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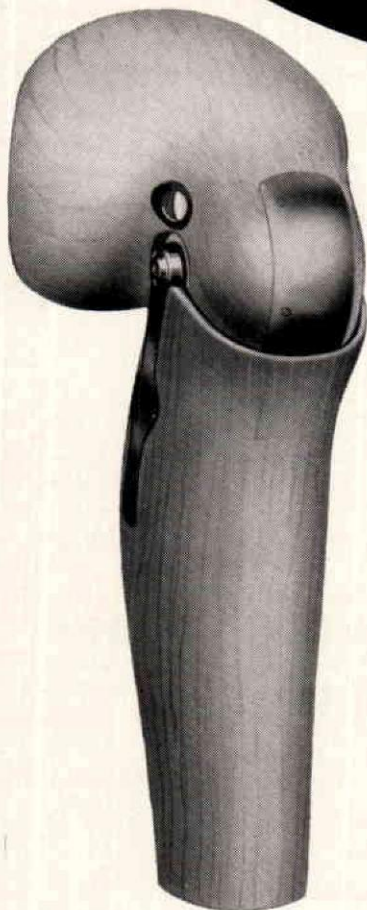
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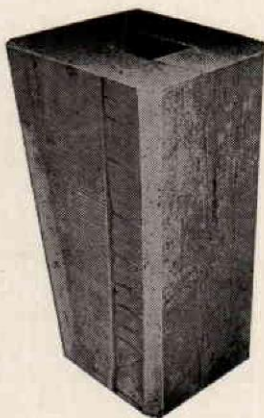
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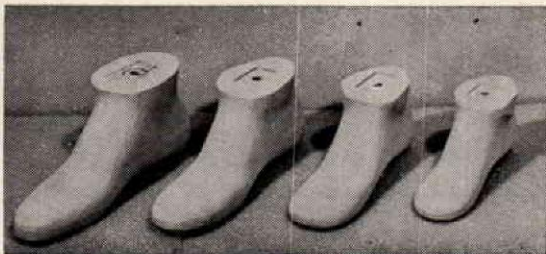


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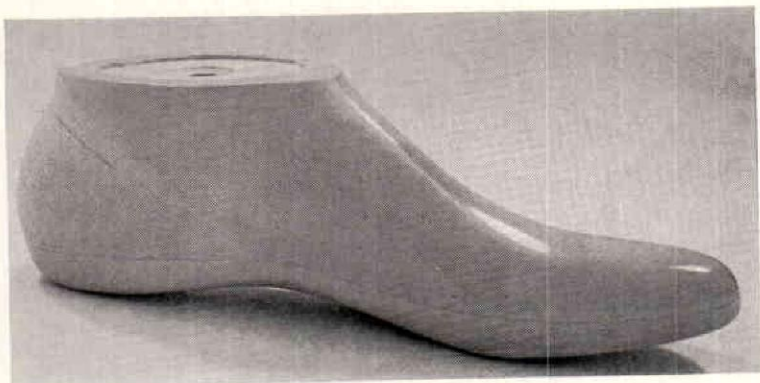
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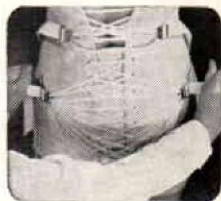
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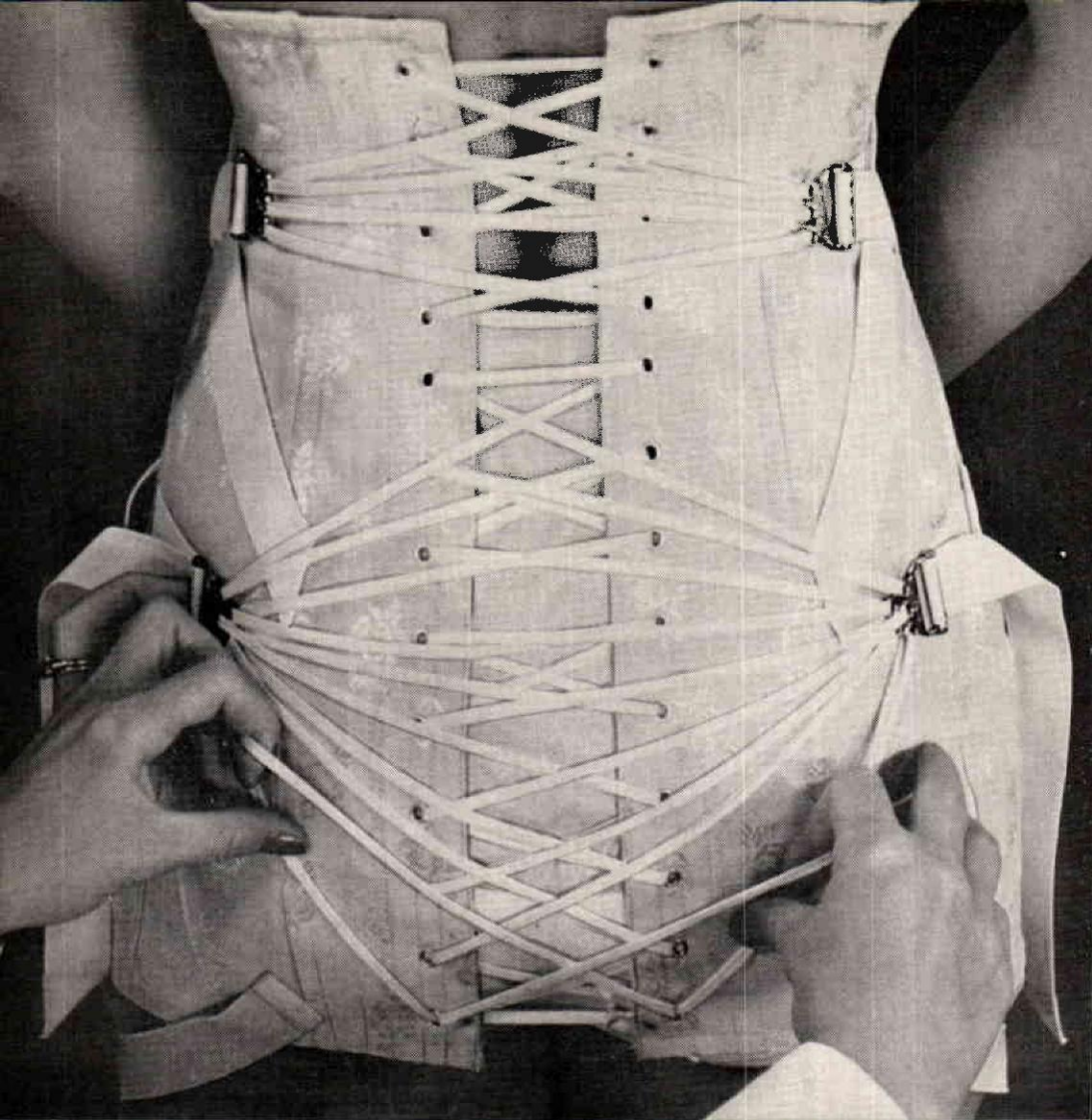
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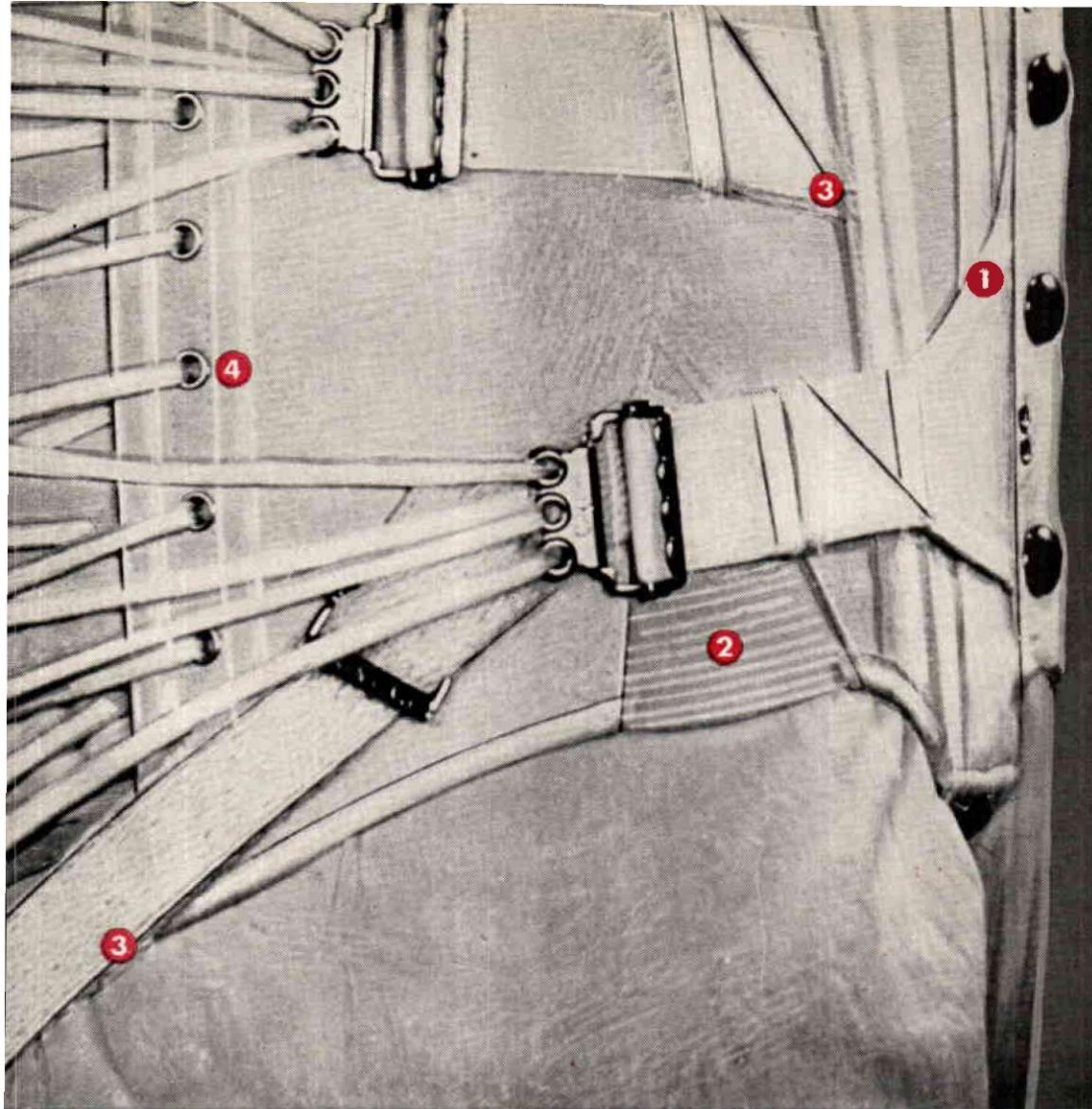
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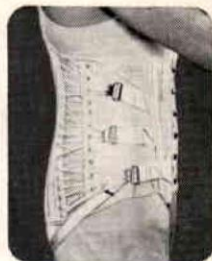
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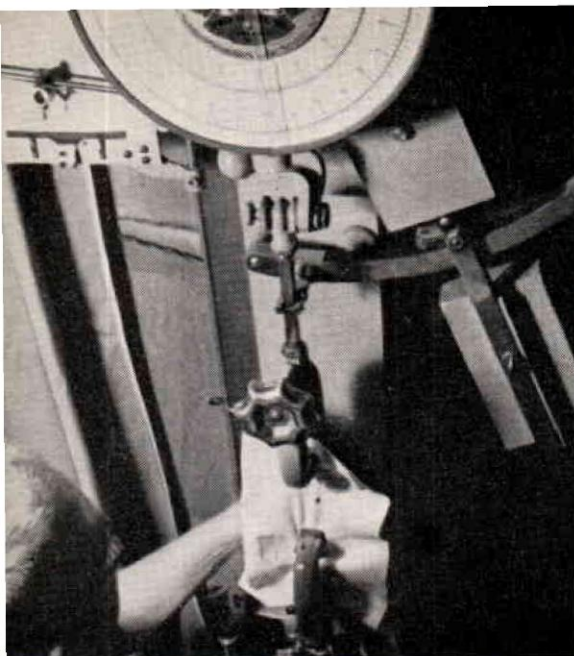
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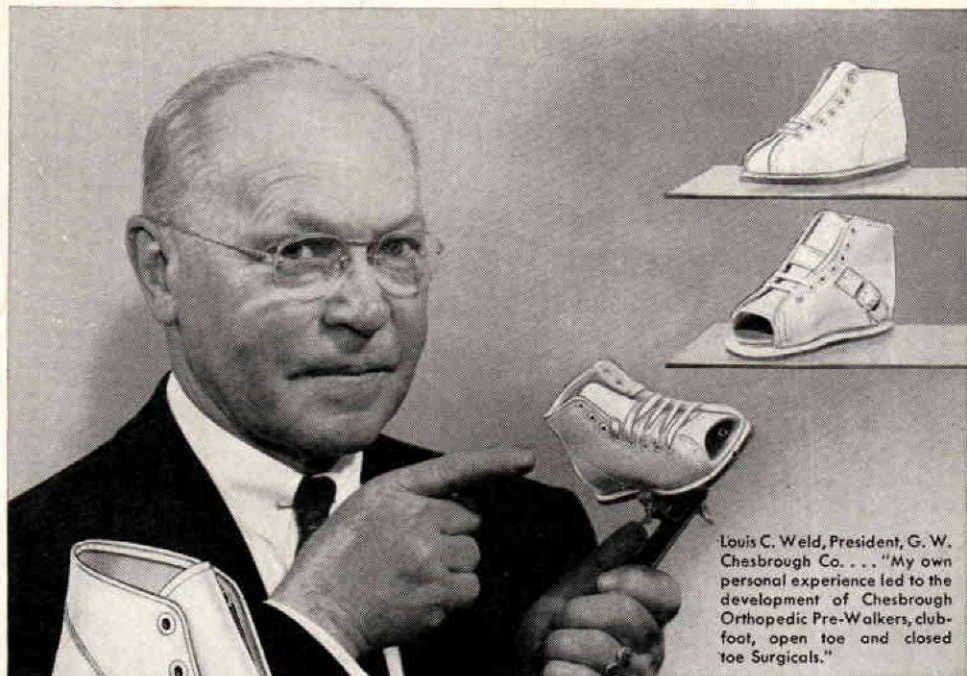
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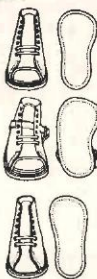


