVA bag over the cotton stockinette to serve as a separator between the mold and the plastic resins.

4. Tie off the PVA bag below the proximal air hole that has been drilled in the pipe. Test this PVA bag with the vaccum as it is imperative that the bag follow the exact contour of the mold or a poorly fitting jacket will result.

5. Apply three (3) lengths of nylon stockinette over the PVA bag and tie them off below the distal air vent.

6. Lay up strips of ½ or 1 oz. dacron felt (4 to 7" wide) over the posterior and/or lateral sections of the jacket that will require reinforcement for strength and rigidity. Severe scoliotic cases with excessive concave or convex exterior alignment will require considerably more reinforcement than fully corrected or normally aligned backs.

7. Pull on 2 to 4 additional nylon stockinettes, depending on size of mold, and tie them off below the distal air vent.

NOTE: In selecting size of stockinette, a rule of thumb guide may be as follows:

22″ to 27″ Hip circumference—4″- 5″ stockinette
28″ to 32″ Hip circumference—5″- 6″ stockinette
32″ to 36″ Hip circumference—6″- 7″ stockinette
36″ to 40″ Hip circumference—8″-10″ stockinette
Rarely will there be occasion to use 12″ stockinette

8. Pull a second (outer) dampened PVA bag over the top layer of stockinette and tie it below the distal air vent and again check the vaccum. This should pull all layups snugly into any undercuts of the mold and assure an exact reproduction of the mold contours.

9. Polyester plastic resins are used in the laminating process. These are mixed in the heretofore mentioned proportions. The total weight of the mixture will vary from 1500 to 2600 grams depending on the size of the mold and the number of layers of stockinette to be impregnated.

To this mixture add 3% ATC Luperco Paste, 3% Naugatuck No. 3 promotor, and 2%-3% pigment as desired.

Mix and blend thoroughly. This formula allows approximately 20 minutes working time before the plastic jells.

10. Pour the plastic mixture in the area between the two PVA bags and turn on the vaccum (8 to 15 in. lbs. depending on size of jacket).

11. Work the plastic into the nylon thoroughly making sure that the plastic is evenly distributed and that all air is driven from the bag and no air pockets remain. A nylon cord used as a "stringing" tool will aid in this operation.

12. After the nylon is saturated, evenly distributed, and all air removed, gently heat the jacket with a heat gun. Keep the heat gun in motion to prevent concentrations of heat in any area. This heat will speed up setting or jell time and not allow the plastic to be sucked up into the vacuum pipe or tube.

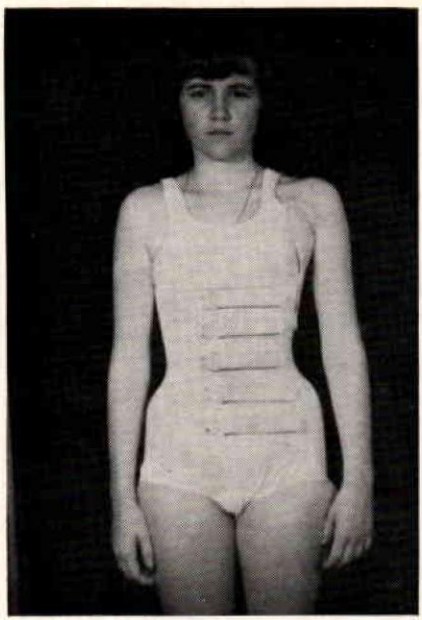

FIGURE 3—Anterior view of plastic laminated jacket.

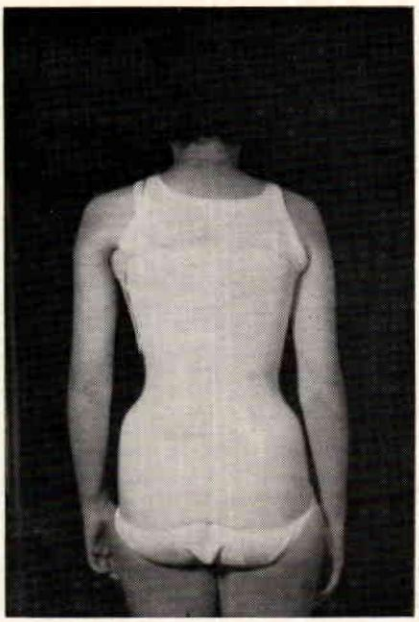

FIGURE 4—Posterior view of plastic laminated jacket shown in Figure 3.

13. The vaccum can be turned off after the resins have set and the lamination should be allowed to "bench cure" 24 hours or at least overnight before it is removed from the mold.

14. To remove from the mold, cast saw cuts to release the top and bottom sections are made above and below the top and bottom margins of the finished jacket. An anterior vertical cut from top to bottom will now allow easy removal, and the inner and outer PVA bags will slide off.

The temporary cast, applied and worn while the jacket was being made, is removed and the new jacket placed around the patient and secured by an ordinary belt while the patient is lying down. Preliminary marks are made on the jacket with a grease pencil to mark the top and bottom margins. At this point of the fitting it is frequently impossible, because of the height of the jacket, for the patient to assume the sitting position.

After the preliminary trimming, usually done with a cast saw, the patient is brought to a sitting position and again the jacket is carefully marked for additional trimming to afford maximum comfort while sitting.

Normally the top margin of the jacket is left as high as practical, particularly in the back, coming up well above the inferior margin of the scapulae. The front of the jacket is normally trimmed below the nipple line of male patients and below any breast prominence of the female.

While trimming, it is highly advisable to avoid taking off too much at any one cut, since, once removed it cannot be made higher or lower. For this reason, we pursue the trial and error method and will frequently make as many as three or four cuts rather than take the chance of cutting away too much in any one cut.

Once the jacket has been made comfortable to the patient's tolerance, all edges are rounded and polished to a smooth glossy finish. Straps are then attached, using Velcro rather than conventional buckles. The Velcro is less bulky, easier to fasten and loosen, and will be quite effective.

When finished the patient is advised regarding the wearing and removal of the jacket and told that he or she can take a shower or go swimming without undue damage to the appliance. The patient is then referred back to the doctor who, in most instances, will have additional X-Ray pictures made with the jacket in place for record purposes.

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1965 BOARD EXAMINATIONS

The Case for a Pylon

By DAVID G. MURRAY, M.D.

Assistant Professor of Orthopedic Surgery, State University of New York, Upstate Medical Center, Syracuse, New York

Is there a place for a "peg" among the modern laminated products of the limb maker's shop? Progress in the field of limb construction now allows for fitting of all types of stumps with satisfactory prostheses. Agencies, both private and governmental, are furnishing support for research in advanced prosthetics, as well as financial assistance for the purchase of the latest in prosthetic appliances. Prosthetic clinics provide an arena where surgeon and prosthetist can combine talents to solve the most difficult prescription problems. In spite of this a large gap exists between the number of persons having a major lower extremity amputation and those subsequently using an artificial limb. This gap is primarily occupied by geriatric amputees, and as this number is increasing more effort must be devoted to solving the problems existing in this area.

A partial solution may lie in the use of a temporary pylon fitted soon after surgery. By this means the patient may begin to adjust to the use of an artificial extremity before he or the surgeon lose interest in the whole procedure. A trial with a pylon will indicate those patients with the stamina and motivation to carry through with the required training and ultimately use a prosthesis. During this time the use of the pylon will help prepare the stump for proper fitting, limit the development of contractures, and shorten the period of post prosthetic training required.

To expand on this possibility we have begun a program directed specifically toward the geriatric patient with a below knee amputation. The initial work revolved around the design of a standard pylon which would meet the following requirements:

1. Inexpensive. Most financial support in the geriatric group comes from public funds and to meet with agency approval for routine use the cost must be kept down.

2. Simple. Fabrication must be uncomplicated to allow for prompt fitting and replacement if stump conditions change.

3. Characteristics similar to permanent prostheses. It is important to provide the older amputee with the best conditions possible when assessing his tolerance for an artificial leg, and to minimize the problem of adapting to the final prosthesis. This criterion must be considered carefully with the first two because there is a strong tendency to refine temporary pylons until they are virtually identical to a finished limb.

4. Safe. Supervision and training should require no more than the ordinary facilities available in the average hospital and physiotherapy units.

We are now using a temporary below knee pylon, to be described in the following article, which we feel meets the above requirements. At the present time we are fitting the below knee amputee with the pylon three to four weeks after surgery. Despite optimistic reports from other sources on fitting at the time of surgery we feel that by allowing three weeks for wound healing the necessity for specialized supervision is eliminated, the patient can be treated in a usual fashion without upsetting hospital routine, and, most important, possible damage to fresh and precarious skin flaps in a below knee amputation is avoided. During this time the patient is started on exercises, there is little loss of continuity and the patient remains motivated. This pylon has proved satisfactory in trials to date with patients ranging in age from fifty-six to eighty. Clinical experience indicates that the socket will allow for changes in the size of the stump as it matures and there have been no significant problems with skin tolerance. A period of several years will be necessary, of course, to evaluate the ultimate success of this program.

The elderly amputee has many things working against him. He is less readily adaptable to changes in his environment, and less adept in mastering new physical skills. He is easily discouraged by failure and often lacks motivation to persist with tedious training. He lacks financial resources for obtaining an expensive prosthesis and by virtue of age may not qualify for certain types of assistance. Concurrent medical problems often cause delays in prescribing a prosthesis. The combination of these factors results in many prostheses gathering dust in a closet and many capable amputees gathering dust in a wheelchair. If an inexpensive temporary pylon can make any significant improvement in the present situation, it will be well worth the extra time and effort involved.

Temporary B.K. Prosthesis

By SAM E. HAMONTREE, C.P., † KURT MARSCHALL, C.P., * and D. G. MURRAY, M.D. §

The following is a discussion of the temporary prosthesis that was used for the group of geriatric patients discussed in the preceding article by Dr. David G. Murray.

This team is attempting to provide an inexpensive, temporary walking leg, that will not only give the elderly below knee amputee an adequate socket for the purpose of stump shrinkage and shaping, but will also get the geriatric patient back on his feet within three to four weeks after operation. This temporary prosthesis is being used to some extent to determine the advisability of further prosthetic rehabilitation.

NOTE: This work supported by the Onondaga County Welfare Department, Dr. Herbert Notkin, Medical Director.

† Frees and Tyo, Inc., Syracuse, New York.

* Empire Limb Co., Syracuse, New York.

§ Upstate Medical Center, Syracuse, New York.

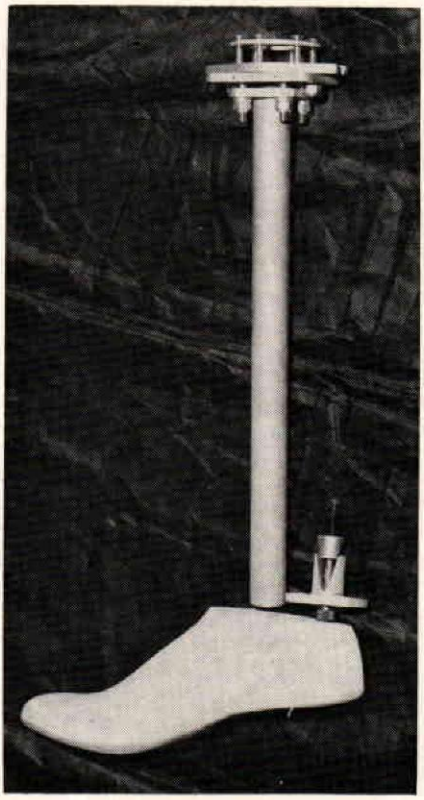


FIGURE 1—Components utilizing Northwestern B.K. pylon.

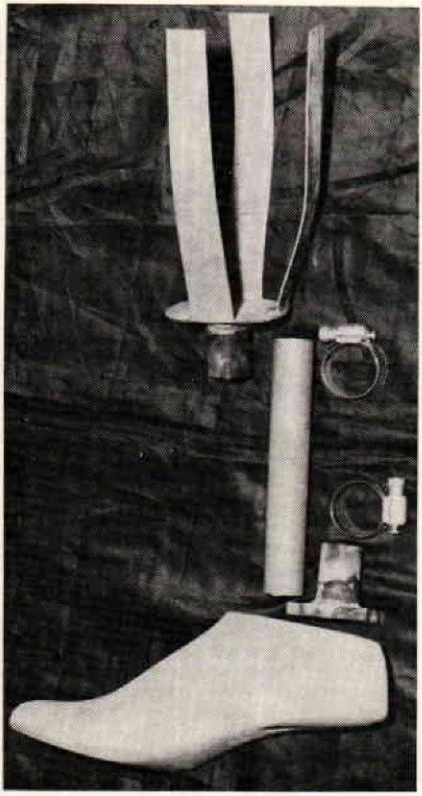


FIGURE 2—Components for original pylon.

When choosing a material for socket fabrication, it was realized that a plaster socket cannot be as extremely well-fitted as a P.T.B. socket, nor can it incorporate all the biomechanical advantages of one. However, it does provide some of the characteristics of a P.T.B prosthesis. Also, it has proven quite satisfactory for weight bearing, stump shrinkage, and stump shaping during shrinkage.

Two types of pylons were used in this study. Originally a simple and inexpensive pylon was fabricated in our own facilities, subsequently we have used the Northwestern B.K. pylon (fig. 1) from A. J. Hosmer Corporation for comparative purposes.

The original pylon (figs. 2 and 3) lacks the features of alignment adjustments incorporated in the Northwestern unit, but it is much less expensive and did appear to be sufficient for this study; and minimal expenses were mandatory. The pictures of the pylon are self-explanatory, but in brief, the straps (medial, lateral and posterior) and the plate (approx. $2\frac{1}{2}$-3 inches in diameter) are cut as one piece from a soft, light metal. The proximal and distal plugs are steel pipe, welded to bases, with an aluminum tube of the proper size to fit over the plugs, and clamped with hose clamps.

The following is the method which is used by this group for fabricating a temporary prosthesis to meet the specified requirements.

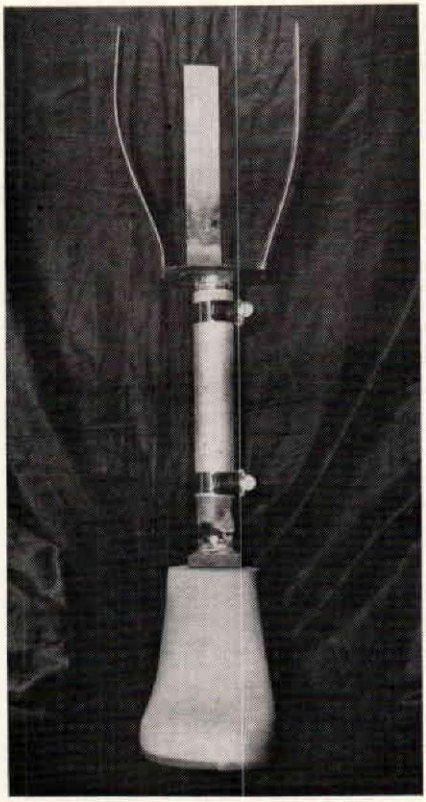


FIGURE 3—Assembled components.

FIGURE 4—Stump prepared for casting. Foam rubber in place over end of stump.