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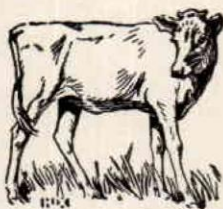
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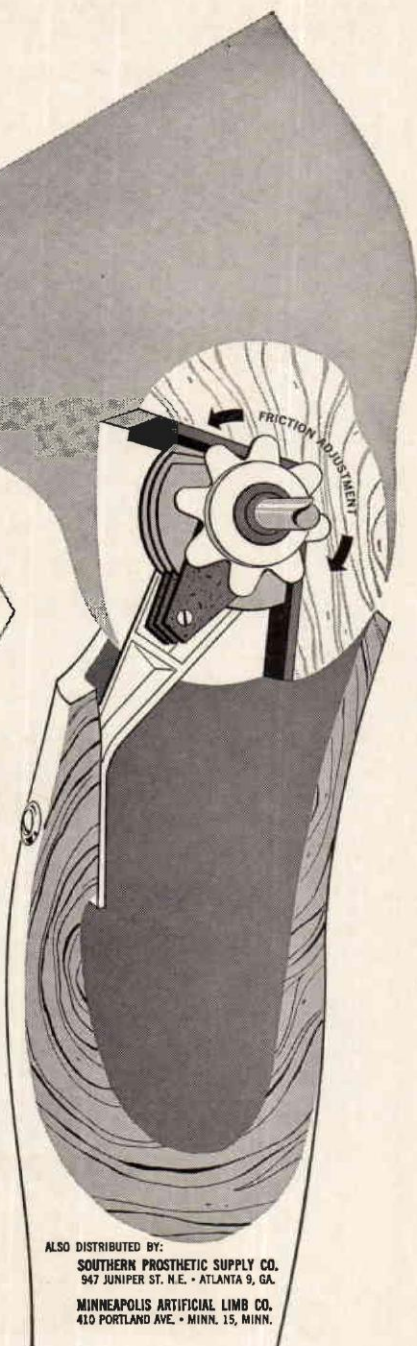
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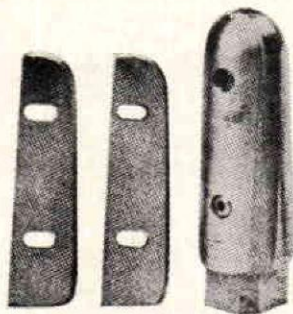
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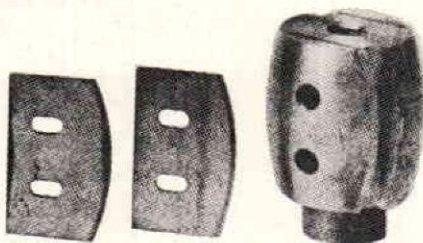
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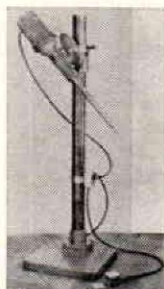


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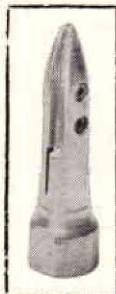


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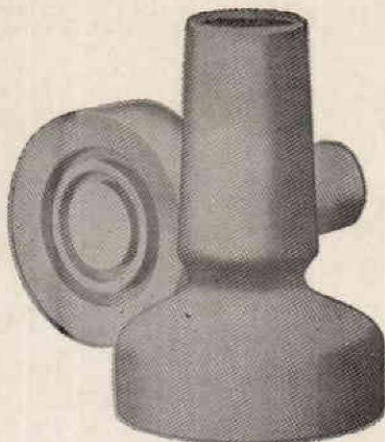


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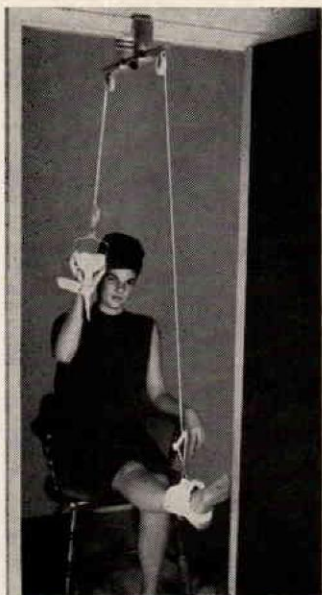
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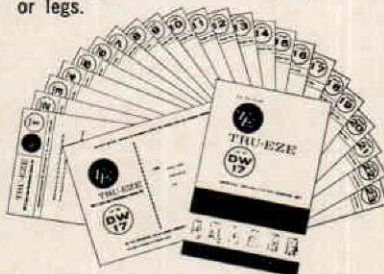
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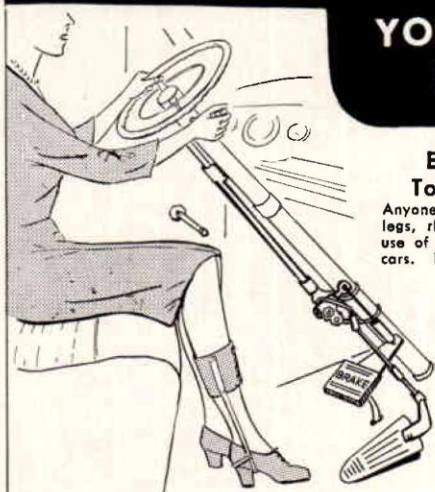
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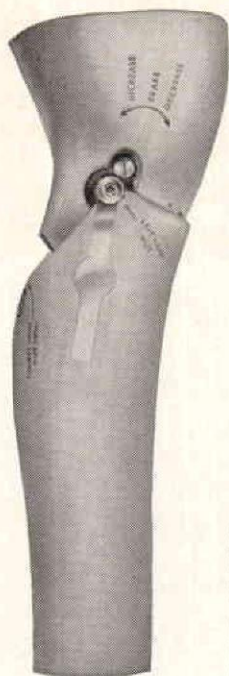
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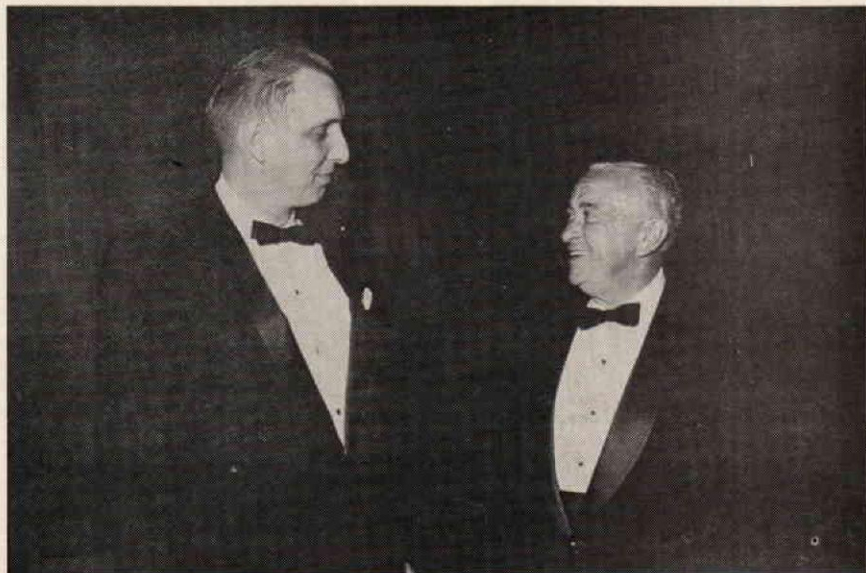
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AOPA and The Certification Board Elect Officers



Fred J. Eschen, President and M. P. Cestaro, Secretary-Treasurer, of the American Orthotics and Prosthetics Association, at the installation ceremonies, National Orthotics and Prosthetics Assembly, Colorado Springs, Colorado.

FRED ESCHEN INSTALLED AS AOPA PRESIDENT NATIONAL ASSEMBLY MEETS AT COLORADO SPRINGS AUGUST 30 - SEPTEMBER 4, 1965

Fred J. Eschen of New York City was installed as National President of the American Orthotics and Prosthetics Association on September 4, 1965. This was the concluding event of the National Orthotics and Prosthetics Assembly held at the Broadmoor Hotel in Colorado Springs, Colorado, August 30 - September 4.

Mr. Eschen is associated with his father John Eschen in the operations of the John N. Eschen Company, Inc. in New York City. He is a certified Prosthetist and Orthotist and was Vice-President of the Association in the past year. Previously he had served as Director of the Association for the states of New York and New Jersey, and as President of the Metropolitan Orthopedic Appliance and Limb Manufacturers Association. Mr. Eschen was Chairman of the Committee on Advances in Prosthetics and Orthotics of the Association from 1963-1965.

Mr. Eschen has been elected Chairman of the Joint Executive Council which has been set up by the American Board for Certification in Orthotics and Prosthetics and the American Orthotics and Prosthetics Association.

McGRAW HONORED

Mr. Eschen was nominated and elected as President after the Assembly had learned of the unavailability of President-Elect David C. McGraw of



Basil Peters, C.P.O., Philadelphia, Pennsylvania, who will serve as Vice-President of the American Orthotics and Prosthetics Association for the term 1965-1966.



George H. Lambert, Sr., C.P.O., Baton Rouge, Louisiana. Mr. Lambert is President-Elect of the American Orthotics and Prosthetics Association, and will assume the Presidency October 20, 1966.

Shreveport, Louisiana. Mr. McGraw is recuperating from a heart attack suffered in the spring of 1965. While making satisfactory progress, he felt that due to the obligations he owed his family and his professional associates in Louisiana he should not assume the Presidency at this time. Accordingly he tendered his resignation. Members of the Association learned of his decision with regret though understanding the reasons for it. They unanimously voted a resolution of tribute to him, citing him as honorary President for the year 1965-1966.

LAMBERT NAMED AS PRESIDENT-ELECT

Mr. George H. Lambert, Sr., of Baton Rouge, Louisiana, was unanimously elected President-Elect of the Association. Mr. Lambert had previously served as President of the American Board for Certification and as a director of AOPA Region IV.

Serving with Mr. Lambert will be Mr. Basil Peters, of Philadelphia, Pennsylvania who is Vice-President of the Association for the year 1965-1966. Mr. Peters is the head of the B. Peters Company in Philadelphia, certified prosthetic facility. In addition, he serves as faculty member in the prosthetic program at New York University and as a member of the AOPA Manuals Committee.

Mr. M. P. Cestaro of Washington, D. C. was reelected as Secretary-Treasurer of the Association. Mr. Cestaro served in that position since 1952. He is a former member of the American Board for Certification and consultant to the Board. Mr. Cestaro has been active as a member of the Committee on Advances in Prosthetics and Orthotics of the Association, as Chairman of the Veterans Administration Liaison Committee and as Advisor to the Educational Program in Business Administration for Orthotists and Prosthetists at Northwestern University.



Mr. McGraw, who resigned as President-Elect because of health, was named "Honorary President" by the 1965 Assembly.

PALM SPRINGS IN 1966

The Association will sponsor the 1966 Orthotics and Prosthetics Assembly in Palm Springs, California. The dates are set at October 16-20, 1966.

Mr. Leroy Noble, Whittier, California has been named Program Chairman, Mr. Kenneth Dodd, Santa Monica, California and Mr. Cletus Iler of Saginaw, Michigan, will serve as Co-Chairmen of the Scientific, Technical, and Supply Exhibits at the 1966 Assembly.

D. R. COON HEADS AMERICAN BOARD FOR CERTIFICATION

Durwood R. Coon, C.P.O., of Detroit, Michigan, has been elected President of the American Board for Certification in Orthotics and Prosthetics for the year 1965-1966. Mr. Coon had served previously as Secretary-Treasurer of the Board. He is President of the D. R. Coon Company, a certified facility of Detroit, and was formerly Regional Director of the American Orthotics and Prosthetics Association.

Serving with Mr. Coon will be Dr. Claude N. Lambert of Chicago, Illinois as Vice-President, and Bert R. Titus, C.P.O. of Durham, North Carolina as Secretary-Treasurer. Mr. Titus is head of the Department of Prosthetic and Orthopedic Appliances of Duke University of Durham, North Carolina.

Two members of the Board were elected to three-year terms: John A. Metzger, C.O., of Long Beach, California and Dr. Robert G. Thompson, of Chicago, Illinois.

Honors were paid to Theodore W. Smith, C.O., retiring President of the Board and Dr. Richard H. Jones, who was Vice-President for 1964-1965. Both had completed three-year terms as members of the Certification Board.

The elections took place in Colorado Springs, Colorado, during the National Orthotics and Prosthetics Assembly.



PALM SPRINGS FOR '66. John Metzger of Long Beach, California, Harry Kleinberg of Syracuse, New York, and LeRoy Noble of Whittier, California. Mr. Noble will be program chairman for the 1966 Assembly. Mr. Metzger was elected to a three-year term on the American Board for Certification.

President Johnson Commends VRA Gains In Rehabilitation

EDITOR'S NOTE: *On August 10, 1965, President Johnson made the following statement as he released to the public significant reports on federal-state rehabilitation programs.*

August 10, 1965

"I am making public the attached reports from Secretary Celebrezze and Commissioner Switzer so that the public may be fully familiar with the valuable work being done in this country to help our disabled citizens become active and useful citizens.

"I can think of no better example of what this Administration is trying to accomplish for the American people than the federal-state program of vocational rehabilitation.

"However difficult the circumstances, whatever the burdens of poverty, whatever the deficiencies in educational opportunity that exist today, we must and we will find ways to offer full opportunity for a useful and satisfying life for all Americans.

"If we can do this for 135,000 of our people who, along with other problems, face the obstacle of a serious physical or mental handicap, then we can do it for other people as well. That is our goal."

Excerpts from the reports mentioned by the President in his statement above included this comment from Secretary Celebrezze: "I believe you will share my pride in the attached report of the Commissioner of Vocational Rehabilitation, Miss Mary E. Switzer. It shows that the federal-state program of vocational rehabilitation has achieved a new record this year, with about 135,000 disabled men and women rehabilitated into useful work.

"The total of rehabilitations for the past year represents an increase of nearly 13 percent over the previous year. The outlook for the future will be even more promising when the Congress completes action on the Vocational Rehabilitation Amendments passed by the House of Representatives last week and now pending in the Senate."

The report from Miss Mary E. Switzer, Commissioner of Vocational Rehabilitation, HEW, points out that the gain in the number of rehabilitated persons in the past year represents almost 4,000 more disabled persons rehabilitated than the States estimated when they presented their 1965 budget goal figures.

Included in Miss Switzer's report is a table showing the numbers rehabilitated by States. Pennsylvania leads with 12,794 disabled men and women restored to activity and useful work. Others in the top five were New York (9,067), North Carolina (8,545), Georgia (7,221), and Florida (6,153).



PRESIDENT JOHNSON

West Virginia led all States in terms of the number rehabilitated per 100,000 population, with a rate of 218, followed by the District of Columbia (178), North Carolina (176), Rhode Island (173), and Georgia (168). The national average was 70.