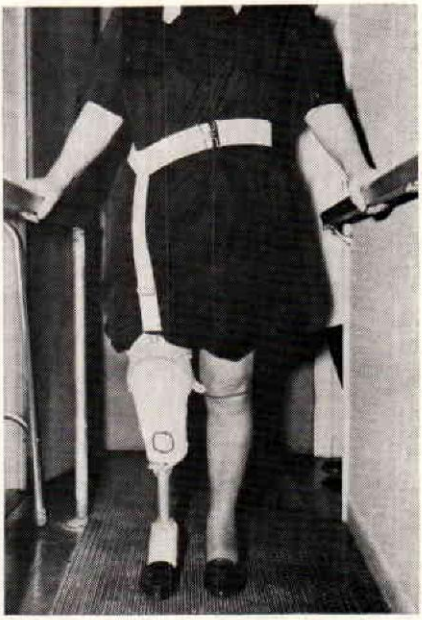


FIGURE 5—Finished pylon marked for cutting the anterior opening

FIGURE 6—Side view of finished pylon.

Materials

One regular 5-ply stump sock, light foam rubber, 1 cast sock, 1 piece of separating material, 1 elastic plaster bandage, 2 regular plaster of paris bandages, pylon.

Fabricating Procedures

We will discuss only the procedure used with the original pylon as many other articles have been written about the Northwestern type which is shown in the illustration. Figure 4 shows the stump prepared for casting with a clean, new 5-ply wool stump sock which is pulled over the patient's stump. A small pad of foam rubber is placed inside, between the stump and sock, to create a soft contact between the yet tender area of stump and plaster socket. A piece of Saran Wrap, acting as a separator, is pulled over the stump sock and held in place with a thin cast sock. Both socks and separator are held in place with two clamps and elastic webbing around the pelvic region. Elastic plaster bandage is applied to the stump in the same manner as for a P.T.B. cast, and patellar tendon and popliteal areas are depressed in the same fashion. The cast is later further depressed across the patellar tendon area after removal and is reinforced for weight bearing.

After the bandage has hardened, the base plate with the three uprights is roughly formed to the cast, placing the uprights medially, laterally, and posteriorly. The pylon tube is then cut to length, attached to the plug and secured with a hose clamp. A used Sach foot was employed in this study and fastened to the pylon tube with foot plug and clamp. At this stage, the patient is put in a standing position and static alignment is completed. After marking the placement of the baseplate and uprights with indelible pencil, the cast is then taken off the patient's stump and reinforced with ordinary plaster of paris bandages, taking care to cover the upright straps well. After adequate hardening of the cast, an opening (as marked in fig. 5) is cut into the anterior distal portion of the socket to facilitate re-introduction of the stump, with a pull-on sock, and to eliminate pressure on the tibia in this area. P.T.B. buttons are installed at the medial and lateral uprights, and a cuff suspension strap added. A light waist belt is necessary for suspension. The patient is given the finished product and can begin training the following day.

We have not attempted to use this temporary prosthesis for walking without additional support, nor is it meant for such use. It is intended only to furnish an inexpensive device for the purposes expressed previously: to allow the geriatric amputee to become mobile at a time somewhat earlier than is normally practiced; to shrink and shape the stump; and to require minimum attention. It should also assist in evaluating the geriatric amputee for a permanent prosthesis. We realize that this procedure is neither new nor earthshaking, but it appears to have promise as a means of dealing with the geriatric group of our new amputee population.

Principles and Alignment Problems in Custom Built Orthopedic Shoes

By Erich Hanicke, C.P.O.
Kansas City, Missouri

Our industry is aware that there is a real problem for persons with deformed feet to obtain properly fitted, functional and comfortable shoes. We should be concerned with these problems and help to solve some of the difficulties encountered with modern footwear in relation to orthotic and prosthetic devices.

Custom built shoemaking is becoming almost a lost art and since so many foot problems are related to brace and leg problems, we feel that our profession with its background and experience would be the most logical and qualified to undertake some leadership in this direction. Most of us have the materials and machinery for the necessary procedure. We have a great deal of anatomical knowledge; we have practical experience and skill; we are well adapted to interpret doctors' prescriptions and make most anything required in the Orthotic-Prosthetic field. We need not feel and do not intend to encroach in someone else's profession.

In many instances it may be a good practice to consult with an orthopedic physician to obtain his advice and suggestions. A doctor's prescription would insure a more intelligent and efficient approach to the patient's existing problems. A custom built shoe must perform a multitude of duties. It must hold and support the foot in its best anatomical position; it must support the foot in its best functional position; it must support the foot in its most comfortable position. This position should be in accord with the requirements of a functional knee joint in its anterior-posterior as well as the lateral plane in relation to foot and hip. This position should not be a pseudo-alignment which means that the leg and foot may be fairly well balanced but at the expense of the articulating mechanism of the knee and hip. This is the reason the complete leg must be taken into consideration. The custom built shoe must also be acceptable from the standpoint of appearance.

We as a profession should concern ourselves with the problems of alignment, taking the casts, construction of lasts, etc., and leave the actual manufacture of the shoes to one of the few shoemakers available or to a shoe factory having a custom shoe department who is interested in cooperating with us. It will will be impossible to cover every phase of this worthwhile project but we will discuss our technique briefly.

Examination of the Patient

Assuming that the patient has been referred by his physician who has recommended certain paramount necessities, it will be your job to examine this patient from a mechanical point of view to ascertain the various limitations of static and dynamic alignment and flexibility of motion. This should include not only the foot proper but also the knee and hip. Establish the

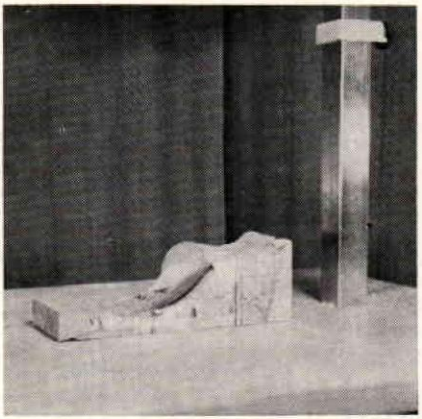


FIGURE 1—Rehearsal block shaped to take care of malformation of foot.

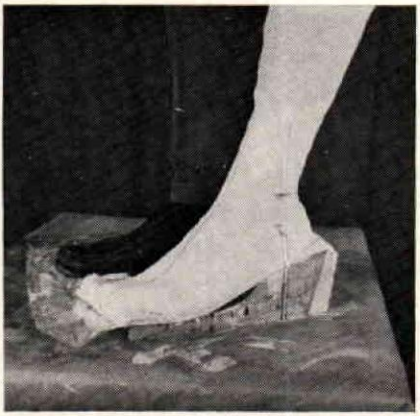


FIGURE 2—Taking cast under weight bearing. Note guide lines.

degree of correction desired, necessary and tolerable. Be sure to ascertain the length of both legs. After discussion with the patient it may be necessary to discuss the complete problem with his physician.

Before attempting to take the cast of the foot, we make what we call a rehearsal block to determine alignment. (Figure 1) We use a block made of cork and shape it to take care of any shortness of the affected leg, pad it to take care of any malformations that are apparent. We have the patient stand on this block so that we may note the desired amount of correction. The patient should have his shoe on his good foot while testing and taking cast. At this point, you can establish the center line of gravity in the anterior-posterior as well as mediolateral aspect. This rehearsal block is used while taking the cast.

Taking the Negative Cast:

1. Preparation prior to taking cast.
   a. Powder the foot well, preferably with Zinc Stearate.
   b. Apply light cast sock to foot. Place a black leather strap under sock on dorsal side of foot to toes. Pull sock tight, but do not squeeze toes.
   c. Place plastic sheeting on rehearsal block. Place thick blanket material on plastic to absorb moisture.
   d. Mark any sensitive or pressure areas.
2. Taking of actual cast.
   a. Using 3" or 4" bandages, wrap foot in oblique fashion, taking care not to compress toes. Allow the metatarsal region of the foot to expand under weight bearing.
   b. After wrapping, place foot on rehearsal block with about 75% weight bearing. Watch flexion or hyper-extension of leg as well as varus and valgus of knee. Hold leg and foot steady until cast is dry.
   c. Mark cast medial, lateral, anterior and posteriorly while patient is standing on rehearsal block with vertical lines square to floor. Extend lines downward on to rehearsal block. (Figure 2)

d. When cast is set, have patient sit down, mark cross lines where cast is to be cut. Cut cast open on dorsal side and remove from patient's foot carefully.

So that we may have a duplicate of the correct alignment we fill the negative model using our modified Bock type alignment jig. (See Figure 3) Insert pipe that is to go into cast on bracket in receptacle on upright column of jig. A set screw on the bracket fits into the hole at the upper end of the pipe. This arrangement will guarantee as accurately as possible the exact position of the patient's foot in its various angles to the floor. It will indicate eversion, inversion, abduction, adduction, plantar as well as dorsal flexion, valgus and varus but not the distance from plantar surface of the foot to table top. Therefore, it is important to record the height from table top to a set collar on upright column below bracket.

Construction of Positive Model:

1. Place cast back on rehearsal block, aligning to marks on cast. Tape cast to block and close front seam with plaster. Let cast dry.
2. Powder inside of negative cast with Zinc Stearate.
3. Place the cast on rehearsal block on table of jig. Lower pipe into cast to within ½" from the bottom of heel of negative cast. (Figure 3)
4. Mix plaster of Paris fairly thin and pour slowly into negative to prevent air pockets.
5. Let stand for about an hour.
6. Separate cast from rehearsal block.
7. Raise bracket on upright column (including cast) about 5". Do not disturb set collar on column.
8. Remove cast from bracket on alignment jig.
9. Mark cast around its anterior-posterior axis along the center of the foot-dorsi-plantar surface.
10. Cut negative from positive cast with a razor sharp knife. Cut should be straight and smooth so that cast comes off in halves. Should cast become too hard, use a vibrating cutter.
11. Keep rehearsal block and both halves.

This positive plaster of Paris model represents not only the shape of the patient's foot and its relation to the lower leg but also it represents the line of gravity, balance and amount of correction tolerable and possible. Pressure areas are clearly indicated by indelible pencil. This method is comparable to the adjustable leg set up jigs as used in prosthetics.

Modification of Plaster Model in Preparation for the Last:

When the shoe is completed there is very little chance to make any major alteration as to tension, fit and alignment. If there is any doubt, it might be well to try the negative on the patient's foot with his regular sock.

The positive cast must now be modified so that it will assume the shape of the desired shoe. The sensitive areas should be spotted with leather, well skived around the edges. Shave off areas where more pressure is desired.

To extend the toes, put cast in jig, draw around foot on a piece of paper. At least ¾" should be added to the end of toes. Decide on the shape of toe of shoe, whether pointed, blunt, broad, etc. and sketch with

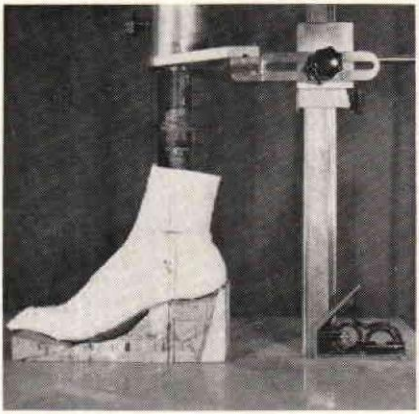


FIGURE 3—Cast is filled on modified Bock jig to maintain same alignment.

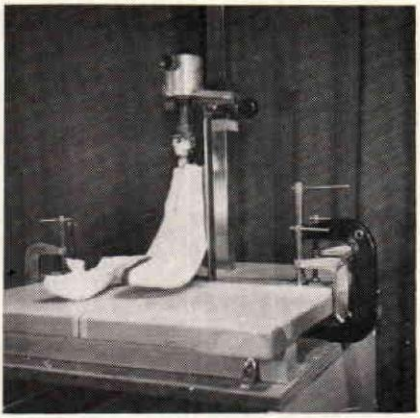


FIGURE 4—This shows making the negative over the corrected positive cast in preparation for last.

indelible pencil on paper. Wet positive cast where plaster is to be added to extend the toe. The entire toe section on the dorsal surface should also be enlarged.

After the addition of plaster has dried, sand the cast until smooth. Holes and other imperfections may be filled out with Synkaloid Spackling paste. This material spreads like cream, hardens quickly and can be sanded. It is not affected by PVA emulsion or Johnson's wax.

When this model is completed, it represents the pattern for the shoe last. After cast is completely smooth, coat with two coats of Hosmer parting lacquer. Let dry between coats. Then add two coats of Johnson's wax rubbing to a polished finish. Apply a third coat of Johnson's wax but do not rub down. Now the model is ready for construction of negative from which the Last proper is made.

Construction of the Last:

This procedure is of utmost importance so it will be described in minute detail. Place the model in any convenient vice or use the alignment jig. Take a new negative paster of Paris model, applying plaster wrap directly to the coated cast (do not use cast socks or stockinette). Wrap bandages tight and rub bandages between layers of plaster in order to obtain a smooth inside finish.

Remove cast while still moist, using a sharp razor knife. Cut so that cast comes apart in two halves. The cut must be a clean sharp edge.

So that we may duplicate the last in the same alignment as our positive cast, the following steps are necessary.

1. Leave one half shell on positive and tie to positive with a string. (Positive is in jig.) (Figure 4)
2. Make a strong right angle bracket which will not bend under weight of filler material for last.
3. Place the vertical arm of this bracket close to negative half shell which is tied on positive.
4. Clamp the horizontal section of bracket to the table of jig. Reinforce with guide blocks on other side. Tape with masking tape and mark across guide blocks.

5. Attach the vertical section of bracket to half shell *only* with plaster of Paris gunk and a bandage looped back and forth.
6. Remove half shell and bracket from the model. Let both shells and gunk dry well. Do not disturb guide blocks on table.
7. Remove positive model from jig.

After the negatives have dried well, coat the half shells with two coats of Johnson's wax. Let first coat dry well and polish. Do not polish the second coat but remove any excess wax. Paint the inner surface of the half shells with two coats of PVA emulsion. Paint well along cut seam of cast. Let dry well between coats. Then spray with one coat of Releasagen S-1. This will not dry, let stand for about 30 minutes.

Unite the two halves and tie. The entire seam should be closed tight enough so that the resin will not find a way out. Play dough and pressure sensitive tape can be used. Attach this negative to the table of the jig between the guide and clamp down. Insert a new pipe attachment in jig and attach Last ferrule with allen screw pointed toward front. Cover area around screw with Johnson's wax. Lower this unit into negative cast. Height on upright column may be changed now. Do not let the bottom border with allen screw at top of ferrule extend below the top edge of the cast. (Figure 5)

Record number on the height indicator on upright column of jig, below the set collar on patient's chart. Wrap screw and set collar with tape to prevent loosening. Raise this unit with ferrule out of the cast sufficiently to clear top of cast but do not disturb position of set collar. Remove cast and bracket from table and place in a refrigerator for about 30 minutes. Also, place a large fruit juice can (for mixing resin) in refrigerator. This is done to prevent resin from over heating. After the cast has cooled, replace in jig in previous position.

Mix about 1500 grams of resin, using 50% Versamid #140 and 50% Genepoxy #177. Use an extra strong shear mixer in drill press to thoroughly mix resins. Add pulverized cork slowly, mixing it to a consistency of fairly thick cream of wheat. Mixture should be thin enough so that it can be poured into cast. Use some white pigment so Last can be marked with pencil.

Pour mixture into negative model rather slowly to avoid air bubbles. It is best to do this in a fairly cool room to prevent overheating. If this reaction should occur, pour mold in two or three sections, letting each cool sufficiently before adding additional resin. They will adhere well. Let resin set a few minutes to permit settling. Add more if necessary. Fill to within ¼" from top of cast to allow room for metal ferrule.

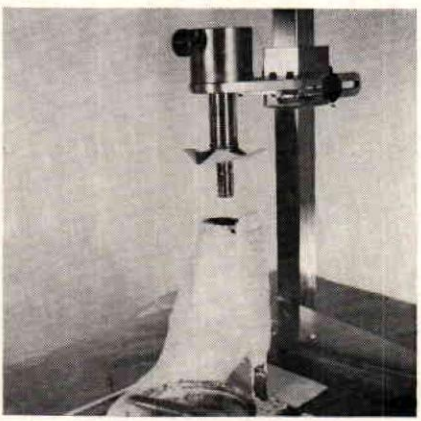


FIGURE 5—Shows negative corrected cast ready to fill with resin.

Lower the ferrule on the cross bracket until it meets the set collar on the upright of the jig. Important: this ferrule is the only guide to indicate the proper position of the Last with regard to all angles to the table top as well as the correct height of the foot of the patient to the table top. Let this mixture dry about 24 hours.

After the resin is set, compare height of lower border of set collar with the record on patient's chart. Then loosen and remove clamps which hold right angle bracket attached to cast on table top. Raise entire unit upward on upright post of jig about 4". Do not disturb set collar but leave it taped securely. Loosen allen set screw in ferrule and pull last off receptacle. Remove bracket from shell. Place last with plaster negative in refrigerator for about 30 minutes.

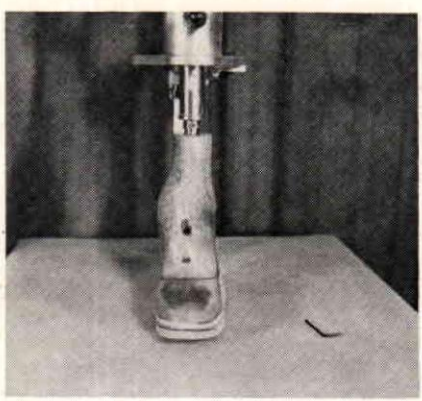
Pry open seams of half shells and remove from plastic last model. Use a sharp narrow chisel and wooden mallet. The plastic last model can be suspended in the jig in the exact position the patient's foot will be held in the shoe. Check Last model for air pockets. Fill with resin and cork and sand smooth.

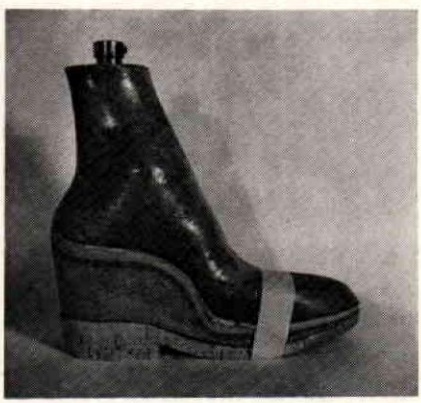
It will be necessary to provide the Last with a joint across the instep so that the Last can be removed from the shoe when completed. This joint is a curved cut from the distal anterior or dorsal aspect of the Last toward the posterior proximal area of the plantar surface of the foot. Bear in mind that the distal segment must be extricated from the shoe without ripping the distal end of the blucher or french cut.

Adequate room must be allowed for 3/8" hexagon nuts and shoulders of allen socket screws to be embedded into the plantar and dorsal surface of last. Before cutting the Last, draw a curved line for the proposed cut. Then draw a line along the center of the dorsal surface of the Last. Select the best possible spot for inserting two screws and nuts. Use a 3/8" drill and drill through entire last. Drill proximal section—dorsal surface of Last with a 9/16" counter borer having a 3/8" pilot. Do not counter bore too far down, otherwise the remaining section of resin will not be strong enough to withstand the strain exerted during manufacture of shoe.

Next, use a 13/16" counter borer with a 3/8" pilot to fit the drill diameter and bore out the space the nuts will occupy on the distal section of the Last (plantar surface). Again, be careful not to bore down too far. Leave adequate thickness of plastic for the units to hold together during construction of the shoe. Be sure that nuts and screws do not protrude beyond plantar surface but keep them about 1/8" below surface. (Figures 6 and 7)

Now cut Last along curved line marked on side of Last. Replace sawcut with a piece of 1/16" sheet cork, attaching to proximal section only. Insert screws and attach nuts and screw together. Do not screw down too





FIGURES 6 & 7—Completed last with cut so that it can be removed after shoe is made over it.

tightly. Let screws extend 1/8" above top of nuts. This will prevent breaking the plantar surface when screws are tightened later.

Now turn last with plantar surface up and fill out area around nuts. Start with fairly thin resin so it will flow around edges of nuts. Next mix resin fairly thick and smear into space like putty. After this has dried, last must be sanded carefully. Apply two coats of Hosmer Lac.

This last represents the exact features of patient's foot. It is made of a tough and yet easily fabricated material. It can be sawed, filed, nailed. The Last is now ready for any special insole or elevation which will be described in the next issue of the Journal. (Figures 6 and 7)

World Veterans Federation Prize to Dr. Rusk

The Rehabilitation Prize of the World Veterans Federation was awarded to Dr. Howard A. Rusk, Director, Institute of Physical Medicine and Rehabilitation, New York University Medical Center, in ceremonies held in Lausanne, Switzerland, May 5, on the closing day of the Eleventh General Assembly of the World Veterans Federation.

The prize is presented each second year to an individual who has made distinguished contributions to international cooperation for the rehabilitation of the disabled. It consists of a bronze trophy of the WVF emblem and entitles the recipient to allocate a WVF rehabilitation fellowship for training or research during each of the two subsequent years.

In presenting the prize to Dr. Rusk, WVF Secretary General Norman Acton said, "During and since World War II, Dr. Howard A. Rusk has combined an inspired dedication to rehabilitation with an exceptional world statesmanship to produce achievements which will never be forgotten. His leadership has earned the gratitude and respect of war veterans, of all disabled persons, and of men and women of good will throughout the world."

During World War II, Dr. Rusk was director of the rehabilitation program of the United States Air Force, for which he was awarded the Distinguished Service Medal, and retired as a Brigadier General. He is consultant on rehabilitation to the United States Veterans Administration, and has served in a similar capacity with the United Nations and other organizations. Dr. Rusk is currently president of the World Rehabilitation Fund, Inc., a non-profit organization supported by American industry, foundations and individuals to assist in the international development of rehabilitation services for the handicapped, and from 1954 to 1957 served as president of the International Society for Rehabilitation of the Disabled.

The Institute of Physical Medicine and Rehabilitation, of which Dr. Rusk is director, is the largest university center in the world for rehabilitation of the physically handicapped. Through its educational training program, more than 1,200 medical and paramedical personnel from 68 countries around the world, have studied at the Institute, and returned to their own communities to establish new centers for rehabilitation.

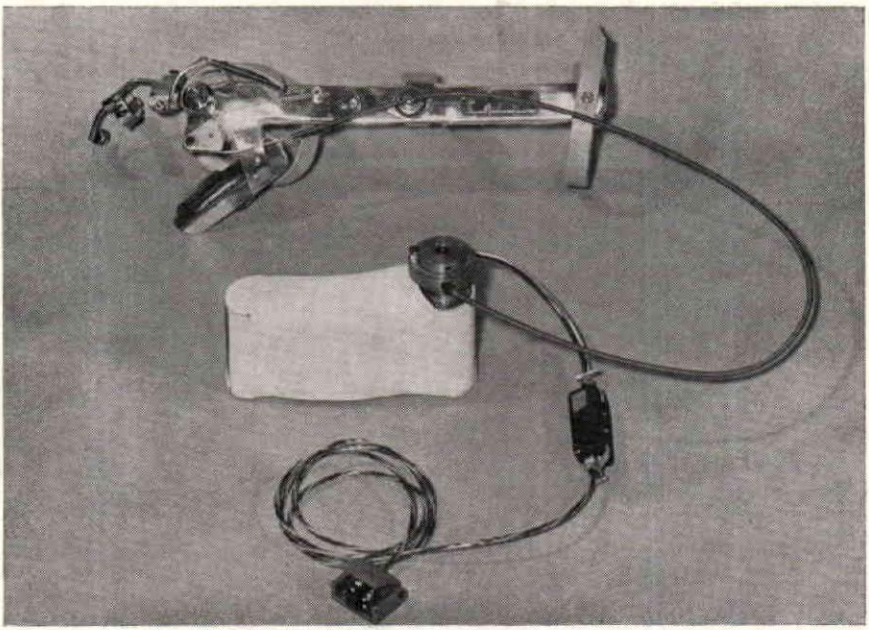
The World Veterans Federation is an organization combining more than 160 associations of veterans and war victims in 50 countries. Dedicated to support of the principles of the United Nations Charter, the WVF carries out a program emphasizing economic development, including especially rehabilitation of the disabled, disarmament and the protection of human rights.

The Electric Hand Splint*

By A. KARCHAK, JR., J. R. ALLEN, V. L. NICKEL, R. SNELSON**

A new source of power has been successfully applied to the flexor hinge hand splint to provide the patient with functional prehension. The power supply can be any 12-volt direct current source. The activator is a miniature permanent magnet gearhead motor. Since the hand splint is driven by a standard prosthetic cable and housing, both the actuator and the energy storage are remote from the hand splint itself and can be placed at any convenient location. The control is a unidirectional three-position switch that can be activated by any extremity movement requiring a force of 2 ounces and a range of motion of 5/16 inch.

The battery should be carefully selected to provide the patient with the maximum capacity at the minimum cost. A patient in an electric wheel



Flexor hinge hand splint is cable driven, powered by a direct current motor and battery pack. The hand splint is controlled by a unidirectional switch that is connected to the motor-battery pack by an in-line plug which also serves as an off-on power switch for the entire unit.

* This investigation was supported, in part, by research grants RD-1461 from the Vocational Rehabilitation Administration, Department of Health, Education & Welfare and AM-07550 from the National Institutes of Health, Department of Health, Education and Welfare, Washington, D. C. 20201.

** A. Karchak, Jr. and J. R. Allen, Research Engineers, Orthotic Department; V. L. Nickel, M.D., Medical Director; R. Snelson, C.O., Chief Orthotist, Rancho Los Amigos Hospital.

chair would require no additional power source since the wheel chair batteries can provide adequate power for both mobility and the hand splint. Patients in standard wheel chairs can place a battery rack on the chair and purchase a standard 12-volt automobile battery and charger which are very economical. The ambulatory patient would require a rechargeable nickel cadmium battery with at least a 1.2 ampere hour capacity whose geometric shape and weight make it easy to carry. These batteries generally require special chargers since the charging rate can be critical.

The chief advantage to the electrical power source is its availability and storage efficiency. Comparison of the electrically driven splint with a carbon dioxide power splint of equal weight showed that the electrical splint would produce approximately ten times as many grasping operations as the compressed gas splint before recharging of the power source was necessary.

An additional advantage of the electric splint is its superior reliability. Approximately thirty of these splints have been fitted on both out patients and permanent hospital patients and to date very little maintenance has been required. Replenishing a storage battery is as close as the nearest electrical outlet and can be accomplished in any home.

AOPA MEMBER EXHIBITS IN LEBANON

AMIN K. HAJJ at Middle East Surgical Conference in Beirut, Lebanon. Mr. Hajj appears here with a patient wearing a PTB prosthesis, at the exhibit at which Mr. Hajj was invited to display prosthetic and orthotic developments. The display was sponsored by the Lebanon Chapter of the American College of Surgeons. Mr. Hajj, who heads the prosthetic and orthotic department of the American Hospital in Beirut, reported that a number of surgeons were much interested in the prosthetic developments for A/K and B/K amputees.

A Plastic Tenodesis Splint*

Preliminary Evaluation of a Functional Brace for a Paralyzed Hand With Effective Wrist Extensors

By CLARK L. SABINE, O.T.R., * ROBERT G. ADDISON, M.D., † and HERBERT K. J. FISCHER, M.D.,§

Chicago, Illinois

A paralyzed hand with some power in the wrist can be made functional by stabilizing the proximal and distal interphalangeal joints of the index and long fingers and the joints of the thumb in the position of function so that the fingers, when flexed at their metacarpophalangeal joints, meet the abducted and partially opposed thumb. The fingers, of course, must be

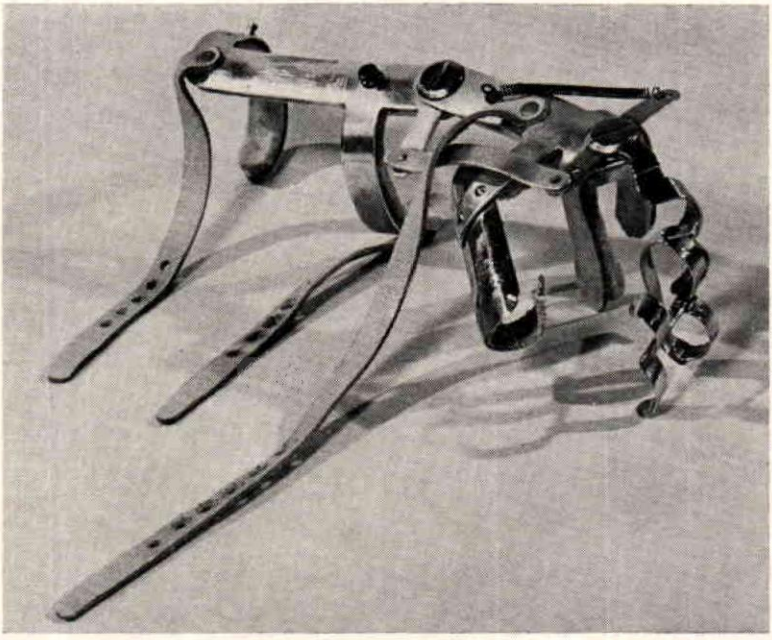


FIGURE 1

Flexor-hinge splint developed at Rancho Los Amigos, Downey, California.

All illustrations courtesy of Mr. Edwin Bonk, Medical Photographer, Rehabilitation Institute of Chicago, 401 East Ohio St., Chicago 60611.

* Richmond Professional Institute, Richmond, Virginia.
† Northwestern University Medical School, Chicago, Illinois.
§ Rehabilitation Institute of Chicago, Chicago, Illinois.

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made to flex toward the thumb by some connecting device or tendon that extends from the fingers past the mobile wrist joint to some anchor point on the forearm.

In the conventional metal tenodesis brace, the flexor-hinge splint, the fingers are pulled toward the thumb by a connecting lever arm, which is attached to steel finger rings and extends past the wrist to be attached to the side of the forearm brace (Fig. 1). There are four joints in this type of device. When the patient extends his wrist, a three-jaw-chuck type of finger flexion occurs.[2] This brace must be custom-fitted by an experienced orthotist, since the fit of the finger rings is critical. For patients who have anesthetic hands, as in quadriplegia, the pressure of these rings can cause pressure sores when the patients attempt to wear the device for extended periods.

The weight of the splint, although only about four ounces, may tire the marginally functional wrist extensors of some quadriplegic patients and this, together with the resistance offered by the joints in the splint, may prevent movement. The splint is also difficult for patients to apply and, in our experience, its appearance is difficult for some patients to accept.