Concluding her report to Secretary Celebrezze, Miss Switzer stated: "I am deeply grateful for the consistent encouragement and direction which you and other officials of the Department have given to the development of the vocational rehabilitation program. I hope you will convey to the President our profound gratitude for his leadership and support, both in appropriations and in proposing legislation to expand and improve this work which so vitally affects the lives of millions of Americans."



MISS MARY E. SWITZER

Human Resources Foundation Affiliated with NYU

A new affiliation between Human Resources Foundation and the department of physical medicine and rehabilitation, New York University School of Medicine, has been announced. Human Resources is the research-education affiliate of Abilities, Inc., the widely publicized organization in Albertson, N. Y., which employs 450 severely disabled and mentally retarded persons.

The relationship between Human Resources and Abilities, Inc., headed by Mr. Henry Viscardi, Jr., and the department of physical medicine and rehabilitation, has been one of long standing as Mr. Viscardi has been a departmental faculty member for almost 15 years. Departmental trainees have long made seminar and observation tours to Abilities, Inc., and Human Resources and many of the faculty have assisted in the planning of facilities at the Foundation.

Under a grant from the National Institutes of Health in 1960, the Foundation was able to put up its own building, which included special classroom and research laboratories to establish the Human Resources School devoted entirely to teaching handicapped children. Only those children considered "homebound" were acceptable. The success of this operation has now resulted in the erection of a separate building to house the school, allowing the Foundation to enlarge its program and expand research facilities.

With the growth of Human Resources and the new departmental affiliation, departmental residents will be assigned to the Foundation for research and observation, thus allowing the trainees a broader scope of experience than has previously been available. Under the new affiliation, the following general areas of study will be undertaken: Pediatric rehabilitation, energy cost studies, psychological studies, and verbal impairment.

Orthotics Measurement Board for Tibial Torsion and Toe-out¹

By HANS R. LEHNEIS, C.P.O.²

EDITOR'S NOTE: *This article was prepared at the request of the Committee on Advances in Prosthetics and Orthotics of AOPA. The measuring device is obtainable from The Pope Brace Division, 197 South West Avenue, Kankakee, Illinois.*

Coordinated function of the brace-anatomical complex is dependent upon the configuration and fit of the brace with the patient's anatomical structure. Brace alignment should be consistent with individual variations in toe-out and tibio-fibular torsion. The process of accomplishing such proper alignment depends, first upon the anatomical measurement technique and second, upon the orthotic fabrication technique.

Since in conventional orthotics practice individual tibial torsion and toe-out accommodations are rarely made for lack of precise measuring devices and techniques, an orthotics measurement board was devised at New York University. The measurement board was designed to obtain individual measurements of tibial torsion and toe-out as well as to serve as a tracing

board. In addition, a technique was developed by which the measurements obtained through the use of the orthotics measurement board can be utilized to make appropriate accommodations for tibial torsion and toe-out in the patient's brace.

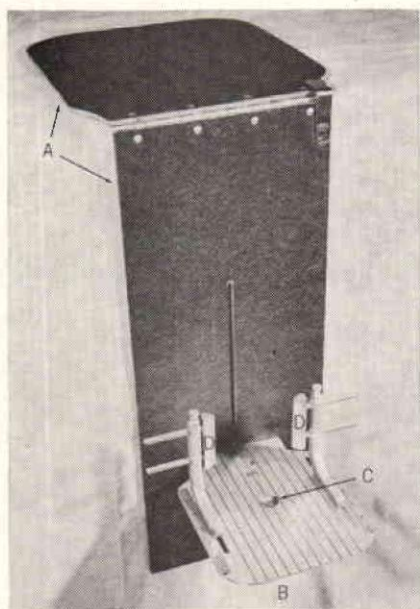


Figure 1

Description of Measurement Board (Fig. 1)

The measurement board consists of two hinged masonite boards (A), an adjustable foot rest plate (B) permitting vertical adjustment as well as rotational adjustment on the goniometer (C), and two malleolar pointers (D) mounted on the foot rest plate (B) which is slotted to allow anterior-posterior adjustability of the pointers. Medio-lateral adjustability is provided by a set screw locking the malleolar pointers in the desired position.

¹ This research and development was conducted under a grant from the Vocational Rehabilitation Administration, Department of Health, Education and Welfare.

² Instructor, Prosthetics and Orthotics, New York University Post-Graduate Medical School; Chief, Orthotics, Institute of Physical Medicine & Rehabilitation, New York University Medical Center.

Measurement Procedure

Prior to the positioning the patient on the measurement board, the medial and lateral malleolus must be marked on the patient's skin to serve as landmarks for the determination of tibio-fibular torsion. Based on the assumption that the ankle joint axis runs through the centers of the malleoli as viewed in the sagittal plane, the width of each malleolus is palpated and its center indicated by a mark approximately one half inch long.

A. Patient Placement

Placement of the patient on the measurement board is one of the most critical parts of the procedure. The patient must be seated on a hard surfaced table with both knees flexed approximately ninety degrees over the edge of the table with the measurement board placed under the involved extremity (Fig. 2). Make sure that the popliteal areas are pressed firmly against the hinge of the measurement board on the affected extremity and against the edge of the table on the sound leg. This insures that the knee axis runs parallel to the hinge of the board. The space between the knees in this position should not be excessive, for this would influence the accuracy of the measurements. At this point, the foot plate should not touch the patient's foot so that the weight of the shank will orient the knee axis horizontally in the frontal plane.

B. Tibial Torsion

The procedure described does not involve any angular measurement of tibial torsion. Rather, the relative anterior-posterior distance between the medial and lateral malleoli in the transverse plane is a simpler measure for orthotics application.

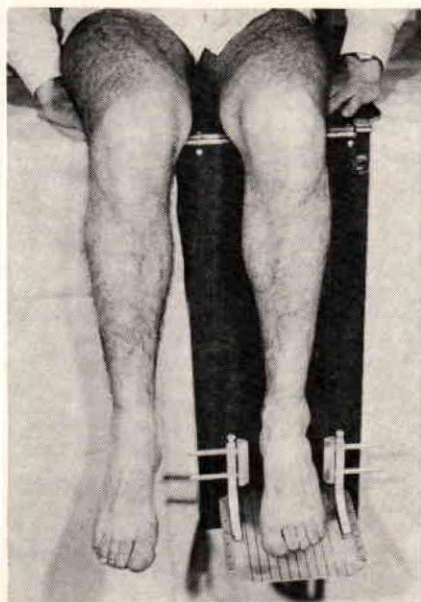


Fig. 2. Positioning patient on Orthotics Measurement Board.

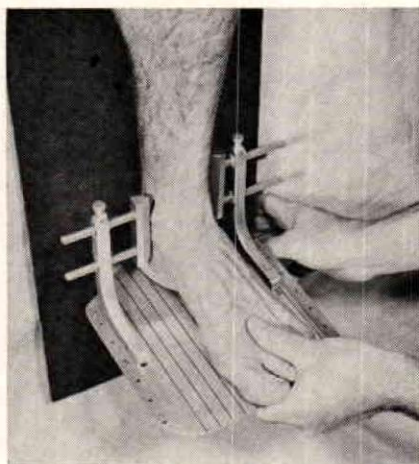


Fig. 3. Measuring tibial torsion.

Following the proper placement of the patient on the measurement board, the foot plate is brought against the patient's foot. Care must be taken that the foot is not distorted in any way as the foot plate approaches the foot, i.e., the foot should not be everted or inverted. To measure the amount of tibial torsion, the goniometer setting must be at the zero mark. This places the adjustment slots in the foot plate at right angles to the surface of the masonite board. With the back of the patient's heel pressed against the board the malleolar pointers are individually adjusted to coincide with the landmarks previously indicated on the patient's skin (Fig. 3). The scale on

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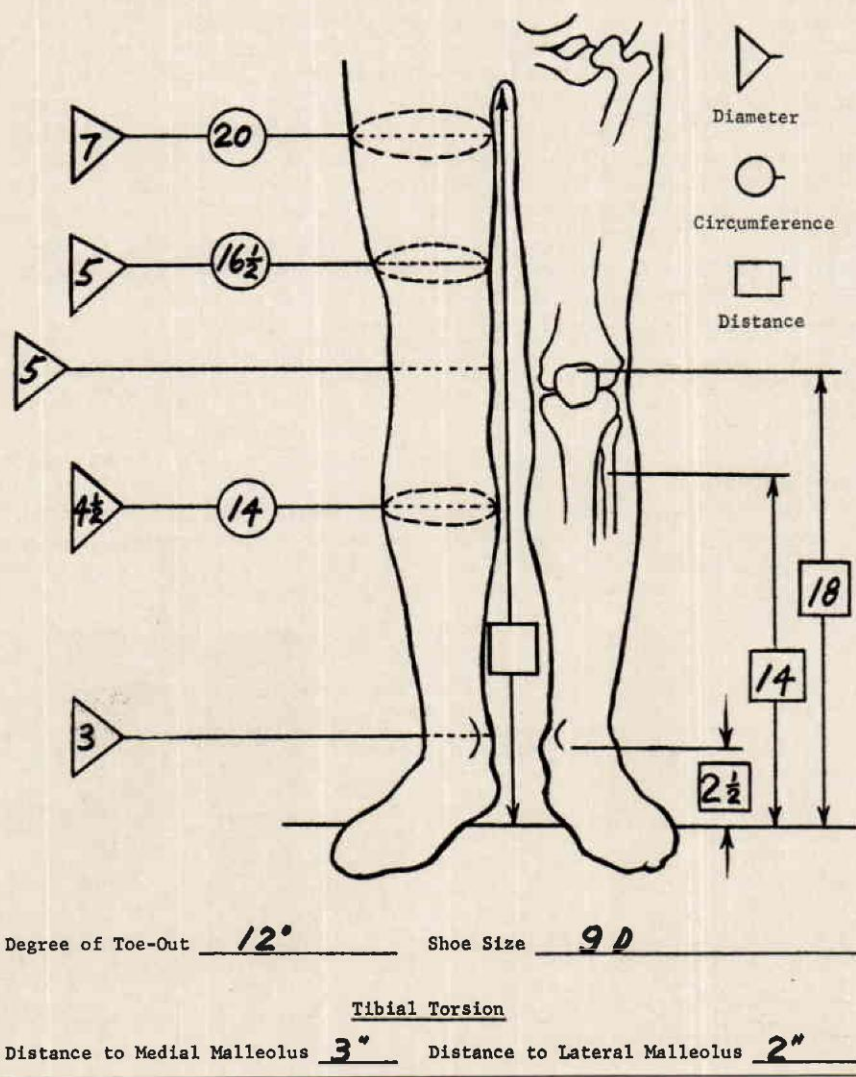


Figure 4

either side of the foot plate measures the distance of the medial and lateral malleolus from the back of the heel. These two measurements are then recorded on the Orthotics Measurement Form (Fig. 4).

Although the angular degree of tibial torsion is not measured, it may be obtained trigonometrically, if so desired (Fig. 5).

C. Toe-Out

Toe-out is measured by carefully lifting the patient's foot slightly away from the foot plate so as to free the plate to rotate about the goniometer. The plate is adjusted until one of the longitudinally inscribed marks coincides with the medial border of the foot (Fig. 6). Note, the orthotics measurement board does not measure the degree of toe-out as related to the long axis of the foot; rather it measures the angular relationship between the medial border of the foot and the knee axis. This measure is also recorded on the Orthotics Measurement Form.

Fabrication Procedure

A. Tibial Torsion

From the measurements obtained, it is a relatively simple procedure to introduce tibial torsion into the brace. The difference between the medial and lateral malleolar measurements simply indicates the amount of offset needed between the medial and lateral brace ankle joints. If, for example, the medial malleolar measurement is three inches and the lateral measurement is two inches, the difference is one inch. Therefore, the medial ankle joint is offset anteriorly with respect to the lateral ankle joint by one inch plus one eighth of an inch for a total of one and one eighth inches (Fig. 7). The purpose of adding the additional one eighth of an inch is to allow for the usual clearance needed between the malleoli and the brace ankle joints, i.e., if a total of seven sixteenths of an inch is added for ankle clearance, the value of r in figure five increases by this amount, resulting in an increase of y of approximately one eighth of an inch for the average degree of tibial torsion.

Generally, the offset is made on the medial bar if the difference between the malleolar measurements is one inch or less because, normally, the medial malleolus is anterior to the midline of the leg as viewed in the sagittal plane. Should the difference of the malleolar measurements exceed

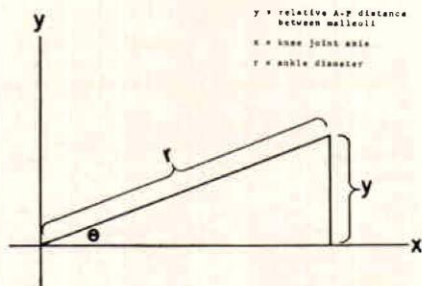


Figure 5

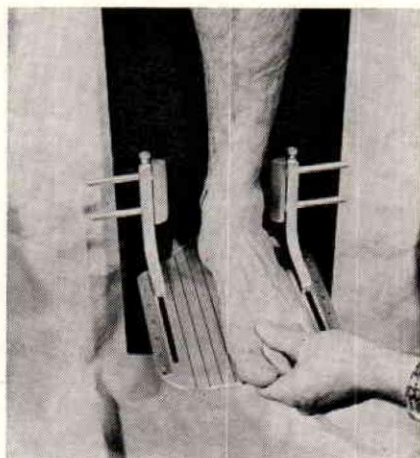


Fig. 6. Measuring toe-out.

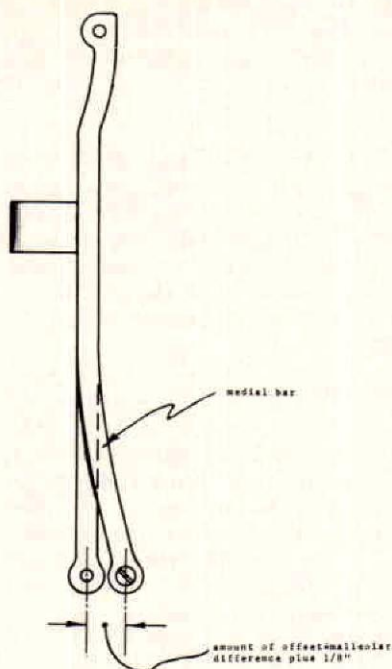


Figure 7

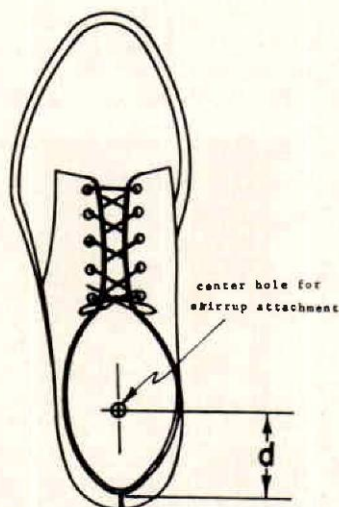


Fig. 9. $d = \frac{1}{2}$ sum of malleolar measurements.