TABLE I

Patient's Reaction to Characteristics of the Splint

Characteristics	Satisfied (No. of Patients)	Indifferent or No Answer (No. of Patients)	Dissatisfied (No. of Patients)
Weight	25	5	0
Pinch or three-jaw-chuck grasp	24	5	1
Ease of application	23	5	2
Appearance	22	7	1
Fit	21	5	4
Washability	21	5	4
Size of finger opening	18	5	7

TABLE II

Results of Pinch-Meter Test on Seven Patients

Case No.	Muscle Grade	Three-Jaw Pinch without Splint (Ounces)	Three-Jaw Pinch with Splint (Ounces)	Gain (Ounces)
1	Fair plus	7	17	10
2	Fair plus	13	24	11
3	Fair plus	10	23	13
4	Good minus	5	22	17
5	Good minus	11	32	21
6	Good plus	8	128	120
7	Good plus	14	112	98

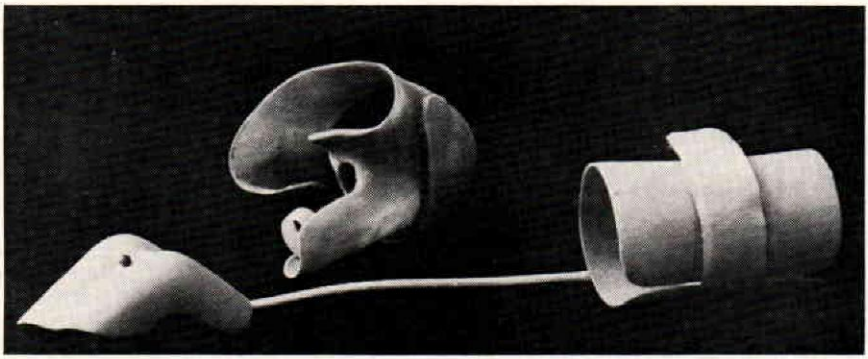

FIGURE 2

The R.I.C. plastic tenodesis splint showing the finger shell, thumb post, and wrist cuff.

FIGURE 3

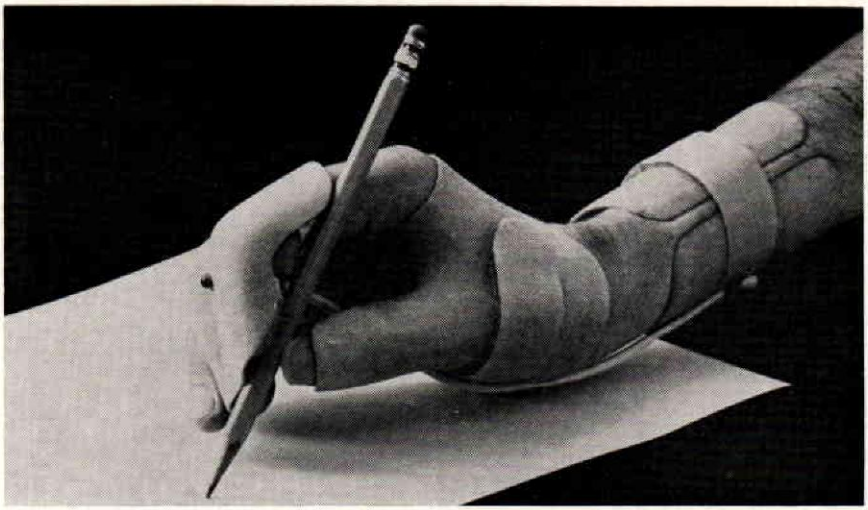

FIGURE 4

Figs. 3 and 4: Writing and holding a glass with the R.I.C. plastic tenodesis splint.

Five years ago, a splint was developed in the Orthotics Research Laboratory of the Rehabilitation Institute of Chicago through the combined efforts of the rehabilitation team. This device is now known as the R.I.C. plastic tenodesis splint.[1] The purpose of this report is to present a preliminary evaluation of this device, based on thirty patients with post-traumatic quadriplegia fitted in the Upper Extremity Disability Clinic at the Rehabilitation Institute of Chicago.

The device provides a three-jaw-chuck type of grasp, using the tenodesis principle in a simplified manner. All mechanical joints are eliminated and the patient's own joints are used (Fig. 2). The splint consists of three laminated plastic parts: (1) the finger shell, which stabilizes the middle and distal phalangeal joints of the index and long fingers; (2) the thumb post, which holds the thumb in abduction and opposition so that the pulps of the thumb and the index and long fingers meet as the fingers flex; and (3) the wrist cuff, which is the anchor point above the mobile wrist joint. The tendon connection is a round nylon lacer, three-sixteenths of an inch, which fastens distally to the volar surface of the finger shell between the fingers and just distal to the interphalangeal joints. Proximally the lacer is secured above the wrist joint on the volar surface of the wrist cuff. The thumb post and forearm cuff are kept closed by Velcro straps and can be adjusted by the patient. All parts of the splint are formed over a cast of the patient's hand and forearm so that a critical fit is ensured. The splint may be constructed by a prosthetist or any person familiar with standard lamination techniques. Its total weight is approximately one and one-half ounces, compared with the four-ounce weight of the flexor-hinge splint.*

In the Upper Extremity Disability Clinic at the Rehabilitation Institute of Chicago, during a four-year period, thirty patients with post-traumatic quadriplegia characterized by paralysis of the hands and wrist extensors with fair plus strength or better were fitted with the R.I.C. plastic tenodesis splint. The following results were obtained:

Of the thirty patients fitted, twenty-six continued to wear the splint after discharge from the hospital. These twenty-six used the splint for writing (Fig. 3), eating or drinking (Fig. 4), table games, typing, shaving, applying makeup, and smoking. The splint was also used for cooking, brushing teeth, combing hair, and washing the face.

The patient's reaction to various characteristics of the splint is listed in Table I.

When wearing the brace, pinch was improved to the extent that all thirty patients could grasp heavier objects with the brace than without it.

Of the four patients who did not continue to wear the splint, two rejected it for psychological reasons and two had reconstructive hand surgery.

* The device is kept from sliding down for several reasons: (1) The finger shell does not slide because the fingers are held in the shell by elastic straps; (2) the 45-degree angle of the shell at the proximal interphalangeal joints tends to lock the fingers firmly in place; (3) the harder the patient extends his wrist, the more the interphalangeal joints are pressed, by pressure of the object grasped, against the distal wall of the shell; (4) the thumb post is quite stable and, if well molded to the contour of the thumb, will not move; and (5) the wrist cuff is kept from sliding distally by being certain during fabrication that it is molded carefully behind the ulnar styloid process and by tightening the Velcro closure so that a clamping action is provided. In patients who have a minimum ulnar styloid process and much fatty tissue in the wrist and forearm (rare in our experience), a longer wrist cuff will provide the necessary clamping action to provide a stable attachment point for the nylon tendon cord. Lining the cuff with Silastic RTV 502 during fabrication will also reduce sliding tendencies, although this is not necessary in the large majority of cases.

Seven patients selected at random from the group were tested with a pinch meter with and without the splint; the results are listed in Table II.

In a few patients a particularly effective tenodesis developed spontaneously after several weeks of wearing the splint. Without the splint these patients could then grasp very light objects between the thumb and the index and long fingers by extending the wrist. This spontaneous tenodesis effect was observed even in patients who had shown no improvement over a long period of time prior to using the splint.

Ten patients were fitted bilaterally, but five used the splint on the dominant hand only. The other five used both splints, but only for specific activities.

All but one of the twenty-six patients using the splint were able to apply and remove it independently. The splints were worn for as much as twelve hours a day to as little as once or twice a month.

When hand surgery is contemplated, functional bracing with the R.I.C. plastic tenodesis splint develops maximum strength in the functioning muscle groups and prevents contracture of the web space of the thumb and contractures or deformities of the index and long fingers. Preoperative use of the splint also helps the patient to learn the functional pattern for three-jaw-chuck prehension; hence, little training is needed after operation.

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FIFTIETH ANNIVERSARY FOR P. W. HANICKE FIRM

Fifty years ago P. W. Hanicke came to Kansas City by special invitation from a patient who was being treated in Philadelphia by Dr. Frank D. Dickson. Dr. Dickson also settled in Kansas City. Mr. Hanicke was a pioneer in custom-built orthopedic appliances, whose trademark of quality and efficiency still prevails.

In 1921 Mr. Hanicke brought his nephew, Erich Hanicke, to Kansas City. Erich Hanicke had served his apprenticeship in Dresden, Germany, where P. W. Hanicke also had been trained. Werner Hanicke joined the firm in 1924. Erich's wife, Betty, is also an important member of the firm and is one of seven women Certified Orthotists in the United States. Both Erich and Betty Hanicke have contributed outstanding service to the Association, as well as to their patients and associates in the medical profession.

ERICH HANICKE, C.P.O.

Temporary Prostheses

By WILLIAM A. TOSBERG, C.P.O.

Technical Director, Prosthetics Services, Institute of Physical Medicine and Rehabilitation, New York University Medical Center, New York City

EDITOR'S NOTE: *The following article was presented at the Meeting of Region II, AOPA, in New York City, May 14, 1965.*

WILLIAM A. TOSBERG, C.P.O.

There have been substantial changes in the amputee rehabilitation program during the last twenty years. Some of these changes are the result of prosthetics research and educational programs sponsored by the United States Government, but to a great extent they are brought about by the type of patients presented in amputee clinics today. Twenty-five years ago the majority of amputees were in the younger age groups, with the amputation being the result of trauma, either from industrial or vehicular accidents. Amputations today, however, are performed to an ever greater degree to overcome the consequences of impaired circulation.

What is considered a standard prosthesis today is not necessarily indicated for this group of amputees, because prescription requirements vary considerably from patient to patient. Following long hospitalization, the patient may be debilitated. The stump may be edematous or painful. Motivation may be impaired. It is therefore essential that the physician has the choice of prescription. All former criteria which determined the type of limb indicated are no longer valid for this type of patient. If a standard prosthesis is prescribed for such a patient, he may never be able to utilize its full potentials.

For this reason it is quite often necessary to provide a temporary prosthesis which may serve as a diagnostic tool in order to establish the feasibility of providing a permanent limb. Although such a temporary prosthesis need not have all the features of a permanent limb, it must be anatomically and biomechanically correct, which means that a socket has to be formed in a manner to properly accommodate all tissues of the stump. Weight must be distributed over pressure-tolerant areas, and all sensitive areas must be carefully avoided. Good alignment is essential. Alignment could be defined as the proper relationship of the component parts of the prosthesis to the body.

Any other type of prosthesis will not only be useless as a diagnostic tool but will probably do damage not only to the patient's stump but will also be detrimental to the patient's motivation and ability to attempt ambulation training.

Many so-called pylons as seen today consist of nothing but a negative plaster of Paris cast to which either part of a crutch or part of a brace is attached. If the negative cast is correctly formed such a pylon may be used to induce stump shrinkage by tissue compression. It might also be indicated where the procurement of a prosthesis would be delayed but, for medical reasons, it is essential to have the patient assume a standing position. Most prefabricated pylons are contra-indicated because stump conditions and alignment vary from patient to patient and can rarely be accommodated for in any pre-manufactured device.

Temporary prostheses have to be constructed to the individual patient's needs. A correctly modified socket is the basis for any temporary prosthesis for a below-knee amputation. If a stump is sufficiently atrophied to permit predominant weight-bearing over the patellar tendon and the slope of the tibial condyles, it may not be necessary to provide side joints and a thigh lacer. A supracondylar strap will, in many cases, be sufficient to suspend the prosthesis.

If a below-knee stump cannot tolerate weight-bearing shortly after surgery, a temporary leg might still be indicated, even if only to preserve the function of the remaining leg. In those cases, most of the weight is transferred to the thigh. The leg might even have to be provided with combination ischial gluteal bearing. Such a construction would benefit from a simple knee-locking device.

It has become more and more the practice to ambulate patients very early. Although the stump volume should be reduced by means of an elastic bandage or a stump shrinking sock, it has been found that weight-bearing on a prosthesis as soon after amputation as possible will offer many advantages. It will not only improve the stump tissues, but will also be helpful on an emotional basis.

It is, of course, necessary to adjust for changes in stump volume almost weekly in order to maintain a good fit. In the early stages of shrinkage it may be sufficient to add liners or paddings in the areas of shrinkage. This, however, is only a temporary procedure. The construction of a complete new socket often becomes necessary after a short time. If the socket has been constructed from relatively inexpensive materials, the cost of replacements can be kept to a minimum.

It is seldom indicated to provide a temporary prosthesis with a crutch tip such as is seen sometimes. A crutch tip will rarely allow the patient to transfer his weight properly since the area of contact with the floor is very small. A desirable heel-toe motion of the ankle cannot be achieved without

the provision of a standard foot. This might be of the SACH type or the single axis foot.

The greatest need for temporary prostheses, however, exists for patients with above-knee amputations. To obtain the greatest value from a temporary prosthesis it is again necessary to observe all biomechanical requirements. The primary pressure concentration should be below the tuberosity of the ischium. Lateral stability needs to be provided by diffused pressure at the lateral distal aspect of the stump. Pressure of the proximal rim of the socket in the peroneal area must be avoided; also over the adductor tendon.

In order to secure proper seating over the posterior rim of the socket, counter pressure needs to be provided by a fairly high anterior socket wall. These are the same requirements that apply to a permanent socket.

In order to control position of the distal part of the prosthesis it is always helpful to furnish a knee-shank-foot mechanism which allows at least limited alignment changes. These changes need not necessarily result from any original errors in the construction. They may be due to improvements in prosthetic control by the patient as a result of gait training.

In order to achieve the highest degree of function from the prosthesis it is essential that an above-knee amputee walks with a narrow base. The extension stop would have to be adjusted in such a manner that the knee flexes with only minimal effort by the amputee. These achievements are generally the result of rather concentrated ambulation training. In the beginning phase of training the patient will tend to abduct his stump and he will also require a maximum of knee stability. If, therefore, a permanent prosthesis is initially prescribed it is difficult to adjust such a prosthesis to benefit from improved function resulting from training.

The weight of the temporary prosthesis should be similar to the weight of the finished artificial leg.

Swing-phase control, which results from correctly adjusted extension assist and friction devices, should ideally be part of a temporary prosthesis.

Adjustable limbs which meet these requirements are presently commercially available. They also contain a locking mechanism which might be utilized in the beginning phase of ambulation or on a permanent basis where lack of muscular control contra-indicates a free-swinging knee.

From this short description, it would appear that financial advantages from a prescription of a temporary prosthesis are limited. If one considers, however, that the lower part of such a limb can be utilized repeatedly, and that the socket is made from nonpermanent material which can be replaced fairly rapidly when required by stump changes, one would feel that a temporary leg can be of considerable advantage and should be used more frequently.

Another factor which might be overlooked is the relatively easy adjustability of the temporary prosthesis compared to a permanent limb. It must be stressed, however, that a temporary limb is not just any "cheap" device which can be applied under all conditions by "just anybody" but requires the same skill and training, (possibly to an even higher degree), as is needed in the construction of a permanent prosthesis.

Stump Bandaging of the Lower-Extremity Amputee*

By BELLA J. MAY, B.A.

In many rehabilitation centers and hospitals throughout the country, the physical therapist must wait for the amputee to be referred for treatment. Often the surgeon will not refer the elderly patient or the one suffering with a vascular impairment until the sutures are removed and healing is complete.