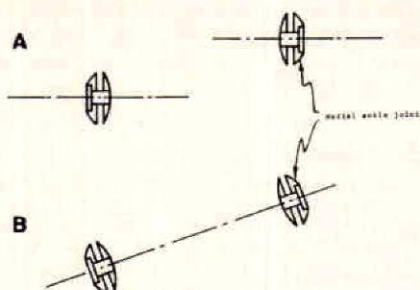


Fig. 8. Ankle joint offset before (A) and after parallel realignment of joint surfaces (B).

one inch, the excess is accommodated by posterior deflection of the lateral ankle joint. After offsetting the ankle joint, both joint surfaces must be re-aligned parallel to each other (Fig. 8).

B. Toe-Out

Toe-out accommodation is the final step in brace fabrication. This requires assembly of the stirrup to the leg brace frame. To determine the proper antero-posterior position of the stirrup on the shoe, a hole is drilled through the shoe sole at a point in front of the counter, equal to one half the sum of both malleolar measurements. (Fig. 9). The stirrup is then

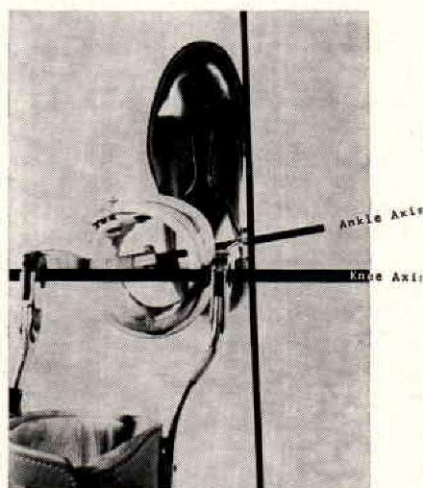


Fig. 10. Relating toe-out to knee axis.

attached to the shoe with one rivet through the center of the stirrup to permit rotation of the shoe on the stirrup to match the degree of toe-out recorded on the Orthotics Measurement Form. As described above, toe-out is measured as the angular relationship between the knee axis and the medial border of the foot. Consequently, in brace fabrication the medial border of the shoe must be related to the brace knee axis (Fig. 10). Two or more additional rivets may then be used to fix the shoe on the stirrup in the desired position.

Summary

The measurement board described is designed to measure the relative distance of the medial and lateral malleoli from the back of the heel in the transverse plane. It is also used to obtain an angular measurement between the medial border of the foot and the knee axis.

Following the procedure described above, the orthotist may produce a brace which more nearly corresponds to the patient's individual anatomical structure. Although the accommodation of tibial torsion is of diminished consequence when limited motion ankle joints are used, its routine introduction in the brace is relatively simple and, of course, of utmost importance with free motion ankle joints. Conversely, toe-out accommodation is not dependent on the type of ankle joint but is an individual measure with equal importance in all cases.

Acknowledgement

The research project described was conducted under the general supervision of Dr. Sidney Fishman and Mr. Norman Berger. I also wish to thank both Dr. Fishman and Mr. Warren Springer for their review of the manuscript.

Gait Analysis Film Loops Available

Three years ago, the Prosthetic-Orthotic Education Program at the Northwestern University Medical School, at the request of the Committee on Prosthetic-Orthotic Education, National Academy of Sciences-National Research Council, prepared a teaching film entitled "Gait Analysis" that demonstrates the more common gait deviation seen in above-knee amputees, together with their causes and means of correction. This proved to be such a valuable instructional film that some 40 copies were printed for loan purposes. At the request of a number of directors of schools of physical therapy, the Committee had prepared sets of loop films taken from the parent production, each of which depicts one single gait deviation. Each set consists of 16 loops that are 7 feet in length and can be rerun for an indefinite period while the instructor discusses the deviation. They can be shown on standard projectors, such as Bell and Howell, Eastman, etc. These sets are being made available at cost and can be purchased for \$25.00. Make check payable to the distributor when ordering:

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Partial Foot Amputation for Severe Deformity Caused by Congenital Absence of Fibula

By JEROME LAWRENCE, M.D., and MARY S. DORSCH, C.P.O.

New York, New York

This case represents one of congenital absence of the fibula associated with anterior tibial bowing, shortening of the tibia with deformity of the residual foot characterized by lateral and posterior displacement of the foot with pulling of the heel upward into a position such that the plantar surface pointed directly posterior. Due to the severe contracture of the tendo achillis, the heel pad was proximal to the distal end of the tibia. There is three inches shortening of the femur. The foot had three toes. There was some external torsion of the femur, a 10 degree flexion contracture at the knee with genu valgum.

When first seen in our Amputee Clinic, at the age of eight, the patient was wearing a Thomas splint with an ischial bearing pelvic band and a thigh cuff.

X-rays showed a hypoplasia of the right femoral shaft with atrophy of the pelvic girdle and femur. The fibula was absent; the tibia foreshortened with marked anterior medial bowing of the lower two-thirds of the tibial shaft. The os calcis and talus was fused into one bone. X-rays of the spine showed an incomplete fusion of the posterior neural arch of L-5, and the upper sacrum.

Before surgery the patient was fitted with a prosthesis with knee joints and thigh corset. The upper portion of the socket consisted of a molded leather corseting and lacer which permitted full-end bearing; however, the toes and metatarsal area of the foot protruded laterally, extending over the leather socket and bulging underneath his trousers. Aside from this, the patient walked very well and attended school. He occasionally got a little irritation over the sharp bowed crest of the tibia. His major complaint was that of the protrusion of his foot outside the prosthesis with bulging of his trousers, and the bulkiness of the prosthesis, which had to accommodate the deformed foot.

He returned to the clinic at the age of sixteen expressing the desire to have a procedure performed that would eliminate the bulge of the prosthesis and the foot under the trousers.

We had the choice of going ahead with the original plan of doing a two-stage procedure, first correcting the bow of the tibia and then doing a Syme amputation. However, several considerations were analyzed. First of all, the patient was doing very well with the prosthesis as it existed with excellent end bearing on his own original skin. He had no pain. His gait was good. He was able to attend school and participate in all activities. Secondly, the heel flap was pulled markedly superior, proximal to the distal end of the tibia and it was considered surgically difficult to bring the displaced heel flap down over the tibia.

The basic requirements of the case were as follows:

1. To give a good, competent end bearing stump.
2. To reduce or eliminate the sharp bow of the crest of the tibia.
3. To eliminate the need of a thigh corset.
4. To remove the protruding foot, as described.

If we did an amputation through the mid-tarsal joint, this would place the foot in line with the longitudinal contour of the leg below the knee. It would also preserve a larger surface of end bearing skin, including the heel flap, that would remain undisturbed and would represent the original tissue that had been successfully bearing weight on the end ever since the patient had been using a prosthesis from the age of eight.

There is one other factor which convinced us that this procedure might have some merit—the factor of the value of the hook (as represented by the deformed position of the heel and the hind foot)—that this hook would act as a suspension device for a simple but adequately designed prosthesis, which would eliminate the need for any thigh corseting or possibly eliminate the need for a patellar strap.

The case was thoroughly discussed with the parents and the patient and they both agreed that they would prefer to have the partial foot amputation; that, if it did not succeed, we still could do a Syme amputation and we would not have lost anything except time and effort, and possibly we would have gained certain advantages, as described.

At this time, a mid-tarsal disarticulation was performed back to the joint formed by the fused astragalus and os calcis. The sharp crest of the tibia was diminished by osteotomy. All incisions healed per primum.

He was then fitted with a special plastic prosthesis. The patient returned to school and did very well. He was satisfied with the restoration of relatively normal contour to his stump and there was no longer any bulging of his trousers. He had no pain. The anterior crest of the tibia no longer gave him any trouble. The stump was end bearing and there was definite hook type function to the deformed residual foot.

X-rays were taken of the amputation stump with the prosthesis on—both weight bearing and without weight bearing with the patient holding the prosthesis suspended off the floor. These x-rays clearly demonstrate that there is a definite hooking of the socket by the posterior heel, giving security to the suspension by means of the contour of the socket over the residual heel. This hooking effect was also analyzed by using a smudge transfer technique by which a lipstick smudge was applied to the posterior-superior margin of the heel without a stump sock. The patient got into his prosthesis and the transfer was applied to the undercut of the socket to clearly show true hooking function of the residual foot stump. The minimum amount of piston action of the stump in the socket was also demonstrated by the x-rays.

Summary

The above case report indicates a technique of solving the problem of severe deformity incident to congenital absence of the fibula—not by Syme amputation but by partial foot amputation, leaving the hind foot in its deformed position with the purpose of giving a special type of moulded socket and utilizing the deformed position of the hind foot as a suspension device. This so far has successfully solved this patient's problem. We are following the case and plan to submit an additional report after a number of years.

It should also be mentioned that if further trouble is encountered, we can always have the Syme amputation since the heel pad has not been disturbed by the partial foot amputation. The authors feel that this will be unnecessary, since our result to date has been gratifying. The prosthesis has been functional and cosmetically accepted. The dynamic type of fitting allows the patient to bear weight on the residual foot, affording a more comfortable and secure application, since the surface area for weight bearing is greater than that of a Syme amputation.

The prosthesis was plastic, with a conventional foot. A patellar cuff suspension will be provided after the planned removal of the waist belt.

"To P.T.B. or Not To P.T.B."

With Apologies to William Shakespeare's "Hamlet"

By ROBERT W. KLEIN, M.D.

Repatriation Department, South Melbourne, Australia

On reading the article "The Decline and Fall of the P.T.B." by Dr. Robert G. Thompson, M.D. (O.P.A.J. March, 1965), a question posed by Dr. Eugene Murphy regarding the "Weiss technique" comes to mind and it might be asked "What was the P.T.B. which declined and fell?"

P.T.B.'s have been prescribed and supplied by the limb fitting facilities of the Repatriation Department (the equivalent of the U.S.A. Veterans Administration) in the Commonwealth of Australia since 1961 and in the last 12 month period 437 were issued. However, great stress has been placed on the necessity to follow the principles of cast taking, cast modification, alignment and walking re-education as taught to officers of this Department at a U.C.L.A. Prosthetic Course. All stages of casting, modification and manufacture are supervised to ensure that the patient receives this particular concept of a P.T.B.

Not only have these prostheses proved more functional, more comfortable, and more economical, but they have enabled short stumps to be fitted which previously were precluded from wearing below knee prostheses. In fact, quite a number of patients with "kneeling" prostheses, some of quite long standing, have been fortunate enough to be able to change to below knee fitting.

Contraindications in our experience have been minimal and virtually confined to the relatively rare unstable knee (these are fitted with "conventional" prostheses and not "P.T.B.s" with side irons). Few patients have had the misfortune of being unable to enjoy the excellent function and comfort of the P.T.B.

Problems are encountered from time to time as with any patient and any prosthesis, but it is thought that the fault lies, not with the prosthesis or patient, but in our own shortcomings.

Mr. W. Tosberg in his article "Temporary Prostheses" (O.P.A.J. June, 1965) gives timely warning of an impending "decline and fall" in prosthetic treatment in pointing out that "temporary" prostheses *must* be constructed with full consideration of proper fit and alignment, and the anatomical and biomechanical requirements.

With respect, might not Dr. Thompson's P.T.B. experience be a case of "How a good meaning may be corrupted by a misconstruction."

"Pylon-Prosthetic" Devices for Lower Extremity Congenital Skeletal Limb Deficiencies

(From the Shriner's Hospital for Crippled Children,
Minneapolis, Minnesota)

By RICHARD H. JONES, M.D., and CHESTER C. NELSON, C.P.

Preface

Rapid advances in prosthetics since World War II have made it possible to successfully fit amputees of all types, including those with stump deformities, with much greater ease and better results than at any previous time. Improved fitting techniques, materials, and many improved mechanical components now available to the prosthetist provide the amputee of today a much better device with improved functional capabilities, comfort and cosmesis.

These improving techniques of the past twenty years more recently have been applied to the child amputee with ever increasing success despite the problems that are presented in the care of children, particularly those with congenital skeletal limb deficiencies. The success in fitting of the so-called standard child amputee has stimulated interest in attempting to provide better bracing and prosthetic substitutions for children with the more bizarre deficiencies.

Nomenclature and Embryology

The various deficiencies present a frustrating problem to the surgeon and prosthetist-orthotist as well. Communications with respect to prosthetic or brace fitting of the more bizarre limb deficiencies has in the past been very limited because of the lack of a common language and nomenclature. Five years ago youngsters with such limb deficiencies had lobster-claw deformities, short legs, flippers, etc. The so-called lobster-claw deformity had as many as ten synonyms, including crayfish-claw pinchers, adactyly, etc. These synonyms were used to describe partial adactylia.

During the past fifteen years the early development of limbs in the human embryo has been investigated in detail by many. The limb buds appear on the lateral body wall at four post ovulatory weeks. The buds grow and differentiate rapidly within the ensuing three weeks, developing in a proximal to distal sequence. The skeletal elements of the limb buds are first mesenchyme condensations which rapidly chondrify in sequential order, followed by ossification. Ossification begins at five post ovulatory weeks in the clavicle and seven post ovulatory weeks in the long bones. Initially, diaphysis bone collar formation develops rapidly, followed by enchondral ossification. By seven post ovulatory weeks, the skeletal elements of the limb with the exception of the clavicle are individually present in detail as cartilagenous models, as are the extremity joints, with the larger joints beginning to show cavitation.

In summary, the skeleton is, for practical purposes, well developed early as the miniature of post-natal life. Congenital skeletal limb deficiencies therefore arise during the first seven weeks of intrauterine life or during the embryonic phase of intrauterine life. For the remainder of intrauterine life, recognized as the fetal period, development is growth rather than differentiation.

Congenital skeletal limb deficiencies are now classified by descriptive terms derived from the Greek language. The three basic terms are *amelia*, absence of a limb; *hemimelia*, absence of half of a limb; and *phocomelia*, flipper type of limb where the hand or foot are attached more proximally to the trunk. *Acheiria* and *apodia* are the terms used for absence of the hand and foot. *Adactylia* is absence of a digit, usually associated with absence of the proximal metacarpal or metatarsal bone. *Aphalangia* is the term used for absence of phalanges. Hemimelia may be complete or incomplete, the former when the distal half of the limb is absent and the latter when a greater portion of the distal half is absent. *Paraxial hemimelia* refers to axial deficiency of an extremity, absence of a radius or ulna or tibia or fibula. To localize the skeletal deficiency, the terms *terminal* and *intercalary* are now used, the former when parts are absent distal to or in line with a deficient or absent portion and the latter where the mid portion of the limb is missing, the proximal and distal portions relatively normal. Each of these types may be transverse, the deficiency extending completely across the limb or longitudinal, a long axis deficiency or absence. Phocomelia, complete or incomplete, may be proximal or distal. So-called proximal femoral focal deficiency can be classified as incomplete proximal phocomelia. Complete phocomelia is uncommon as usually some vestige form of ossification sooner or later develops within the absent skeletal site.

The use of this classification should serve as a source of common language and communication for the surgeon and the prosthetist-orthotist.

Description and Objectives

The purpose of this discussion is the application of some of the improved fitting techniques, materials and mechanical components in providing improved "Pylon-Prosthetic" devices for some of the more bizarre lower extremity congenital skeletal limb deficiencies. Heretofore, children with deficiencies other than amputations and not severe enough to require surgical modification to amputations, generally were fitted with some type of pylon, usually the basic article, a crutch or a modified shoe. For those deficiencies such as proximal complete or partial femoral phocomelia, the youngster usually was provided with a positioned leather thigh lacer or corset fixed to the uprights of a wooden crutch, the foot usually dangling below the corset. The child could ambulate with such a device or appliance without too much difficulty, but accurate comfortable fitting about the shortened extremity, particularly the weight bearing areas, was lacking and alignment was as straight as the crutch. The cosmetic value of such a rather crude device, without question, is poor. A child can get by and wear almost anything with the minimum of irritation and complaints. Such a child so fitted, however, lacks much to be desired: real comfort from a proper fitting corset, stability through improved alignment, comfortable support of all parts of the extremity including the foot, and functional value. A simple stick or a crutch tip does not allow such a youngster to wear a pair of shoes, does not provide stability for the foot and prevents such a youngster from achieving such physical feats as skating, etc. As the child prosthetic program developed at the Minneapolis Unit of The Shriner's Hospital for Crippled Children, it became obvious

that the child amputee was more comfortable, had better function and looked better than a youngster with proximal femoral phocomelia using a crude pylon. The parents of the latter began to look at the lower extremity amputee child in the waiting room with envy. We had already begun with some success to utilize some of the improved prosthetic techniques in fitting, material and alignment for bracing paraplegics. The products looked better with closer fitting tolerances, prevented skin problems and improved function.

With this background, we began to develop "Pylon-Prosthetic" devices for the youngsters with sensible lower extremity congenital skeletal limb deficiencies, utilizing the already developed prosthetic techniques for support and bracing, alignment for improved stability and prosthetic ankle-foot components. Plastics, using total contact techniques, with and without metal reinforcement, have been used. The proximal weight bearing areas have been modified to surround redundant soft tissue as is present with proximal femoral phocomelia. Trap doors of various sizes and shapes have been necessary to allow placement of the device. Feet, as present, have been incorporated into the so-called socket, usually in as much equinus as is possible for improved cosmetic value. Alignment is achieved below the so-called supporting socket. In some cases, the remaining portion of the extremity is short enough to allow insertion of a knee joint mechanism and with such a device, so-called dynamic alignment is actually achieved.

Paraxial, fibular, hemimelias with relatively normal feet are quite adaptable to this technique. Usually the involved lower leg is shorter than normal and quite often the thigh is likewise, thus allowing application of a foot-ankle prosthetic component below the shortened extremity, with the natural foot-ankle in a position of relative equinus with good device alignment and the advantages to the child as described above.

Utilization of this technique, of course, is more expensive, but the advantages, we feel, support the added expense. Without question, the children exhibit happy satisfaction with their improved appearance, comfort, and increased functional ability. All of these children have voluntarily expressed their delight in being able to wear a pair of shoes, skate and perform other weight bearing tasks that they could not do before and in being like their normal friends. The parents display the same enthusiasm as the parents of the more standard child amputee.

Technical Aspects

Fitting children with congenital deformities is a challenging, and probably the most rewarding, area of prosthetics and orthotics.

One of the first things we must be aware of is that two similar cases may have completely different prosthetic solutions. Children with deformities of the type described may be fitted as early as six months, when the child starts to pull himself up to a standing position, or at any age thereafter. As the foot is in relatively satisfactory functional position amputation is not considered. Without amputation, harnessing is eliminated or simplified as the foot and leg "key" into the socket and provide satisfactory, stabilizing control of the "Pylon-Prosthesis." The parents of the child are grateful that no amputation is necessary and at night the youngster can ambulate on a functional foot for self-care functions with relative ease, without having to put on the appliance.

The clinic team prescribes each device after clinical and x-ray evaluation.

If the child is able to stand for cast fitting, primary pressure is applied to the foot of the affected side. If the child is able to cooperate in a standing

position blocks are placed under the affected side, adjusted to the child's balanced standing posture. If knee locking strength will support weight, we may consider a below knee type "Pylon-Prosthesis." Major weight bearing will be on the plantar aspect of the foot in equinus position. The foot in equinus in line with the lower leg or tibia provides a very acceptable cosmetic result. Knee instability in several cases required knee bracing, joints, and lacer similar to a standard below knee fitting. Added bracing may later be removed as knee stability improves. In the event ischial support is necessary, the socket is extended superiorly or toward the pelvis and flared at the posterior-medial aspect for ischial support. Sockets also have been extended over the buttock for additional support.

Casts are taken with the knee in a neutral, relaxed position. This is important in the prevention of concentrated pressure areas within the socket which cause skin injuries.

Casts are modified by molding for displacement of soft tissue under load conditions. A plaster check socket is then made and fitted. Major corrections made at this time include relief for bony prominences, filling areas where there is no contact, and a trap door or window to facilitate application and removal of the test socket, which ultimately is incorporated in the final socket. There should be adequate space for the foot in the equinus position, particularly the toes, for the free motion required to prevent toe blistering or callous formation. There should be additional space anterior of or distal to the toes to provide some degree of space for growth, as experience indicates that crowding due to growth usually occurs within the foot portion of the socket long before it is significantly noted about the extremity above. The medial malleolus prominence usually requires extra spotting.

When the check socket appears to fit properly and can be easily applied and removed, the appliance below the socket is completed. If there is sufficient clearance between the foot portion of the socket and the floor, an adjustable leg with properly sized foot is installed for completion of the alignment process. An angle iron is used in lieu of the adjustable leg if there is insufficient space for adjustable leg techniques. Alignment with an angle iron is carried out in two planes with the child bearing weight to the floor via the angle iron which is moved about until the maximum balance point is found. Plumb lines are then used as reference points to complete this type of alignment procedure. When the adjustable leg alignment method is used the usual transfer techniques complete the appliance. The extension portion of the "Pylon-Prosthesis" is usually fabricated from light-weight wood, reinforced with a laminate.

These devices are serviceable from 12 to 24 months. The major factor determining appliance life is growth.

Case Presentation

The following is a summary of the cases at Minneapolis Unit, Shriner's Hospital for Crippled Children, who have been provided with so-called "Pylon-Prosthetic" devices with five illustrated cases.

Femoral Deficiencies

I. Femoral deficiency, distal femoral epiphysis, congenital malformation with knee dislocation, left. One case.

Case #1

Male infant, born in 1958 was admitted to Shriner's Hospital in 1959. The left knee was explored, a mal-formed semi-absent distal femoral epiphysis observed and the knee dislocation reduced. The patient was fitted with a crutch-brace type pylon in 1960. Derotation osteotomy to improve alignment was carried out in 1963. Fibrous ankylosis of the knee joint by that time had occurred. The youngster was then fitted with a so-called "Pylon-Prosthetic" device in 1963, replaced because of growth in 1964. The youngster is wearing a regular shoe and for practical purposes is as active as any youngster, age 7, could be, able to skate and engage in competitive sports consistent with his age. (Fig. 1-A through E).

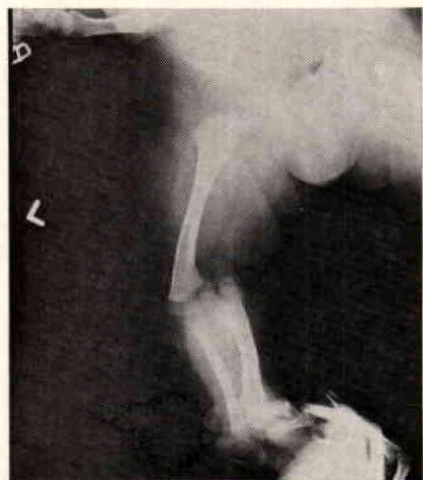


FIGURE 1-A: Case 1. Anterior-posterior roentgenogram showing knee deformity.



FIGURE 1-B: Case 1. Anterior photograph of deformity.

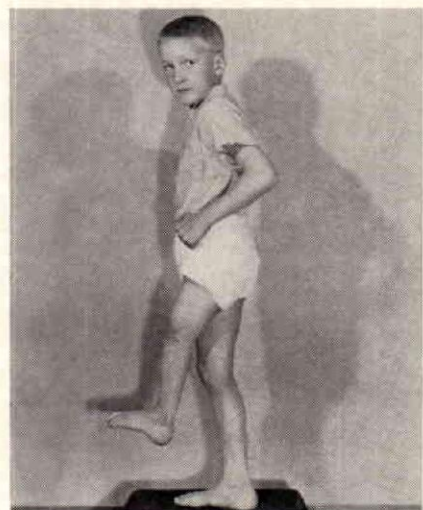


FIGURE 1-C: Case 1. Lateral photograph of deformity.

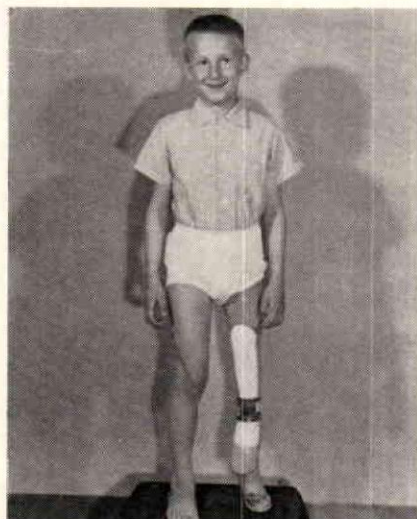


FIGURE 1-D: Case 1. Anterior photograph of "Pylon-Prosthesis."

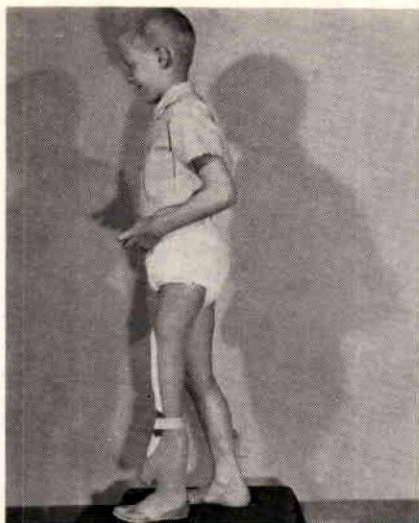


FIGURE 1-E: Case 1. Lateral photograph of "Pylon-Prosthesis."



FIGURE 2-A: Case 2. Anterior-posterior roentgenogram showing complete femoral phocomelia.

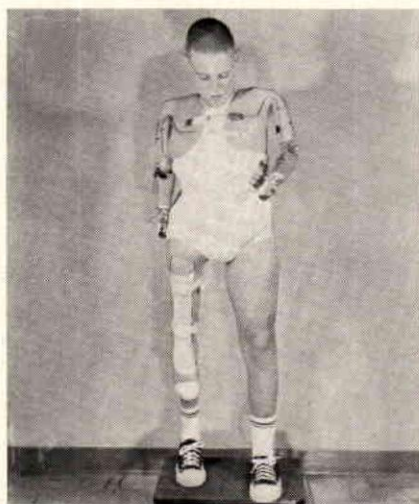


FIGURE 2-B: Case 2. Anterior photograph of "Pylon-Prosthesis."

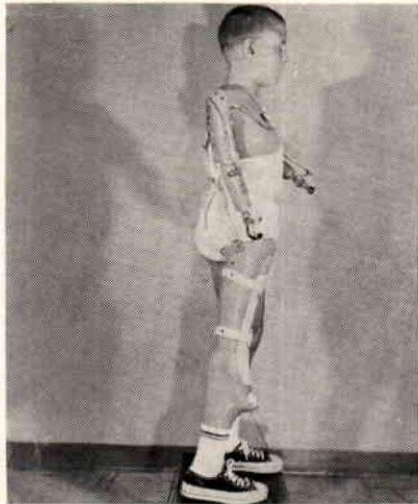


FIGURE 2-C: Case 2. Lateral photograph of "Pylon-Prosthesis."

II. Phocomelia, proximal, complete (femoral), right. One case.

Case #2

Male youngster, born in 1953 with phocomelia, femoral, proximal, complete, right. He was admitted to Shriner's Hospital in 1955 and fitted with a crutch type pylon. He was re-fitted with a plastic "Pylon-Prosthesis" in 1963, replaced in 1964 because of growth. This youngster also has bilateral upper extremity transverse phocomelia, fitted with bilateral shoulder disarticulation type prostheses with excellent upper extremity prosthetic function. His weight bearing balance and over-all functional ability has been much improved by the "Pylon-Prosthesis" in addition to cosmetic improvement. (Fig. 2-A through C).

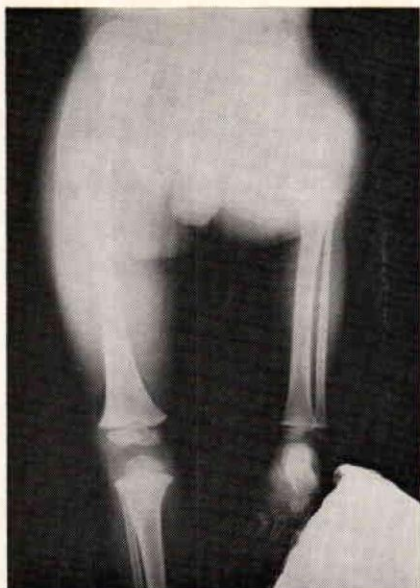


FIGURE 3-A: Case 3. Anterior-posterior roentgenogram showing incomplete femoral phocomelia.



FIGURE 3-B: Case 3. Photograph of shoe elevation.



FIGURE 3-C: Case 3. Photograph of crutch tip brace.



FIGURE 3-D: Case 3. Anterior photograph of "Pylon-Prosthesis."