Early referral of the young, traumatic amputee for proper preprosthetic treatment is well accepted. Such treatment has three main purposes:

1. To prepare the stump for a prosthesis.
2. To maintain general physical condition.
3. To aid the patient's psychological adjustment to his disability.

These aims are achieved through a program of exercise, proper body positioning to prevent contractures, crutch training, and stump bandaging. In the young amputee this training is begun as early as the patient's general physical condition will allow. The amputee is encouraged to assume proper positioning in bed immediately after surgery; walking, exercise, and stump bandaging are usually started a few days after surgery. Early preprosthetic treatment and prosthetic fitting lead to better adjustment and rehabilitation of the amputee. The application of this rationale of treatment toward the geriatric amputee, particularly one suffering from some form of vascular disease, however, leads to much controversy.

Delayed referral may mean a lapse of several weeks or perhaps months before the patient is started on the proper program to prepare him for an artificial limb. Too often this delay results in contractures, muscle weakness, and edematous, flabby stumps that require many extra weeks of prosthetic treatment.

According to many surgeons, early walking and exercise are contraindicated for the geriatric amputee because such exercise may lead to increased edema, sloughing of tissue, and slowing of the healing process as a result of additional stress placed on the already compromised circulation of the stump. Proper bandaging is necessary to control this edema, but, since this requires considerable skill and frequent reapplication, it is impractical.[1] Too often the patient is unable to bandage himself in the early days after surgery and qualified personnel are not available to rebandage the stump as often as necessary. Improper stump bandaging can cause irreversible damage. On the other hand, proper stump bandaging, resulting in shrinking and shaping the stump, is a major key to successful prosthetic fitting.

While working with over 200 geriatric and vascular amputees in the Rehabilitation Department of Jackson Memorial Hospital, the advantages of early preprosthetic treatment became evident.

The author is Supervisor of Rehabilitation, Jackson Memorial Hospital, Miami, Fla.

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THE BELOW-KNEE AMPUTEE

When below-knee amputee patients were started on the usual routine of exercise, walking, and stump bandaging, several patients showed increased drainage, sloughing of tissue, and delayed healing within a few days of the treatment. In all cases the trouble was traced to improper bandaging. Great care always was taken during the treatment period to bandage the stump properly and carefully and to teach the patient the proper techniques. In the interval between treatment sessions, however, the patient often attempted to reapply the bandage, usually replacing it improperly and causing damage to the stump. Occasionally, the patient would leave the bandage untouched for twenty-four hours, causing wrinkles and binding which were equally damaging.

Method

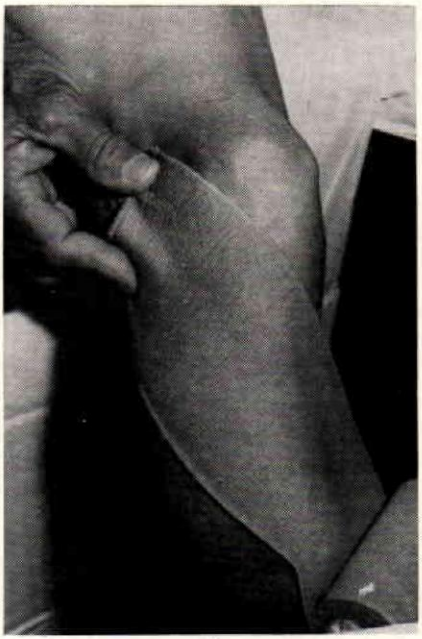
It is necessary for an amputee, or some member of the family, to learn how to bandage the stump as early as possible. Therefore, simple, easy-to-learn techniques were devised that reduce the hazards of early preprosthetic treatment and meet the particular requirements of the patella tendon-bearing prothesis.

Under the old method, the amputee was taught to make two or more recurrent turns and anchor them with one or more circular turns around the proximal portion of the stump before going into the figure-of-eight pattern. Many patients would continue to make circular turns after the recurrents, carrying the bandage from the proximal end of the stump to the distal end, or they would make several tight circular turns around the proximal end of the stump to anchor the recurrents before making a few figure-of-eight turns to catch the corners. These circular turns would choke the stump, cutting off or radically slowing circulation. This obviously led to edema, sloughing, poor shrinkage, and bulbous stumps.

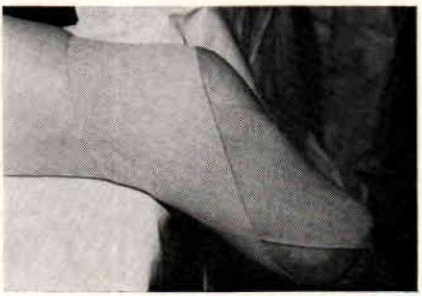
In the new method of bandaging, the patient is taught only angular turns in a figure-of-eight pattern. The only circular turn is an anchor above the knee and the patient is repeatedly advised that this is merely to help keep the bandage on and must not be tight.

The Pattern of Wrapping the Stump.—The bandage is started just above the lateral tibial condyle; it is brought diagonally across the anterior aspect of the stump to the medial distal corner (Fig. 1A). It is then brought back diagonally across the stump posteriorly, swung across the beginning of the bandage and anchored with a circular turn above the patella (Fig. 1B). After a single anchoring turn above the knee, the bandage is brought back down around the medial tibial condyle (Fig. 1C), and across the posterior aspect of the stump to the lateral distal corner as seen in Figure 1D. Figure 1E shows how the figure-of-eight pattern is continued for the rest of the bandage, taking care to cross the crest of the tibia in an angular manner.

If semicircular turns are necessary to bring the bandage in proper position, they must always be on the posterior aspect of the stump in order to compress soft tissue without hampering circulation. As the figure of eights are made, they should partially overlap so that the whole stump is covered, with the greatest amount of pressure on the distal end. In an extremely short stump, it may be necessary to bring the bandage above the knee several times to avoid circular turns below the patella. The figure-of-eight pattern is from the proximal to distal and proximal again, starting at the condyles and covering the stump to include both condyles as well as the patella



1A



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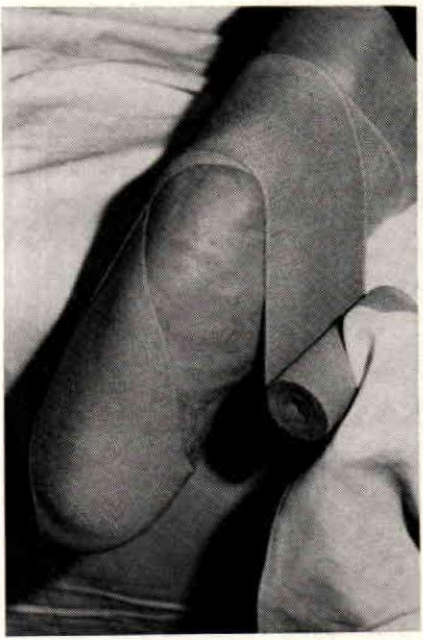

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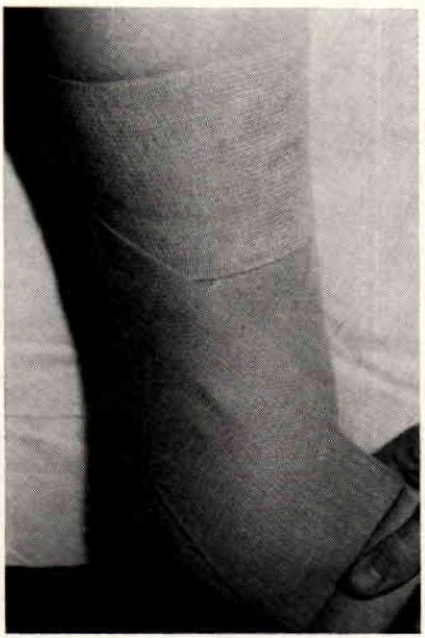
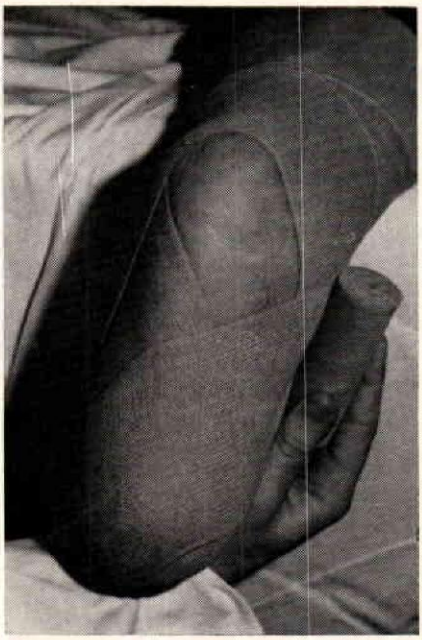


1D

tendon. Only the patella, itself, is left free so as not to interfere with knee motion and allow free circulation in the popliteal area (Fig. 1F).

The Second Bandage.—In the average length stump, two 4-inch elastic bandages are necessary to properly shrink and shape the stump. Sometimes in the early postoperative days only one bandage is used if the stump can adequately be covered. In long or especially large stumps, three band-

FIGURE 1—Steps in bandaging the below-knee amputee are shown. (A) The first bandage is started immediately above the lateral tibial condyle, brought diagonally across the anterior portion of the stump, swung around, and (B) brought diagonally across the posterior aspect of the stump and anchored above the knee. (C) The bandage then is brought around the medial tibial condyle, (D) across the posterior aspect of the stump, (E) continued across the



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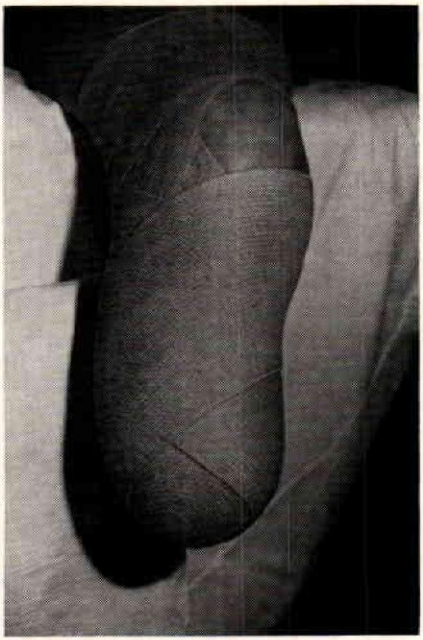

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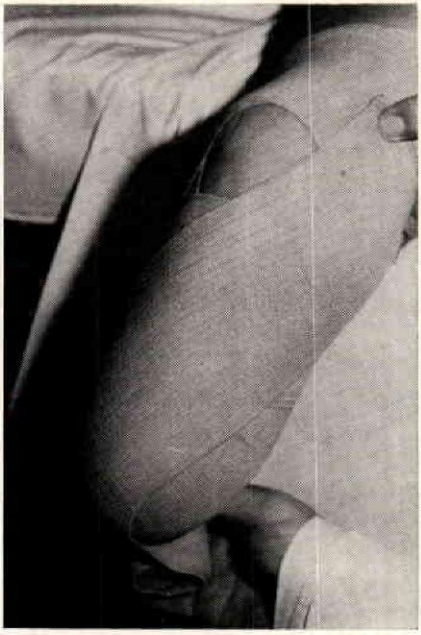
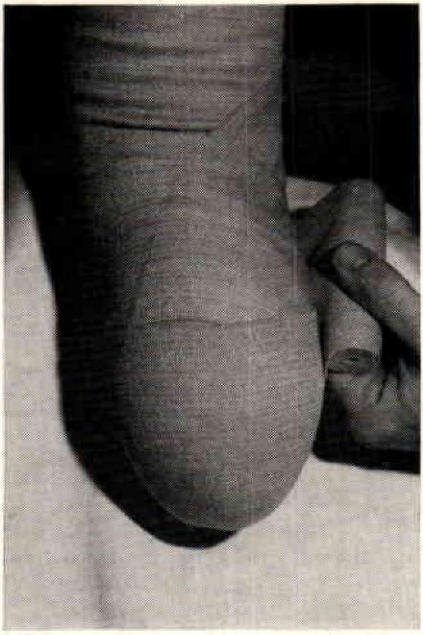


1G



1H

crest of the tibia at an angle, (F) with the patella left uncovered. The second bandage (G) is started in a similar manner, above the medial tibial condyle and brought diagonally across the anterior aspect of the stump to the lateral distal corner. (H) Extra pressure is brought on excess tissue by a semicircular turn posteriorly.

ages are necessary for proper shrinkage. With practice, is has been found that a 4-inch bandage is the best width for all adult below-knee stumps. While it might increase shrinkage to use more than two bandages for the average stump, it has been found that most patients cannot tolerate this.

The second bandage is wrapped like the first with the following exceptions. It is started above the medial tibial condyle and brought across the anterior aspect of the stump to the lateral distal corner (Fig. IG). It will be noted that with the first bandage, the line of stress is from proximal lateral to distal medial, pulling the medial distal tissue posteriorly and the lateral distal tissue anteriorly. In order to create uniform pressure for proper shaping of the stump, the second bandage is started medially, thus pulling the lateral distal tissue posteriorly and the medial distal tissue anteriorly.

In a long stump, 6 inches or more, it is not necessary to anchor the second bandage above the knee, but it can be anchored with a semicircular turn across the popliteal area. With both bandages an effort is made to bring the angular turns across each other rather than in the same direction in order for the weave of the bandage, itself, to assist in exerting a uniform pressure on the stump.

Bandage Pressure

In the early postoperative days, the bandage is wrapped very loosely with moderate pressure distally and minimal pressure proximally. One or more sterile gauze pads are placed between the incision and the bandage to absorb any drainage. If necessary the elastic bandage can be rewrapped without disturbing this sterile dressing. After drainage has ceased, a single gauze pad is maintained between the sutures and the bandage so as to prevent pulling on the sutures. This pad is discontinued as soon as the sutures are removed unless the stump has not yet healed primarily. Occasionally, primary healing is slowed by the vascular condition of the stump and there may be an open area along the incision after the sutures are removed. In these cases, sterile dry dressings are continued under the bandaging until the incision is completely healed. Contrary to opinion, bandaging even in these cases does not compromise healing if done properly. Actually, bandaging and walking aid healing even with difficult cases, as they are deterrents to dependent edema and venous stasis.

As healing takes place and the sutures are removed, the pressure of the bandage is increased to the tolerance of the patient. Care must be taken to provide the amputee with good elastic bandages and to insure an adequate supply of these bandages throughout the preprosthetic period. The amputee is taught to wash his bandages frequently and replace them as soon as they start to lose their elasticity. As the pressure is increased, the amputee must be warned against pulling the bandage to the fullest extent of its elasticity as this causes wrinkles, undue and uneven pressure on the stump.

Often in the last days of preprosthetic training, the amputee will still have some excess tissue at the distal posterior end of the stump. In these cases extra pressure can be brought to bear in these areas by bringing the bandage from one corner directly to the other over the posterior aspect of the stump before bringing it proximally (Fig. 1H). Several of these posterior semicircular turns can be incorporated in the bandaging but a regular figure-of-eight turn should separate them. When the amputee is taught this change in the method of bandaging, it must be carefully explained that these turns should only be used at the distal end of the stump.

THE ABOVE-KNEE AMPUTEE

In the above-knee amputee, an improperly bandaged stump may create such problems as adductor rolls which result in the need for many prosthetic adjustments as the stump shrinks within its socket. Many geriatric amputees have difficulty adjusting to a prosthesis; these added problems may make successful wearing impossible.