III. Phocomelia, proximal, incomplete (femoral). Two cases.

Case #3

Male youngster, born in 1955, with femoral phocomelia, proximal, incomplete, right, was admitted to Shriner's Hospital in 1958 wearing a high shoe elevation which was exchanged for a crutch type brace pylon. He was

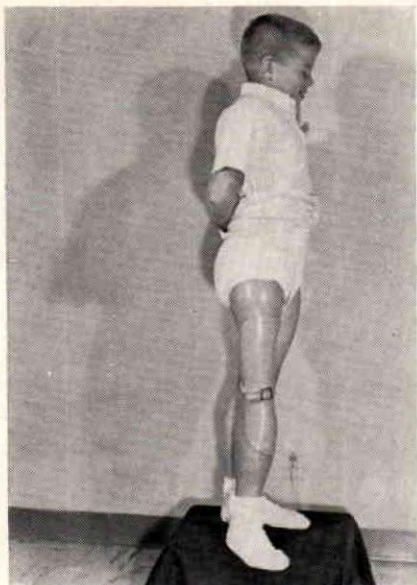


FIGURE 3-E: Case 3. Lateral photograph of "Pylon-Prosthesis."

fitted with a plastic "Pylon-Prosthesis" device in 1962, replaced in 1963 and again in 1965 because of growth. The plastic appliance has improved the patient's stability and allows him to wear a standard shoe and in turn has made it possible for him to engage in sports such as skating in addition to the cosmetic improvement. (Fig. 3-A through E).

IV. Proximal femoral focal deficiencies. Six cases (one bilateral).

Proximal femoral focal deficiency cases have been fitted with similar so-called "Pylon-Prosthetic" devices.

Four youngsters with femoral deficiencies have other significant skeletal deformities which include upper extremity transverse hemimelias and one with a lower extremity amelia. These other skeletal deformities have been replaced by functioning prosthetic devices.

Hemimelia, intercalary, paraxial, complete, fibula

Three cases of this deformity with relatively normal feet in relatively normal position have been fitted with plastic "Pylon-Prosthetic" devices with improvement of stability, comfort and cosmesis.

Case #4

This, the oldest case, age 8, wears a standard shoe and is able to participate in all play and sports consistent with his age. (Fig. 4-A through C).

Case #5

A male youngster, born in 1963, with right fibula complete, intercalary, paraxial hemimelia has been fitted with a rather unique plastic "Pylon-Prosthesis" device as illustrated. This device is extremely simple, light and easy to apply, very stable for the function necessary for a youngster of this age. (Fig. 5-A through E).

Summary

In summary, we have described plastic "Pylon-Prosthetic" devices for children with lower extremity congenital skeletal limb deficiencies, particularly applicable for cases of proximal femoral phocomelia and paraxial fibular hemimelia. These devices provide improved functional capabilities, comfort and cosmesis. The morale of the parents and the child with this affliction is much improved. These improvements, we feel, are well worth the added expense.

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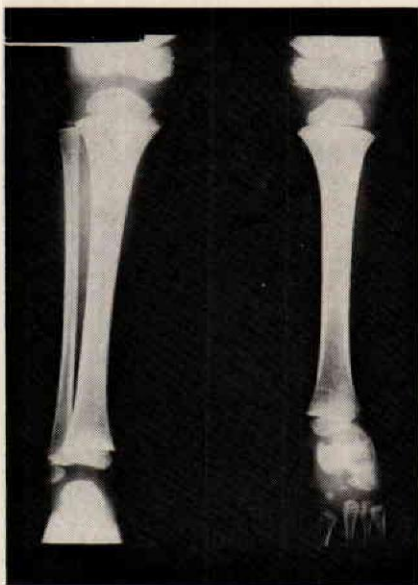


FIGURE 4-A: Case 4. Anterior-posterior roentgenogram of fibular hemimelia.

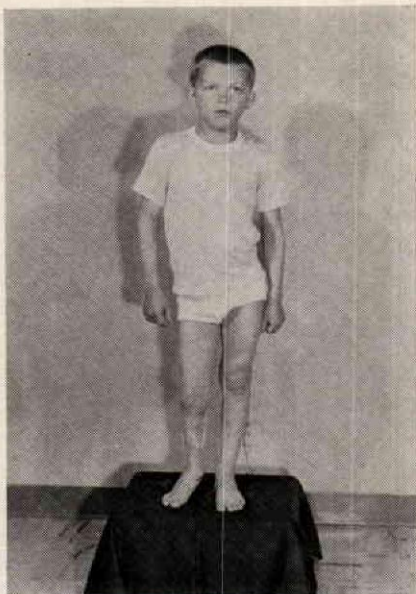


FIGURE 4-B: Case 4. Photograph of fibular hemimelia deformity.

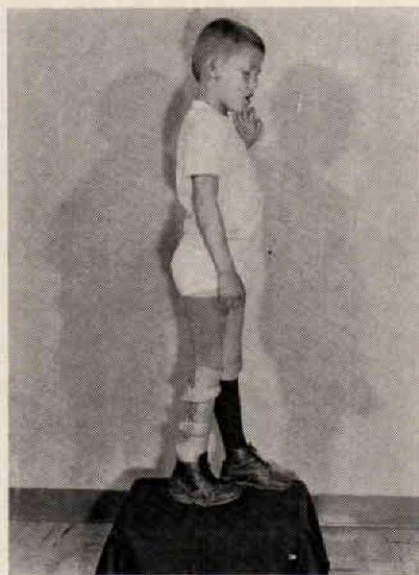


FIGURE 4-C: Case 4. Photograph of lower leg "Pylon-Prosthesis."



FIGURE 5-A: Case 5. Anterior-posterior roentgenogram of fibular hemimelia.

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FIGURE 5-B: Case 5. Photograph of fibular hemimelia deformity.



FIGURE 5-C: Case 5. Photograph of lower leg "Pylon-Prosthesis."

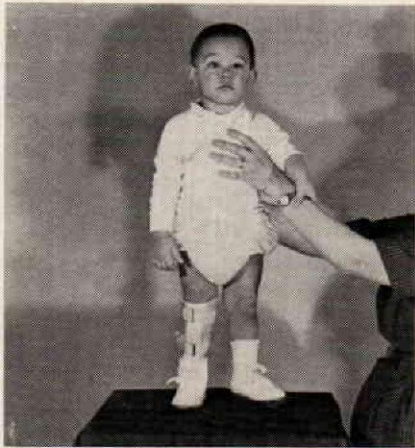


FIGURE 5-D: Case 5. Anterior photograph of lower leg "Pylon-Prosthesis."



FIGURE 5-E: Case 5. Posterior photograph of lower leg "Pylon-Prosthesis."

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Powered Braces With Myoelectric Controls*

By WORDEN WARING, Ph.D., and VERNON L. NICKEL, M.D.**

Patients who need orthotic devices vary greatly in the amount of function which has been lost. When the weakness in an extremity is quite marked, external power may be needed in addition to the brace. This power may be provided by compressed gas, or by electricity. The McKibben braided pneumatic actuator, using carbon dioxide for motive power, has worked well in many applications. More recently, miniature electric motors have been coming into use. In either case, the problem of how to control the external power is present.

In order to operate the device, some body site which is still under voluntary control must be found. The effects of poliomyelitis, muscular dystrophy, stroke, or a spinal cord injury may leave body areas greatly weakened but still useful for control purposes, or they may completely destroy voluntary control in some areas of the body. In any case, a body area with at least a minimum extent of voluntary control is needed, in order to express the patient's intention to the powered equipment. One of the most useful and promising techniques is that of the tongue switch control developed by Allen and Karchak¹ at this hospital. It is applicable to a wide variety of extremely disabled individuals; the tongue is almost always spared and controllable, even in quadriplegics, and is quite dexterous.

As an alternative to this, we are interested in another technique of control. When a person contracts, or attempts to contract, a muscle, the muscle generates a small amount of electricity. This "myoelectricity" can be picked up by suitable electrodes and used as a signal indicating the intent of the subject. Thus it may control the power used in the actual operation of the brace or splint, such as the powered hand splint reported recently in this *Journal*.²

In orthotic and prosthetic devices we desire "VPV" control: volitional, proportional, vectorial control. That is, the device should at all times obey the volition or intent of the user; the action or force should be proportional to the effort exerted by the user; and motions should not be limited to successive rotations about separate axes, but should be combined into single smooth motions in any direction desired (vectorial or directional addition of motions). Myoelectric control lends itself well to these requirements.

There are several possible advantages to myoelectric control. It is a more "natural" mode of control and should require less training for satisfactory use, since it uses the existing muscle signals of the subject. Also it should be less fatiguing because a task can be done without the continual

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division of attention between the task and the control system. For example, a person making a mosaic may concentrate on the choice of pieces and on placing them, without having to think about valves, switches, or foot motions for control. Also myoelectric controls should respond more promptly to the intent of the user, since the intent goes directly to the control mechanism instead of through a separate mechanically moved device. It will be very interesting to see how well these expectations are fulfilled in clinical experience.

Feasibility of this kind of control system with a prosthetic device has been established by the Russian and British hands, wherein pinch is controlled by myoelectric signals from the finger flexors and extensors. One advantage here, of course, is in the strength and the large signals from residual muscles of an amputee, in contrast with the weak muscles and reduced signals of a paralytic such as we are concerned with.

We feel the myoelectric technique may find two major applications with orthotic devices: one, the use with devices which the person uses consistently for his vocation, recreation, or other activities of daily living. It may either be used with a power boost for a weakened muscle still under voluntary control, or on a substitute muscle whose activity pattern is similar to the one with lost function or which can be trained for control purposes. The second area of application is in the retraining of muscles: aiding the patient to strengthen and to learn to control his muscles. There appears to be some clinical evidence that properly fitted braces help the person develop useful patterns of motion which carry on after brace removal, at least for some time. Here, too, myoelectric controls on training braces may accelerate the process of regaining strength and control, and will at least give the patient actual function and use of his extremity during the period of redevelopment.

In addition to the use of myoelectric control with external functional braces, particularly of the upper extremity, it can be used in connection with the electrical stimulation of muscles as a source of power for the actual motion. This may be considered an "internal orthosis," making use of the musculo-skeletal system present in the paralytic but which he is otherwise unable to control and use. This kind of system, with electrically stimulated muscles for power, has been shown to be feasible by Liberson³ at Hines V.A. Hospital, and by Reswick, Long, and coworkers⁴ in Cleveland.

Not all is simple and happy, however. If it were, doubtless the myoelectric technique would already be in wide use! One problem is that the patient must have some voluntary control of the muscle from which the myoelectric signals are to be taken. If the muscle is completely denervated, for example, it is useless as a control source. Visibly detectable motion is not needed, fortunately, and in fact signals can be obtained from muscles with very minimal residual activity. But if there is no voluntary control in a needed muscle, some other muscle must be selected as a substitute and more or less training is then required for it to function smoothly under the patient's volition.

Another problem is that electrodes placed on the skin over a particular muscle also pick up the electrical activity of nearby muscles. This can be very confusing to a control system, and such interference must be reduced in order to have satisfactory functioning of the controls. Further, the electrodes or electrode paste used may be irritating to the skin. One possible solution to both problems is to implant the electrodes surgically within the particular muscle, so signals can be picked up very specifically, and then broadcast with no skin contact.

During the past year, these and other basic problems have engaged our attention. We are now examining patients with various neuromuscular disabilities (which show interesting variations in the kinds of myoelectric signals generated), and are designing and constructing the small electronic control systems required for such patients. Clinical experience with these will aid us in refining and improving them, and will guide us as we consider the feasibility of using signals from the nerves or from the brain itself in the next generation of control systems to aid the disabled.

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In Memoriam

George Anderson

George Anderson, of Anderson's House of Orthopedic Appliances, Winnipeg, died on June 24 in an automobile accident in Canada. Mr. H. F. Nitchke, of the Acme Artificial Limb Company, Toronto, represented the Association at the services for Mr. Anderson. Survivors include Mrs. Eva Anderson and two sons, Stanley and Robert.

Mr. Anderson had been a member of AOPA since April, 1964, and had been in the limb and brace field since 1945, when he was employed as an apprentice in orthotics and prosthetics in the Deer Lodge Veterans Hospital. He had operated his own business since January 1955, and attended five of the prosthetic courses at Northwestern University between 1961 and 1963. Mr. Larry Bridges became a partner in the Anderson firm in 1961.

Sincere sympathy is extended to Mr. Anderson's family and his co-workers on his untimely death.

Ray L. Blackwell

Ray Blackwell, AOPA member from Williamsport, Pennsylvania and Manager of the Minneapolis Artificial Limb Co. of Pennsylvania, died on August 8 after a brief illness. Mr. Jack Shapiro of Harrisburg, Pennsylvania, was official AOPA representative at the services held August 12 at Williamsport. Mr. Blackwell's death is a severe loss to the membership and to his colleagues in Region III.

An outstanding member of the Association, Mr. Blackwell made many contributions to the limb and brace field, including a lecture series for rehabilitation students at Pennsylvania University. (A story on these lectures appeared in the March 1965 *Almanac*, page 12.)

Mr. Blackwell is survived by his wife and son, Raymond G. Blackwell, who has been active in the company. AOPA members join in expressing their sympathy to Mrs. Blackwell and her family.

The "Dundee" Socket—A Total Contact Socket for the Below-Knee Amputation *

By GEORGE MURDOCH, M.B., F.R.C.S. Ed.

Dundee, Scotland

EDITOR'S NOTE: Publication of the article in this Journal has been requested by the Committee on Advances in Prosthetics and Orthotics of AOPA in order that members of the Association and readers of the Journal may be informed of developments in prosthetics abroad.

The patient with a below-knee amputation was, until 1959, fitted with a prosthesis, incorporating a corset and side-steels and employing a socket made of leather or wood. The socket was so shaped that areas such as the head of fibula, the front of the shin and the end of the stump were relieved of pressure. Weight bearing loads were borne partly by the flare of the tibial condyles and partly by the thigh corset and side-steels. In the same way inadvertent errors of alignment built into the prosthesis during fitting and construction were disguised and angular forces absorbed by these same side-steels and encircling corset. Finally the artificial knee joints, whether uni-axial or polycentric, aided or otherwise by devices such as slip sockets, failed to simulate the movement of the natural knee.

The work of a team under the chairmanship of Professor Charles Radcliffe at the University of California has resulted in the development of the Patellar Tendon Bearing Cuff Suspension Limb. This prosthesis eliminates artificial knee joints, side-steels and corset, employs a plastic socket of more sophisticated design and ensures accurate alignment by the use of an adjustable jig at the fitting stage. The socket is fabricated on a male cast of the stump rectified to exaggerate the features of the respective pressure resistant and pressure sensitive areas. In particular the socket is so shaped that a high proportion of the load is absorbed by the patellar tendon.