> Proper bandaging will reduce the excessive adipose tissue and will lessen the tendency of development of an adductor roll. In addition, bandaging supports the soft tissues in the early healing phase following amputation. It is during this phase that the efficiency of the vascular system is greatly impaired causing an accumulation of fluid in the stump. Ambulation with the stump in a dependent position causes further accumulation of fluid. Therefore, external support is essential to minimize and reduce edema.[2]

Shrinking the above-knee stump is much more difficult than the below-knee stump. Best shrinkage and shaping of the stump is achieved through the use of pylons. The Hosmer temporary walking leg with a plaster pylon not only shrinks and shapes the stump faster and more efficiently than bandaging, but allows the amputee to begin prosthetic walking much earlier. The friction knee of the temporary walking leg prevents improper gait habits which occur frequently with the peg pylon. It has a lock, if greater stability is needed for the bilateral amputee or the particularly unsteady patient.

Bandaging should be started in the first postoperative week, but more efficient techniques of above-knee stump bandaging have been needed. Under the old method, bandaging started with several anterior-posterior recurrents which were anchored by several proximal circular turns. Following this several figure-of-eight turns were anchored by a hip spica.

In bandaging the elderly above-knee amputee, two main problems recur fairly constantly. One is inadequate pressure on the medial proximal tissue which causes adductor roll and the other is constant slipping of the bandage. The problem is to bring enough pressure proximally without bandage roll and without cutting off circulation to the distal end of the stump. Most elderly patients, especially women, have an excess amount of soft, flabby, tissue around the proximal area of the stump, and the bandage tends to roll back leaving this area exposed. While the method of bandaging described here does not pretend to solve these problems, it improves upon the old method.

Method

For the average length stump two 6-inch and one 4-inch elastic bandages are used. In a large or obese patient, three 6-inch and one 4-inch bandages are used. With a short stump one 6-inch and two 4-inch bandages are more effective.

The patient is placed on the unaffected side with the stump in an extended position. Bandaging can be done in a standing position but most elderly patients do not have the necessary balance. The 6-inch bandages are used first; the 4-inch is always the last bandage. The bandage is started in the groin and is brought diagonally over the lateral distal corner of the stump. It is swung around the posterior distal end of the stump, over the medial corner, and brought back diagonally over the anterior stump to the iliac crest (Fig. 2A). It is then brought around the hips in a spica. It is important that the bandage be started from the medial portion of the stump

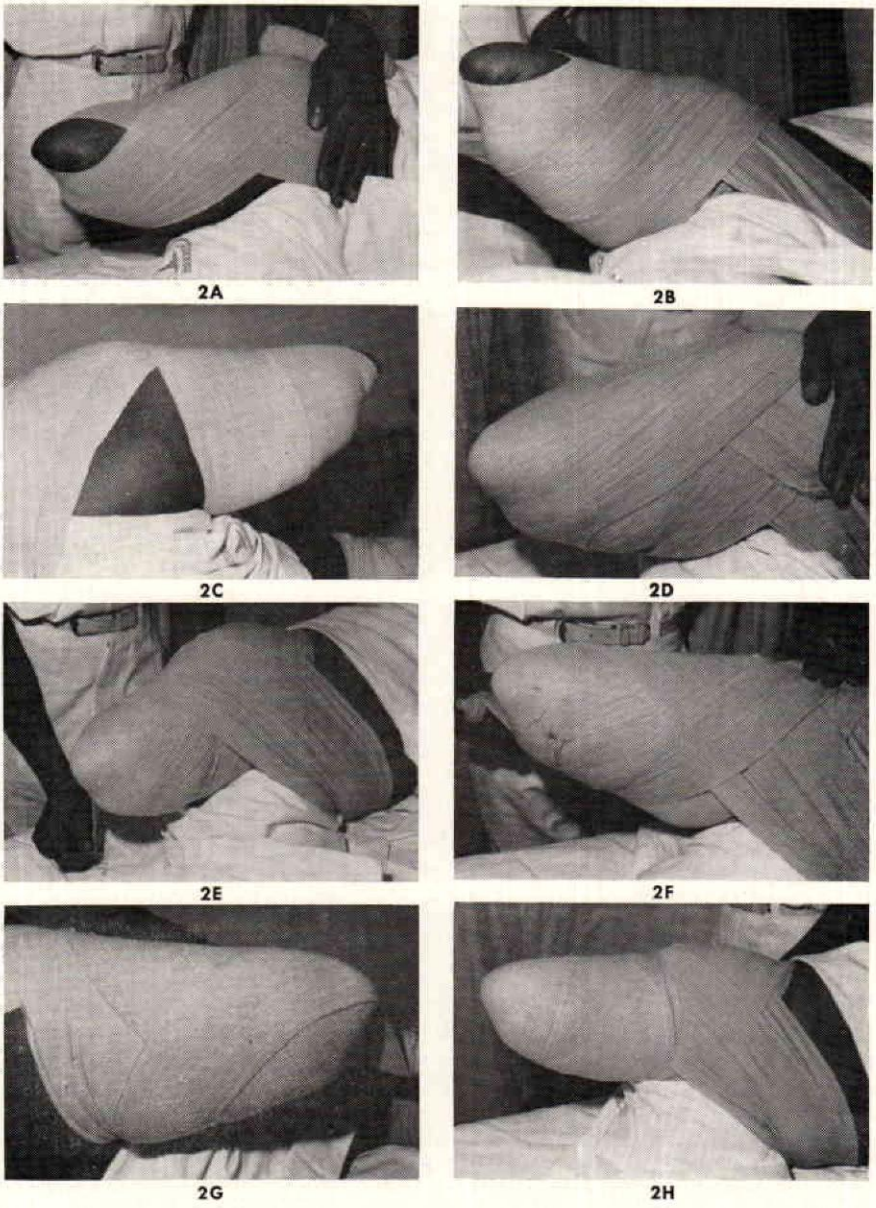


FIGURE 2—Steps in bandaging the above-knee stump are as follows: (A) The first 6-inch bandage is started in the groin and brought diagonally over the lateral distal corner of the stump, swung around the posterior distal end of the stump, over the medial corner, and brought back diagonally over the anterior stump to the iliac crest, (B) swung around the proximal portion of the stump from lateral to medial and around the hips again, (C) covering the stump except for a small part of the lateral distal corner; (D) the second 6-inch bandage is brought around the stump to cover the lateral distal corner in an oblique fashion, (E) across the stump on its second turn as far laterally and distally as possible to help keep the stump in adduction; (F) the 4-inch bandage is started at the lateral proximal portion of the stump, brought over the medial distal corner around the posterior stump to catch the lateral distal corner; (G and H) the figure-of-eight pattern is continued to create the greatest pressure on the distal end.

so the spica will pull the stump into extension. Care must be taken so that the stump is not abducted at the same time.

As the bandage comes back around the hips to the stump, it is swung around the proximal portion of the stump high in the groin area from lateral to medial and around the hips once more (Fig. 2B). At this point, one 6-inch bandage will have been used and all of the stump except for a small part of the lateral distal corner will be covered (Fig. 2C). If the bandages are not sewn together, the second 6-inch bandage is also started in the groin area but slightly more laterally so it can be brought around to cover the lateral distal corner in an obliquqe fashion (Fig. 2D). This second bandage is brought around in a hip spica, then around the proximal portion of the stump to another spica in a similar manner as the first bandage. As the second bandage is brought around from its second turn around the hips, it should be brought across the stump as far laterally and distally as possible to help keep the stump in adduction (Fig. 2E). In the average stump, both 6-inch bandages will have been used at this point. If the stump cannot be adequately covered with the two 6-inch bandages, a third one should be applied in a similar manner as the first two. While more of the first two bandages are used to cover the proximal aspect of the stump, care should be taken that the bandage does not cut off circulation. It has been found that bringing the bandage directly from the proximal medial area of the stump into the spica helps keep the bandage over that area and prevents rolling to a reasonable degree.

The 4-inch bandage is used to exert the greatest amount of pressure at the distal end of the stump, to prevent "dog ears," and to achieve proper shaping for prosthetic fit. In all but the very short stumps, it is not necessary to wrap this bandage in a spica. Thus it is started at the lateral proximal portion of the stump, brought diagonally across the anterior stump, over the medial distal corner and around the posterior stump to catch the lateral distal corner (Fig. 2F). Starting this bandage laterally brings the weave of the bandage across that of the previous bandage, thus exerting more even pressure on the stump. The bandage is continued in the usual figure-of-eight pattern bringing most of the pressure to the distal end of the stump (Fig. 2G).

The finished bandage should provide for a well-shaped, conical stump with the greatest amount of pressure at the distal end but with the proximal soft tissue well held within the bandage. The repeated hip spicas will assist in keeping the bandage in place for a longer period of time (Fig. 2H). It is better to anchor the bandage with safety pins, as clips tend to loosen too easily. Regardless how well the bandage stays on, the patient must be advised to rebandage four to five time a day to maintain proper pressure and prevent skin problems from wrinkles.

Pressure

In the early postoperative stages, the bandage should be applied fairly loosely so as not to compromise healing. While the sutures are still in, sterile gauze pads should be placed under the bandage for the same reason given earlier. Improper bandaging or bandages which are not changed frequently can create a hazard to healing.

Whenever possible, members of the family should be taught how to bandage the stump as most amputees cannot manage this properly by themselves. In teaching the family, the purposes as well as the methods must be taught and members of the family should be given as many practice sessions

externally rotated, thus placing the volar surface of the hand and forearm in the desired casting position. Polyethylene sheets taped in place were used to cover the surgical dressings and all areas of the palm and forearm that were to be cast.

Plaster of paris splints of a suitable length to cover the volar surface of the hand and forearm were prepared.

These were immersed in water and applied in the normal manner, care being taken to insure that the wrist was held in a neutral position until the plaster had dried. (Fig. 1)

The patient was then turned on his side with the arm abducted, the elbow flexed at 90° and internally rotated, so that the extensor surface of the forearm could be cast. The casting procedure was the same as before.

Indelible pencil was used to establish approximate trim lines and to index the two halves of the cast. The cast was removed from the patient and joined together with plaster of paris bandage. A plaster positive was poured and prepared for lamination.

Lamination Procedure:

The cast was coated heavily with High-Glo parting lacquer and a layup of one layer of ½ oz. dacron felt and four layers of nylon stockinette were used. A P.V.A. bag was then pulled over the layup. A blend of 90% rigid and 10% flexible Polyester resin was used. Vacuum was used to insure accurate conformation to the cast, since a rigid laminate was desired. (Fig. 2)

Following trim-out, velcro straps (see Fig. 3) were attached and the orthosis was applied to the patient. Future plans are to line the orthosis with a material such as tricot-backed vinyl foam as the need for surgical dressings diminishes.

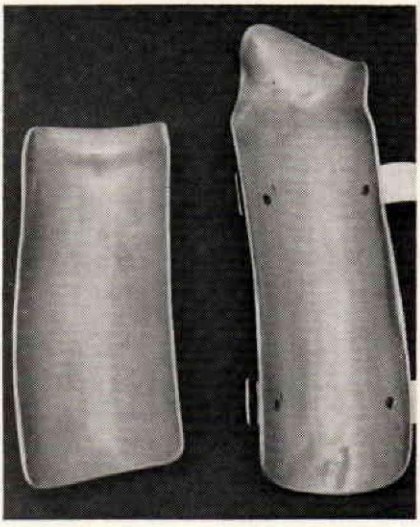


FIGURE 2—Interior view, showing trim lines.

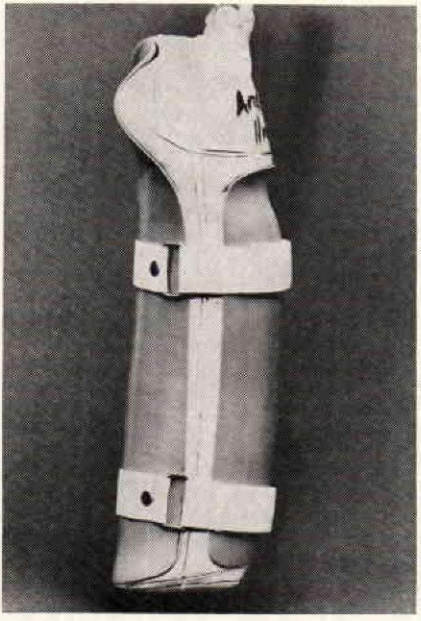
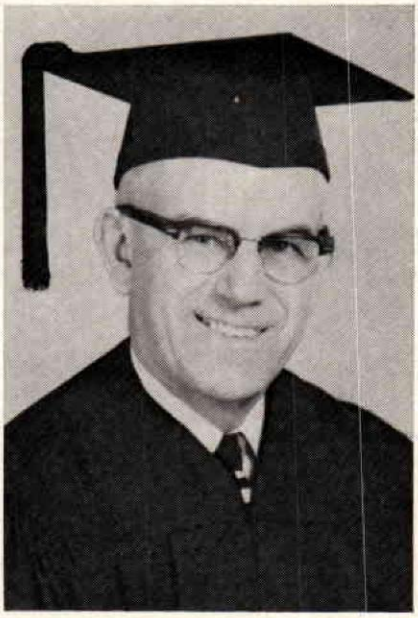


FIGURE 3—Lateral view, showing Velcro closure.

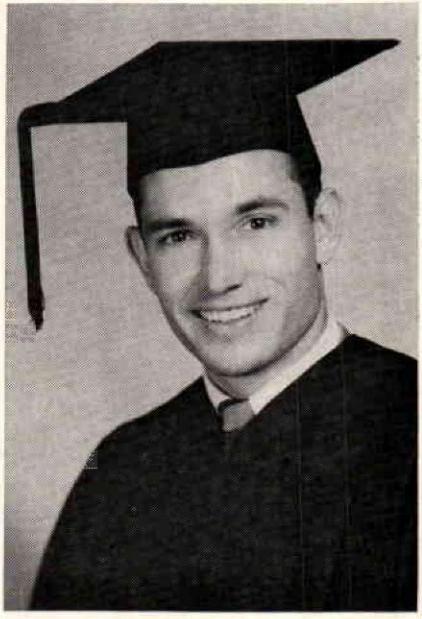
New York University Awards First Bachelor of Science Degrees in Prosthetics and Orthotics

On June 9, 1965, the Commencement service at New York University included the conferring of two Bachelor of Science degrees in Prosthetics and Orthotics—the first such degrees to be awarded in the history of the University and in the history of these fields. On this day, Messrs. Hugh Panton and Ivan Dillee became the first two of the twenty-five undergraduates presently matriculated to complete the four-year course of study. With their newly awarded degrees, these men are pioneers of a new approach and attitude toward their profession.

Mr. Panton is a 22-year-old Floridian, unmarried, and the second oldest child in a family of six sons and two daughters. His parents, Ann and George, who live in Miami, will find his degree award a premiere for their family; the first opportunity for them to celebrate a University Commencement. Mr. Panton enjoys water sports of all sorts, but especially competing in speed boat races and water skiing. When he was eleven, an accident made him a unilateral below-the-knee amputee. He believes his experience as an amputee, plus the encouragement of his own limbfitter, led to his early and abiding interest in becoming a prosthetist. His counselor at the Florida State Vocational Rehabilitation Agency first informed him of New York University's undergraduate program and assisted him in transferring during his sophomore year to New York University.