The higher demands for accuracy of fit and alignment of this prosthesis have served to highlight certain deficiencies in the limb-fitting service and in particular in the method of cast-taking. It has become increasingly clear that moulding of the female plaster cast of the stump by the limb fitter's hands and subsequent arbitrary rectification of the male cast both involve the introduction of human error. In an effort to eliminate sources of error the concept of total contact was examined. In this socket all parts of the stump, both fleshy and bony, bear a proportionate share of the loads of dynamic bearing. Various attempts have been made to satisfy the demands of this theory of total contact in socket construction. Wrap-casting, however carefully done, does not produce a cast which truly represents the shape of the stump under load and in movement. Furthermore there are inevitably some areas of the cast deformed by the edges of the bandage even when elastic plaster of Paris bandages are employed.

* Reprinted by permission of the author and publisher from *Health Bulletin*, issued by the Chief Medical Officer of the Scottish Home and Health Department, Vol. XXII, No. 4, October, 1964.

Canty, United States Navy, a pioneer in this field, used a method which went some way towards the ideal. In this procedure the cast of the stump was produced in free-flowing plaster of Paris and the patient's weight was gradually allowed to bear on the stump as the plaster set. It appears that comfortable sockets were produced following this method of cast taking and it may be that total contact was achieved. Nevertheless the method has not been widely adopted and it is likely that insufficient loads were borne by the soft parts of the stump because too little pressure was brought to bear on the stump during its immersion in free-flowing plaster.

Since the inception of the Prosthetics Research Department in Dundee in July, 1963, one of the projects has been the development of a total contact socket for the below-knee amputation. Clearly success depends on the method of cast-taking employed and many techniques were tried before the final procedure was adopted. In order to expose the method to the rigorous test of patient comfort it was decided to use a hard socket without soft liner in a prosthesis with the same basic construction as the Radcliffe limb.

It was also our hope that the system of cast-taking, fitting and production of the final socket could be so arranged that the factory work on the prosthesis would be confined to removal of the alignment device, completion in the transfer jig and finally, lamination and finishing. In this way we could reduce to a minimum errors introduced at the factory mainly in rectification of the male cast.

The method of cast-taking finally evolved is to employ hydrostatic pressure to shape the female cast.

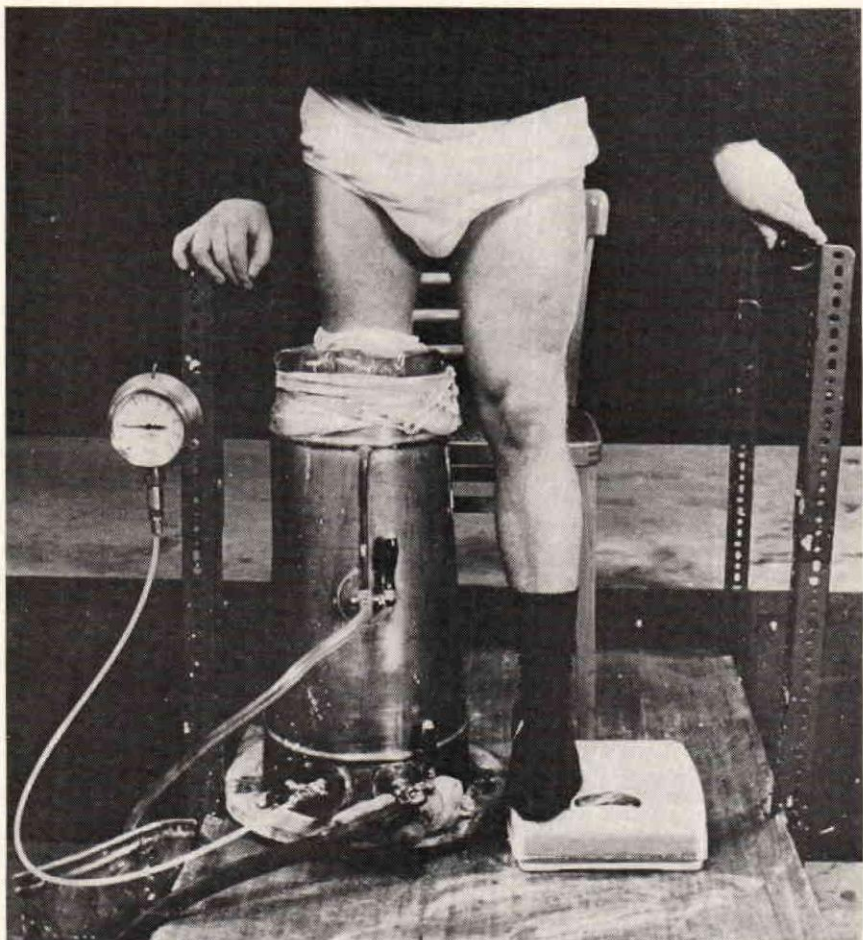
Plaster impregnated nylon stockinette is pulled over the stump which is protected by a 'sock' of nylon sheeting. The stump is then placed in a water tank and the nylon sheeting sealed around the rim with an elastic band. The patient then 'stands' with the stump in the tank with his weight supported by the water and maintains his balance with his hands on side-rails. The tank is so constructed that further water can be forced in or excess water drained off. Similarly allowance is made for the escape of air, from the 'collar' of nylon sheeting formed around the region of the knee. The water in this way moulds the plaster of Paris to the exact shape of the stump under load, compressing hard and soft parts proportionately.

The resultant female cast is removed from the patient and, without rectification, is strengthened and placed in a Socket Block, and then fitted with an alignment jig, foot and ankle.

The patient then has a trial fitting to establish the precise position of the patellar tendon bar. This is achieved by cutting a slot in the plaster socket and fitting an adjustable bar. This has the advantage over the technique used in producing the tendon bar in the Radcliffe limb as the exact size, shape and position can be determined accurately.

The male cast is then made to the exact shape of the female cast using a special technique to ensure easy separation. No rectification is carried out on the hardened male cast and the hard polyester resin socket is constructed on this basis. A second fitting with adjustable jig in position then takes place to ensure accurate alignment and length. The prosthesis can then be finished in the customary fashion.

Results so far have encouraged us to continue producing the prostheses with hard sockets although clearly a soft liner can be easily introduced at the appropriate stage of construction if desired. Furthermore when the female plaster cast is tested at the first fitting stage, rectification in the form of pads, e.g. over the calf muscle or over the antero-lateral area of the stump can be introduced. If this is done it is recommended that the pads be made of hard rubber rather than additional plaster of Paris as there is in the



The "Dundee" Socket

latter method danger of deforming the basic shape of the female cast. In this way the size, shape and general efficacy of the rectification pads can be tested on the patient and changed or discarded as need be. The only rectification employed in the sockets of limbs so far supplied has been in the form of a patellar tendon bar. This has been incorporated to hold the end of the stump off the socket in activities such as running, going up and down stairs, and jumping. With stumps of the osteo-myo-plastic variety little or no patellar tendon bar is required.

Recordings made at the time of cast-taking in the subjects so far fitted suggest that pressures imposed on the stump are between 3 and 6 lbs. per square inch according to the surface area of the stump and the weight of the patient. We hope in the future to determine more accurately the loads borne by the various parts of the stump.

Over ten patients have been fitted with prostheses fitted with 'Dundee' sockets with surprising gains in comfort. The elimination of the soft liner has incidentally produced a neater and more natural appearance. Fitting of these sockets by the method described has so far been confined, with one

exception, to patients dissatisfied with the orthodox Patellar Tendon Bearing Cuff Suspension prosthesis. The exception has been a patient with a primary amputation of the osteo-myo-plastic variety where the coincident development of a painless 'phantom' limb has produced a situation where he is unaware of his stump and describes his prosthesis, without prompting, as 'part of himself'. Nevertheless for the present, the 'Dundee' socket would seem to be best suited to the mature stump although experiments continue to accommodate changing stump dimensions.

Whatever the final form of the prosthesis, whether it has a hard socket or in addition a soft liner, one of the main objects has been achieved, viz. to eliminate two of the main sources of error in socket construction and to give the limb fitter in the peripheral centre a greater measure of control in the production of the finished prosthesis. We hope soon to start an extensive field trial of the method of cast-taking, the system of preliminary fitting and of the 'Dundee' socket itself.



AOPA MEMBERS ON VRA ADVISORY PANEL

Alvin Muilenburg, C.P.O. and H. Blair Hanger, C.P., Members of the advisory group on Prosthetics and Orthotics of the U. S. Vocational Rehabilitation Administration, inspect an upper extremity prosthesis made by a student at the Institute for the Crippled and Disabled in New York City.

Shown above with Mr. Muilenburg and Mr. Hanger are Siegfried Paul, C.P.O., instructor in orthotics and prosthetics at ICD, and Robert Mitchell, C.P., Director of the center's prosthetic and orthotic laboratories.

The devices shown in the background of the picture were also made by students in the ICD training program, which is conducted under a VRA grant. Some 200 devices were made in the course of their training by the 1965 graduates. These appliances have been presented by ICD to the World Rehabilitation Fund for distribution to destitute disabled persons in foreign countries.

Dr. Howard A. Rusk, President of the World Rehabilitation Fund, accepted the appliances, which include prostheses, braces, surgical garments and other devices, and expressed his appreciation for the ICD's donation.

Translation and Abstract Service

Editor's Note: A translation and abstract service for members and other readers of the *Orthopedic and Prosthetic Appliance Journal* was authorized by the Directors of the American Orthotics and Prosthetics Association in November, 1965. This service will provide for the reprinting of translations of prosthetic and orthotic articles from foreign periodicals, and summaries of articles from medical periodicals, and will offer literature of value to Certified Orthotists and Prosthetists, AOPA members, and interested readers.

The Abstract and Translation Committee is composed of:

William Tosberg, New York, N. Y., *Chairman*

Robert O. Nitschke, Syracuse, N. Y.

Camille Corriveau, Montreal

Siegfried Paul, New York, N. Y.

Nunzio Pulizzi, Williamsport, Pa.

Laurence Porten, Pittsburgh, Pa.

W. N. Peterson, Montreal

Fred Karg, Hollywood, Calif.

W. B. Peterson, Montreal

Siegfried Jesswein, Birmingham,

Jesus Nunez, Santa Ana, Calif.

Mich.

Donald Strand, Oakland, Calif.

Kurt Marschall, Syracuse, N. Y.

With this issue, the first two translations (by AOPA members Laurence Porten and Siegfried Jesswein) are made available to our readers. The *Journal* wishes to express its appreciation to the editors of *Orthopaedie-Technik* and to the German Association, Orthopaedie Chirurgiemechaniker und Bandagisten Handwerk, for permission to publish these translations.

Functional Treatment of Infant Spinal Deformities With a New Bandage (Harness)*

By MANFRED KALLABIS, M.D.

Munich, West Germany

Translated by LAURENCE PORTEN, C.P.O., O.M.M.

(Orthopedic Master Mechanik)

Pittsburgh, Pennsylvania

The most widely used treatment of spinal deformities to date is the application of plaster casts, especially plaster beds in conjunction with physiotherapy. However, this method lacks efficiencies which are pointed out as:

A too rigid fixation of the spinal column which restricts needed activity and leads to atrophy of the muscles and bones. The use of straps to tie the infant's legs and arms to the cast appears barbaric to the parents.

Therapeutic provocations such as brushing and tickling on the outside of the curvatures soon will tire the children and do not provide the expected results.

The making of a corrective plaster bed requires the help of two to three people, two of whom have to concentrate on the correction of the spine, and sometimes medication is necessary to quiet the baby. Also, due to rapid growth, the casts have to be replaced every 4 to 6 weeks.

In spite of the best care and attention, it is impossible to avoid soilage of the cast with excrement and urine.

* Translated and reprinted with the permission of the author and the publisher from *Orthopaedie-Technik*, Wiesbaden, Germany, Heft 8: August, 1964.

Due to hygroscopy of the plaster of paris to attract water, the plaster bed is always cool and the children are bound to have colds, and the parents neglect to put them into the beds. If the children are too warmly dressed to avoid colds the plaster beds, which are molded to the naked body, do not fit properly any longer and the correction is practically nil.

In any case, an exact ambulatory treatment in the parents' home is troublesome and very few parents follow doctor's orders systematically. Stationary treatments must be done in hospitals, which are expensive, and a new method is sought which eliminates these difficulties.

The author claims to have developed a simple but effective bandage (harness) which permits a permanent functional treatment of spinal deformities in the breast region of infants. With this bandage it is possible to correct the dorsal scoliosis at the vertex of the vertebrae by rotating the pull direction without disturbing all other normal movements of the spinal column in the upper and lower region.

Note: The following illustrations were supplied by Dr. Kallabis and received by Mr. Porten just as this issue of the *Journal* was going to press. At Mr. Porten's suggestion, the new illustrations and captions are substituted for the illustrations in the article as originally published in *Orthopaedie-Technik*.

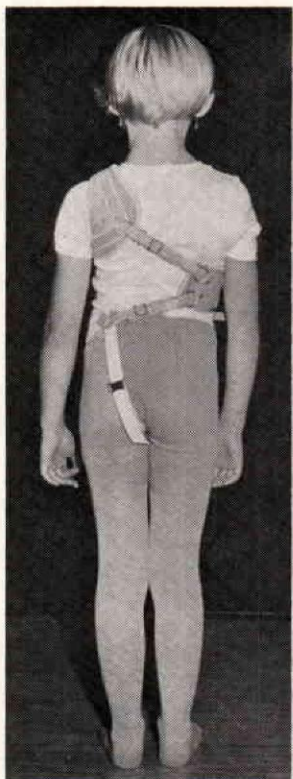


Figure 1



Figure 2

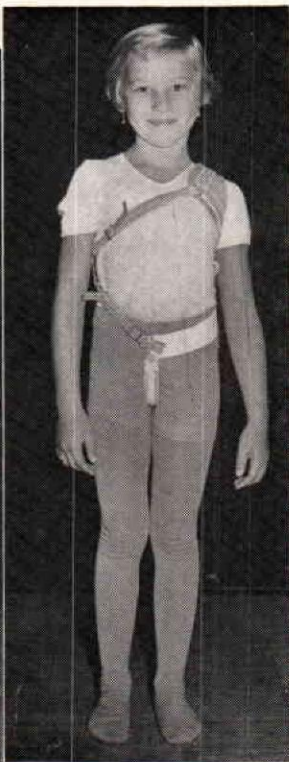


Figure 3

Figures 1 - 3—An 8-year-old child fitted with the bandage. It is fitted and worn over underwear, is practically invisible, and does not restrict normal movement.



Figure 4



Figure 5

Figures 4 - 5—The effect of the bandage on a $3\frac{1}{2}$ -year-old boy, showing the reverse rotation of vertebrae affected by scoliosis.

In summary, as long as the bandage is applied, the child will retain its freedom of movement above and below the vertex of the scoliosis, and extension and expansion, stretching and bending, are unrestrained and the muscles will not suffer from atrophy.