IVAN DILLEE



HUGH PANTON

In discussing his college training, Mr. Panton expressed the following opinions:

"My experiences working in a prosthetic facility during the last two summers proved to me that my university studies have really prepared me enough so I feel confident that when I graduate, I can do the job that I have been taught to do at college. The University teaches you the straight path from point X, as the starting point of a prosthetic problem, to point Y, as the prosthetic goal. But every field is influenced by practical factors, which might make going from point X to point Y in a circle, rather than in a straight line, the most desirable way for that problem. University training makes it easy to adjust to the refinements of practical work, because it gives the student a thorough theoretical background, together with enough practical experience, so he can quickly apply and adapt them both to work situations.

"I would recommend the New York University curriculum to any high school student who has average mechanical, manual and scholastic skills and who also has the ambition to work at a profession, rather than at a routine, unskilled, or semi-skilled job. Prosthetics and orthotics are professions offering useful, interesting work with a future of job security and financial opportunity.

"At present, though, so many people enter these fields only by accident or because of a very special interest, such as my own. High school students don't know enough about these fields and of the fine training, traineeships and job opportunities available to them. Prosthetists and orthotists have a duty to cooperate with educators in getting young people interested in their fields. In the long run, they'll reap the rewards."

Mr. Panton's clinical assignments while at the University have included the Veterans Administration Prosthetic Center in New York City and New York University's Prosthetic and Orthotic Research Studies at the School of Engineering and Science. He was also employed at Arthur Finnieston's Limb and Brace Shop in Miami, Florida, during the last two summers.

Being so close to graduation, he has had a number of employment offers and has accepted a position with J. E. Hanger, Inc., St. Louis. His present plan is to specialize in prosthetics and he will take graduate courses at the University when feasible.

Mr. Ivan A. Dillee, the other Degree recipient, is a unique graduate of this curriculum, because he helped develop it and has taught his fellow students in several of the specialized prosthetic courses.

Mr. Dillee was born 54 years ago in Independence, Missouri. He majored in Religious Education at Graceland College, a two-year college, in Lamoni, Iowa. Soon, he will celebrate his silver wedding anniversary with his wife, Florence, who is employed by the New York Times. His hobbies center about his summer home in East Hampton, Long Island, and include boating, identifying migratory birds, and setting up winter feeding stations for them. He is active in the National Reserve of the United States Army, and during World War II, worked at Bushnell Army General Hospital in Brigham City, Utah.

Mr. Dillee entered the field of prosthetics over twenty years ago, becoming a Certified Prosthetist in 1949. He has been associated with New York University since 1957, doing research and teaching in prosthetics. Outside the University, Mr. Dillee's professional activities have included considerable technical writing and service as: Lecturer for the Committee on Prosthetic and Orthotic Education of the National Research Council—National Academy of Sciences; Research Prosthetist with the United States Army's Prosthetic Rehabilitation Mission to India in 1963; Member and twice chairman of the

Prosthetist-Orthotist Faculty Sub-Committee of the University Council on Orthotic and Prosthetic Education.

Asked to evaluate his experience as both student and teacher, Mr. Dillee said:

"I have long been convinced that the prosthetist and orthotist of the future must work toward achieving a truly professional status. My studies in the New York University curriculum have reinforced profoundly my belief that *only* in the atmosphere of a university can the prosthetist and orthotist become a professional practitioner. As in the training of all other professional personnel, the prosthetist and orthotist require a background of academic as well as practical experience. In a college and university setting, a student has the opportunity to develop genuine ease and facility in his field, essential to a true professional competence. As an individual he can gain valid personal confidence, along with a broad, flexible, informed approach to theory and practice; the essence of a truly professional outlook.

"Our graduates will be immeasurably better prepared for employment in their fields than I was, when I first started in the '40s in Kansas City, Missouri. As with graduates of all college programs, our students will have varying levels of talent, but *all* of them will have a broad liberal arts background and, through their studies in the techniques and theoretical bases of prosthetic and orthotic practice, will have gained a firm competency in their professional fields. I am sure they can and will fit comfortably into various settings for the practice of their professions.

"My experience as a student gave me an opportunity to evaluate the entire plan of the University's new curriculum. The course of study was conceived in a logical sequence from the simple to the more complex, with each course designed to prove more demanding of students, as well as more rewarding to them. The hope was to challenge and expand their abilities appropriately in a reasonable development of skill. Practical experience has convinced me this approach was valid and has proven satisfactory.

"I was able, being a student myself, to judge more readily the students' needs, especially when trying to determine, realistically, the proper range and quantity of content for a specific course. Being older than most of them and, accordingly, further removed from former study habits, I was able to feel sure that, if I were capable of doing the work required in a particular course, they most assuredly would be able to do so, and probably with even greater ease than myself.

"As a student relatively experienced in prosthetics, I found considerable personal value in the expansion of my knowledge in other fields outside of my own specialty. My exposure to orthotic information was not only useful but fascinating because of both the newness of the material to me and the extent of over-lap with prosthetics. I learned that certain techniques carry over directly from one field to the other. The prosthetic principles of alignment, for example, apply directly to bracing alignment and the technology of quadrilateral socket design is similar to the top of a weight-bearing brace."

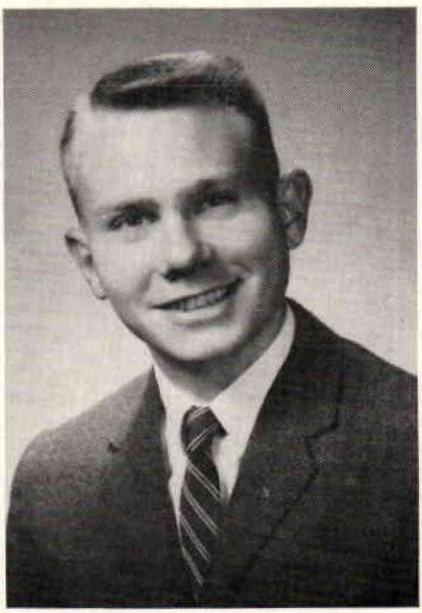
While celebrating the first graduates of the first college curriculum in prosthetics and orthotics, one must recognize the contributions of the faculty without whom there would be no graduates and no curriculum. The vision and inspiration for the entire program came in the first instance from Dr. Sidney Fishman who has been well known, for many years, as the director of the prosthetic and orthotic research and education programs at New York University. Dr. Fishman and his associates had been concerned about the difficulty of attracting bright, young men to careers in prosthetics and orthot-

ics and about the lack of organized training programs for such people. It was this concern that led to the formulation of the present curriculum in 1961.

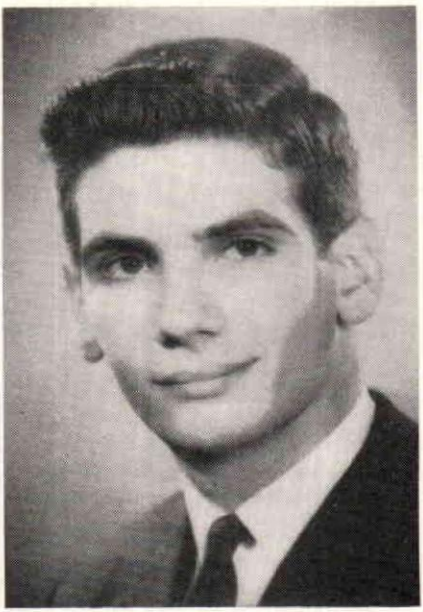
Under the supervision of Dr. Fishman and his associate, Mr. Norman Berger, syllabi were developed and courses taught in Prosthetic and Orthotic Shop Techniques by Mr. Herbert Kramer; in Below-knee, Above-knee, and Upper Extremity Prosthetics by Mr. Ivan Dillee; in Upper and Lower Extremity Orthotics by Mr. H. Richard Lehneis; in Spinal Orthotics by Mr. John Glancy; in Biomechanics by Mr. Warren Springer; in Mechanics by Mr. Elliot Dembner and in Properties of Materials by Mr. Howard Bluestein. The efforts of this devoted group made the Bachelor of Science program a reality and constitute a unique educational achievement.

The curriculum consists of 132 credits, of which 68 are devoted to the specialized courses in prosthetics and orthotics. The remaining 64 credits are designed to provide a broad educational background. The curriculum, which is offered through the School of Education, was developed in conjunction with the New York University Post-Graduate Medical School and the School of Engineering and Science, with the strong encouragement and support of the Vocational Rehabilitation Administration of the Department of Health, Education, and Welfare. The classroom and laboratory instruction is supplemented by clinical training affiliations with a number of certified limb and brace facilities throughout the country which have been arranged through the cooperation of the American Orthotic and Prosthetic Association.

As additional students receive their degrees in forthcoming years, the momentum towards achieving full professional status will be increased with benefits to both the present and future practitioners of prosthetics and orthotics.



CHARLES DANKMEYER



BEN PULIZZI

CONGRATULATIONS to these two sons of AOPA members who are now enrolled in New York University's four-year Prosthetics and Orthotics Program.

Prosthetics-Orthotics Education at UCLA

Highlights of the 1964-1965 academic year for the UCLA Prosthetics-Orthotics Program included the establishment of a new two-semester certificate program for prosthetists-orthotists, record enrollment in courses for physicians and therapists, and the move to new and larger quarters in the UCLA Rehabilitation Center.

Five students were enrolled in the two-semester course: David L. Porter, John L. Stonecipher, Carman Tablada and Jerry Vogt of the Southern California area, and Nelson Martinez from Hato Rey, Puerto Rico. During their two semesters in residence at UCLA, these students participated in the regularly scheduled courses in prosthetics and orthotics, attended eight hours of gross anatomy laboratory instruction, made fields trips to numerous manufacturers' facilities in the Southern California area, took part in various research studies, and handled problem cases in all areas of prosthetics and orthotics. In addition, each student prepared and presented one unit of instruction in prosthetics-orthotics.

The UCLA Certificate Program for Prosthetists and Orthotists includes two full semesters of college level instruction. The program contains eight hours per day of lectures and recitations, laboratory work and clinical practice.

This same two-semester certificate program is being offered again by the UCLA Prosthetics-Orthotics Program in the 1965-66 academic year. Six qualified students will be accepted with traineeship grants available from VRA to assist them. Selection of students is based on educational background and work experience. Preference is given to applicants with a baccalaureate degree and one year or more of shop and laboratory experience in prosthetics or orthotics. Applicants with only a baccalaureate degree are considered next, followed by those with the Associate of Arts degree and one year or more of shop and laboratory experience.

The tentative course schedule for prosthetists and orthotists for the 1965-66 academic year is as follows:

Above Knee Prosthetics——September 20 to October 15, 1965

Special Problems in
Above Knee Prosthetics——October 18 to 29, 1965

Below Knee Prosthetics——November 1 to 26, 1965

Special Problems in
Below Knee Prosthetics——November 29 to December 17, 1965

Functional Long Leg Brace——January 3 to 28, 1966

Special Problems in
Functional Long Leg Brace——January 31 to February 11, 1966

Hip Disarticulation & Symes——February 14 to March 11, 1966

Special Problems in
Hip Disarticulation & Symes——March 14 to April 1, 1966

Upper Extremities Prosthetics——April 11 to May 13, 1966

Special Problems in
Upper Extremities Prosthetics——May 16 to June 3, 1966

Functional Bracing of
Upper Extremities_____June 6 to 24, 1966

Child Amputee Prosthetics_____November 1 to 5, 1965

Child Amputee Prosthetics_____March 28 to April 1, 1966

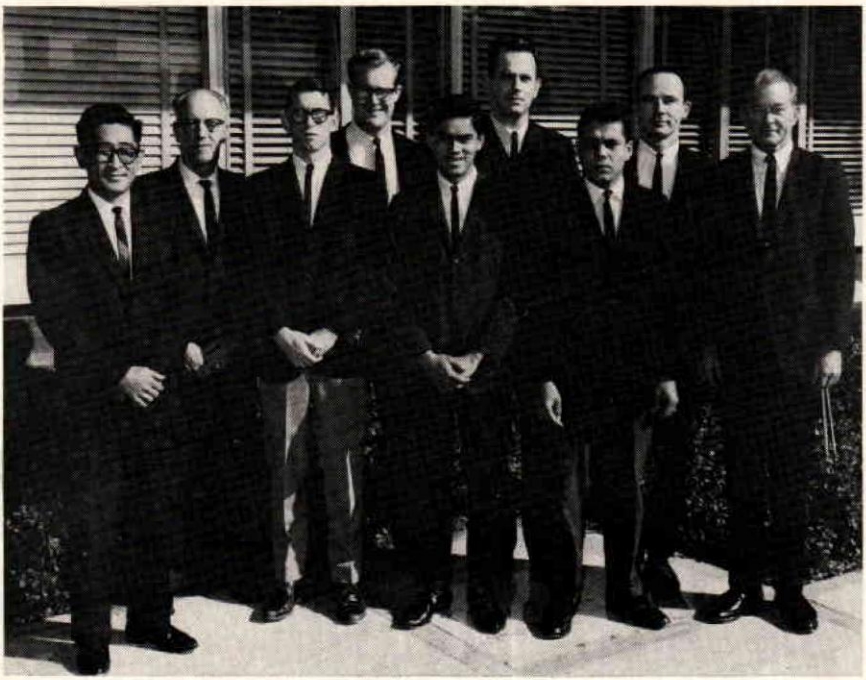
Applications for enrollment in the new two-week course at UCLA for physicians and therapists were filled early in the year, and a number of applicants had to be turned away. The course for physicians and therapists includes complete coverage of upper and lower extremity prosthetics, upper and lower extremity orthotics, spinal orthotics and special material on reconstructive surgery of the upper extremities.

The tentative course schedule for physicians and therapists for the forthcoming academic year is as follows:

Prosthetics & Orthotics for Physicians and Therapists—October 18 to 29, 1965; November 29 to December 10, 1965; January 31 to February 11, 1966; March 14 to March 25, 1966.

Child Amputee Prosthetics—November 1 to 5, 1965; March 28 to April 1, 1966.

Three one-week courses in prosthetic-orthotic rehabilitation for rehabilitation personnel will be presented on the following dates: September 13 to 17, 1965; April 18 to 22, 1966; May 16 to 20, 1966.



UCLA CERTIFICATE STUDENTS, 1964-5 CLASS

Graduating class, two-semester certificate students, at Prosthetics-Orthotics Education Program, School of Medicine, University of California, Los Angeles. Left to right: Wallace S. Sumida, UCLA; Fred J. Sanders, UCLA staff; David L. Porter, Sunset Beach, California; John L. Stonecipher, Alhambra, California; Carman Tablada, Playa Del Rey, California; Jerry D. Vogt, Anaheim, California; Nelson Martinez, Hato Rey, Puerto Rico; John J. Bray, Associate Director, UCLA Prosthetics-Orthotics Education Program; and Miles H. Anderson, Director, UCLA Prosthetics-Orthotics Education Program.

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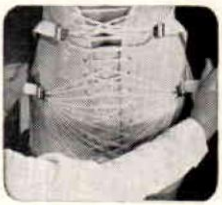

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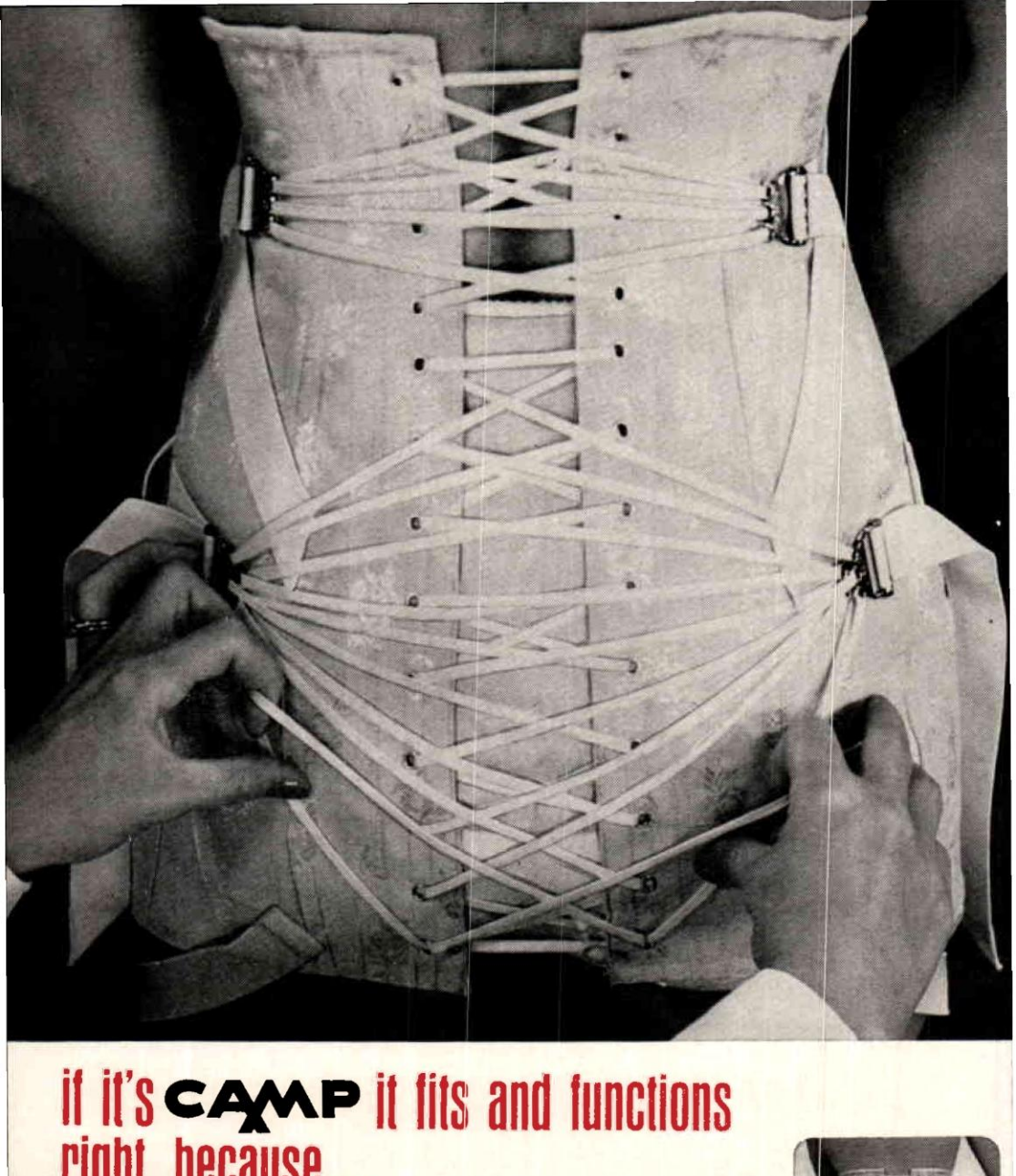

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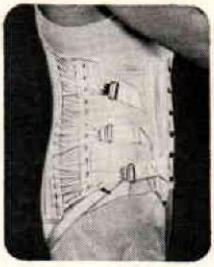

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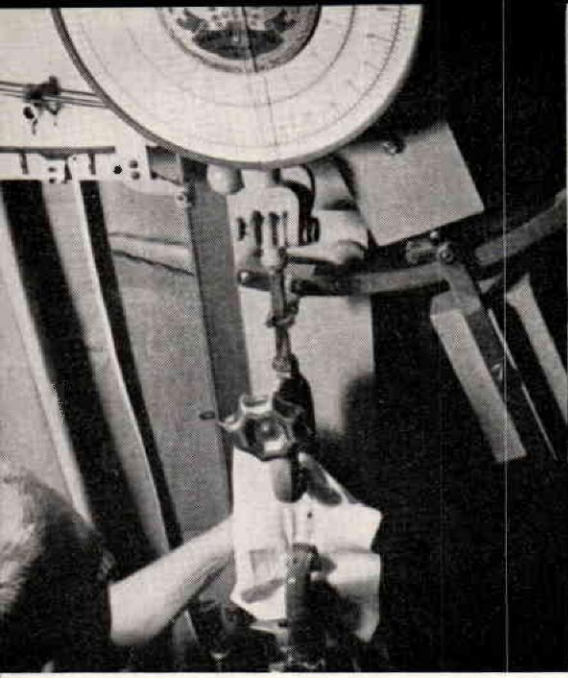

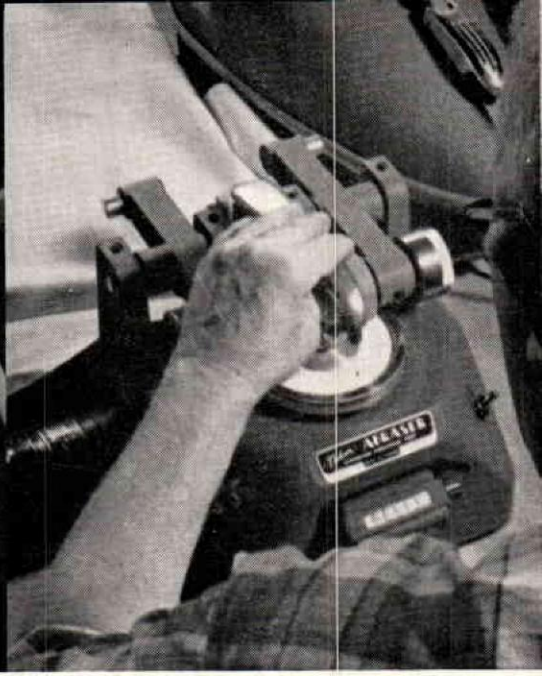

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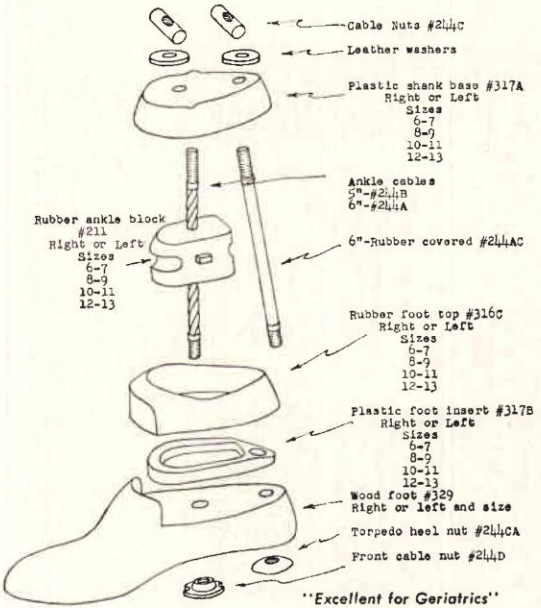

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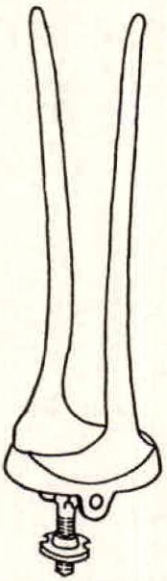
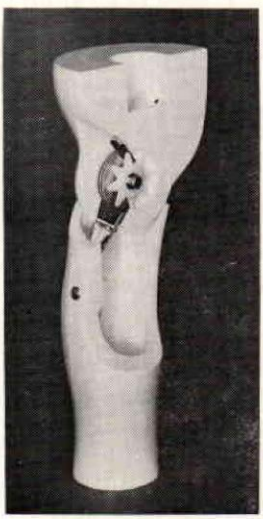


Symes Frame #270A with ankle joint, shaped to cast and measurements.



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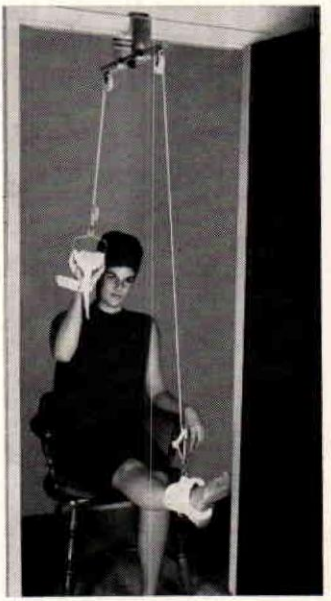

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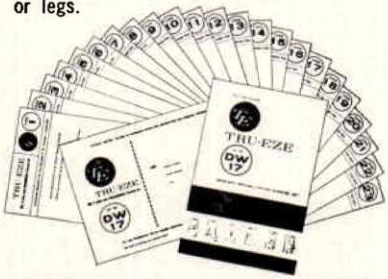

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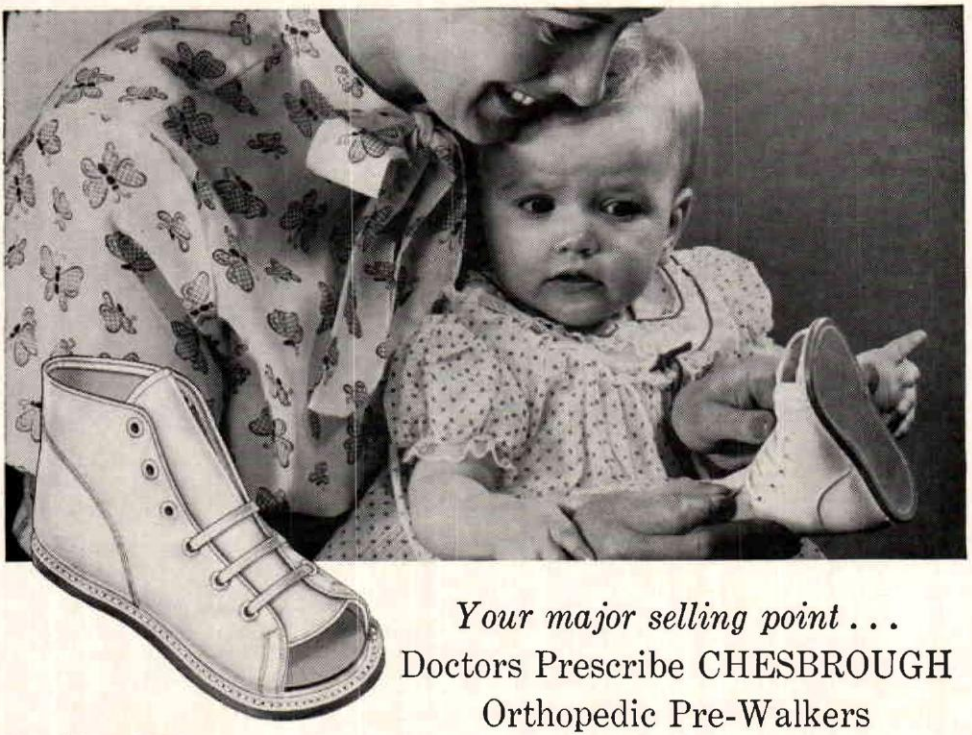

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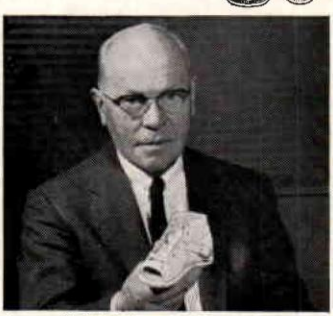

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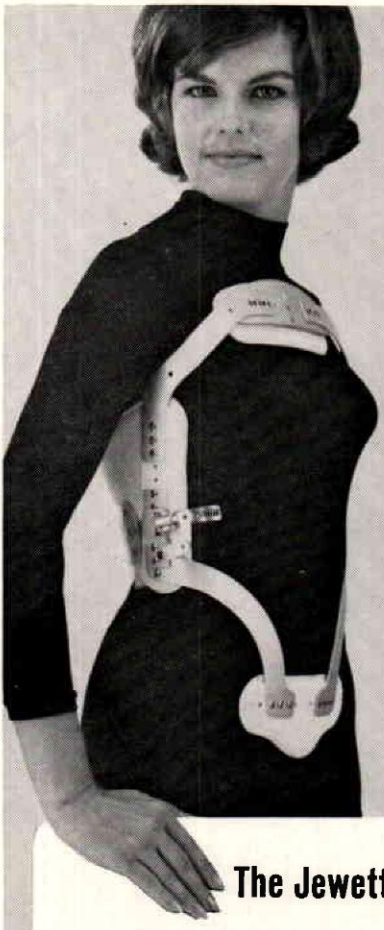

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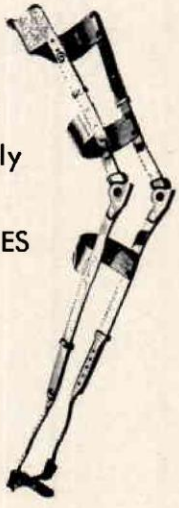

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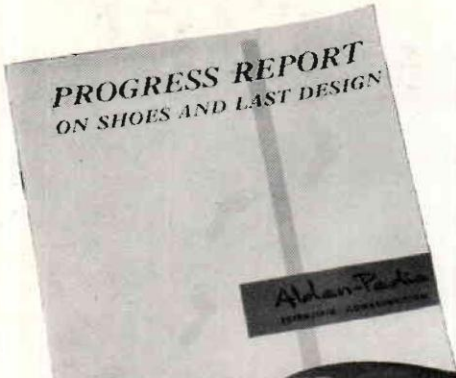

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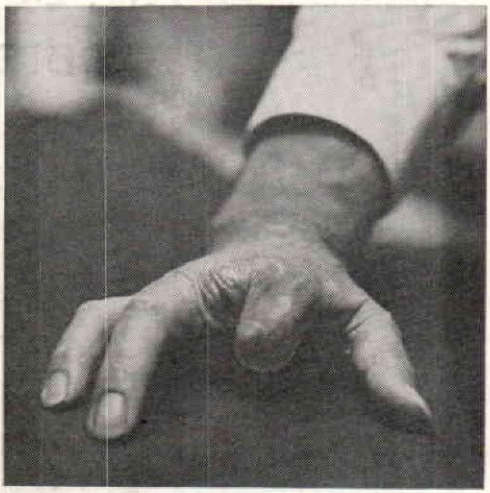

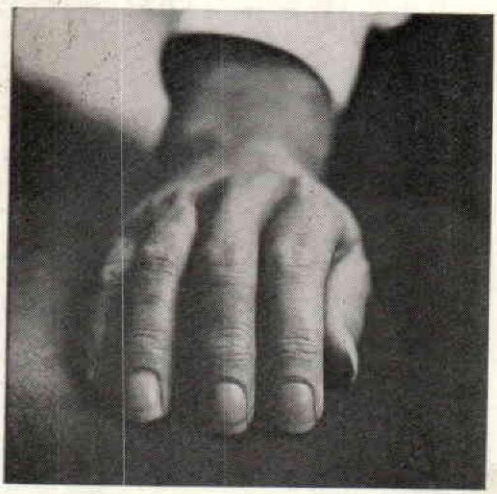

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