Description: of the Scoliosis Bandage

The construction of the bandage is very simple and four different sizes are sufficient for individual curvature treatments from infancy to approximately five years of age. The bandage consists of:

(a) A conical, funnel-shaped shoulder harness made from leather or durable felt and covered with soft leather which fits snug to the shoulder. A strong trapezoid-shaped elastic webbing with metal rings in front and back is fitted into the shoulder harness.

(b) A chest pad (pelotte) made from felt and covered with soft leather, with an adjustable elastic web fastened to the top of the pad.

(c) Four adjustable leather bridle straps, the ends of which are connected by metal rings to the pad in a criss-cross fashion. The free ends have a hook device and connect into the pad rings. Two straps are always used together to connect the shoulder harness with the chest pad (pelotte) and the chest pad with the pelvis harness (sling).

(d) The pelvis sling is made from two simple web straps which fit in a semicircle, pass through metal rings vertically at the ends together, and are moveable. The web strap which applies variable pressure to the symphysis is adjustable in gradual steps.

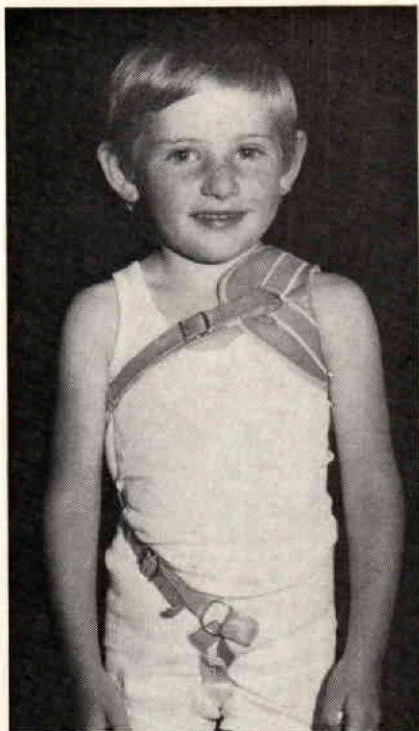


Figure 6

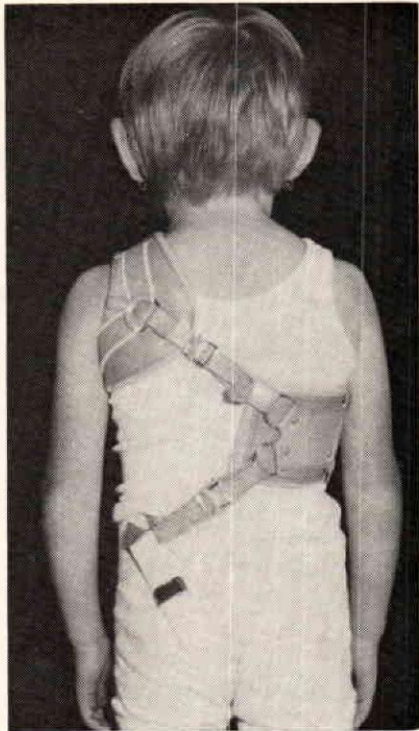


Figure 7

Figures 6 - 7—The bandage fitted to a 5-year-old girl. Note that the pelotte (pad) does not apply pressure from the side, but from below the humpback to secure the right correction.



Figure 8



Figure 9

Figures 8 - 9—The bandage applied to a 6-month-old infant with a congenital hip luxation in addition to a large C-shaped scoliosis. The pictures demonstrate that both afflictions can be treated at the same time without restricting the child's normal movement.



Figure 10



Figure 12

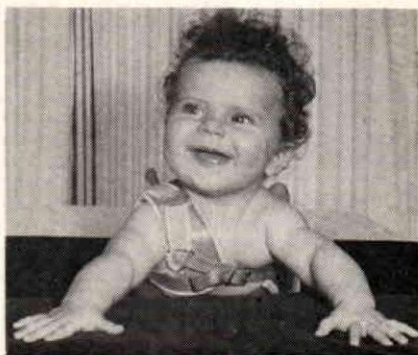


Figure 13



Figure 11

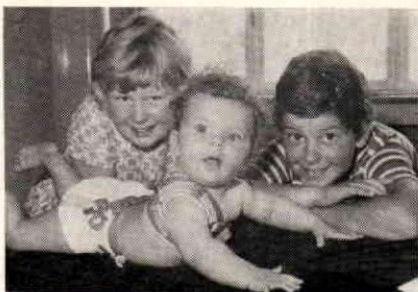


Figure 14

Figures 10 - 14—Five photographs of an infant playing with his brother and sister offer further proof of the value of this new correction bandage. The belly position is particularly valuable since it increases the effect of the reverse rotation of the bandage on the afflicted vertebrae during active play.

Application of the Bandage

The shoulder harness (a) will be applied to the outside of the scoliosis and the chest pad (pelotte, b) to the opposite side of the chest below the armpit. The ventral and dorsal bridle straps are hooked into the shoulder harness rings and tightened by means of the buckles until the pelotte fits snug to the body and the armpit.

The pelvis sling is applied next in such a fashion that the horizontal web strap fits above the crest of the ilia and the vertical strap between the legs and over the symphysis. The two lower bridle straps are hooked into the rings like the ones on the shoulder harness and tightened by means of the buckles until the chosen reversed scoliosis correction is accomplished.

The first fitting and adjustment should be done by the attending physician and an X-ray control is advisable. Further application and re-

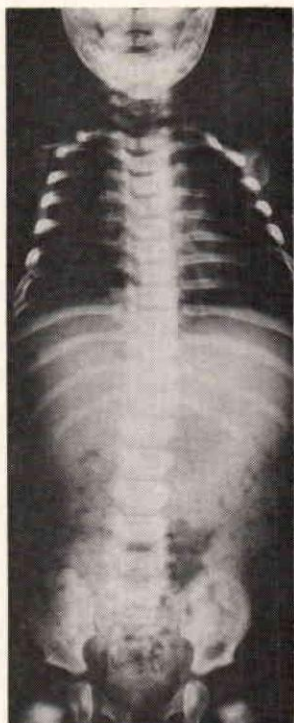


Figure 15

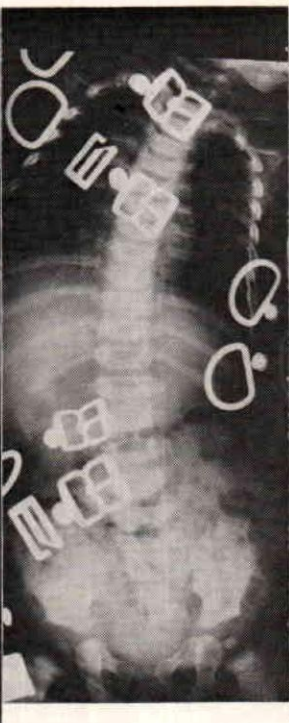


Figure 16



Figure 17

Figures 15-17—(a) A reduced X-ray picture shows a slight C-shaped infant scoliosis with a slight torsion and rib hunchback. (b) The same scoliosis curvature reversed by the new bandage. (c) Same scoliosis after 2 months treatment with the bandage. Attention is called to the fact that the scoliosis correction has improved, but the control was overlooked and delayed, and the result is a reversed thoraxes-symmetry.

removal of the bandage by laymen is simple. If diapers have to be replaced, only the front pelvis strap has to be unhooked, and the baby's leg can be pulled out of the leg sling. For removal of the whole pelvic harness, the second hook which connects the front strap and shoulder harness must be unhooked. To restore the previous position, both hooks are snapped on again and nothing can go wrong.

It has been our experience that all the children fitted with the new scoliosis bandage get used to it in a short time without changing their daily habits. We are of the opinion that treatment and therapy of dorsal scoliosis in infant cases can be administered in a shorter time and more cheaply and comfortably for both the children and the parents.

Future treatments (except for special cases) should be in the hands of accredited orthopedic doctors whose main task is to keep control over the proper adjustment of the bandage, and with the help of X-rays to reach the desired and attainable correction. The parents who are in charge of the child should bring him regularly to the doctor's office.

Due to our past experiences we feel it is possible to have older children fitted with this bandage just as long as the process of growth is not finished, as this will at least restrict the developing scoliosis and perhaps improve the condition until time for corrective surgery.

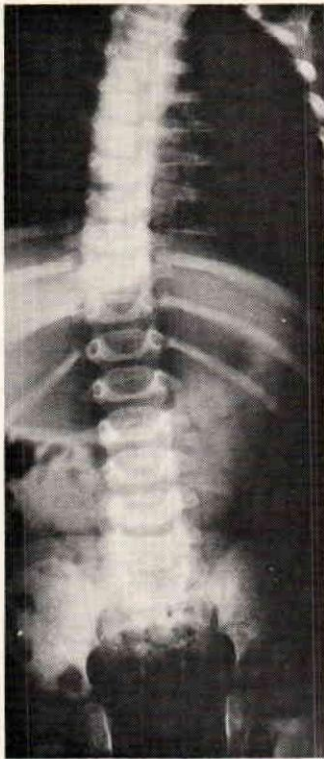


Figure 18

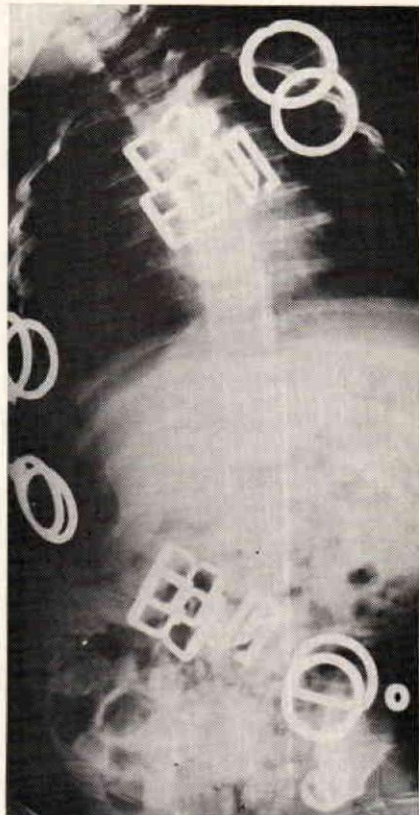


Figure 19

Figures 18 - 19—(a) A more pronounced C-shaped scoliosis of a year-old infant. (b) The same scoliosis after bandage has been applied and the reverse rotation at the vertex and its fixation is clearly visible.

Summary

Preliminary report about the introduction of a newly-designed bandage or harness to influence or reverse the rotation of the vertebrae which are affected by scoliosis. This bandage will allow the child, without hindrance, every normal movement like sitting, standing, running, etc.



Figure 20

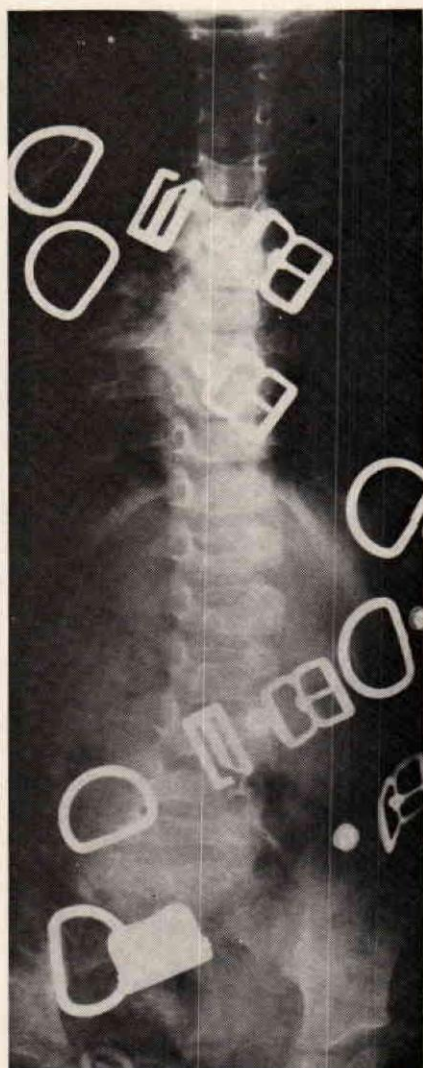


Figure 21

Figures 20 - 21—(a) A severe lumbar scoliosis with torsion caused by transitional disturbances—incomplete curve conclusion—of the last lumbar vertebrae of a 4½-year-old boy, taken in standing position. (b) The same scoliosis just after application. Since the scoliosis is loose and slack, the immediate corrective effect of the bandage is clearly noticeable.

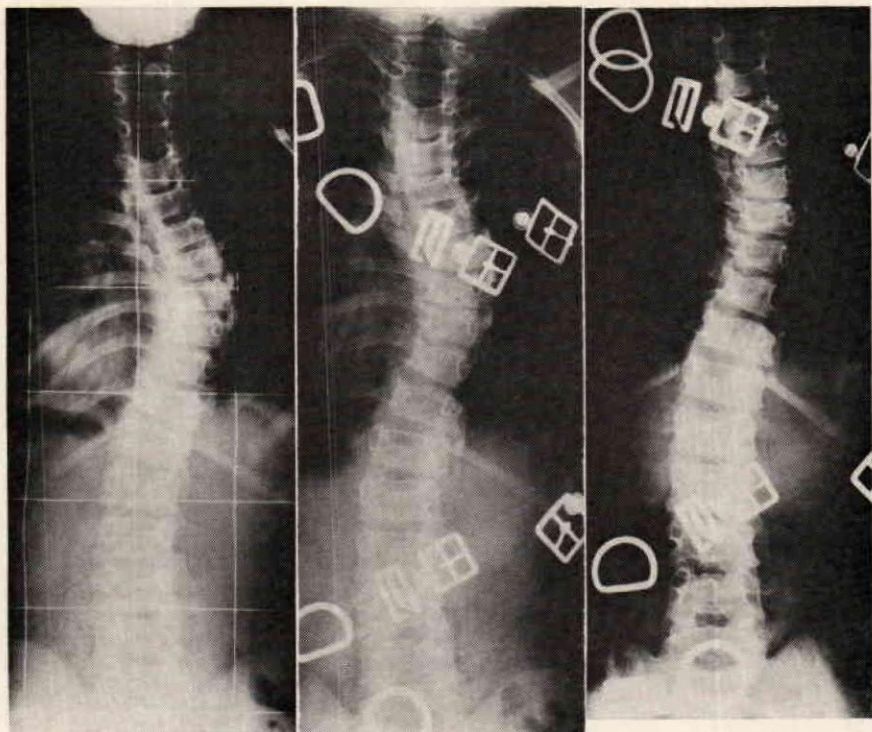


Figure 22

Figure 23

Figure 24

Figures 22 - 24—(a) A severe thoraxal scoliosis with torsion and vertebrae deformity of an 8-year-old boy. (Pictures taken in standing position). (b) The same scoliosis just after application of the bandage, with slight improvement already showing. (c) The same scoliosis spinal column 4 months later, showing the improved erect position which is credited entirely to treatment with the bandage.



Figure 25

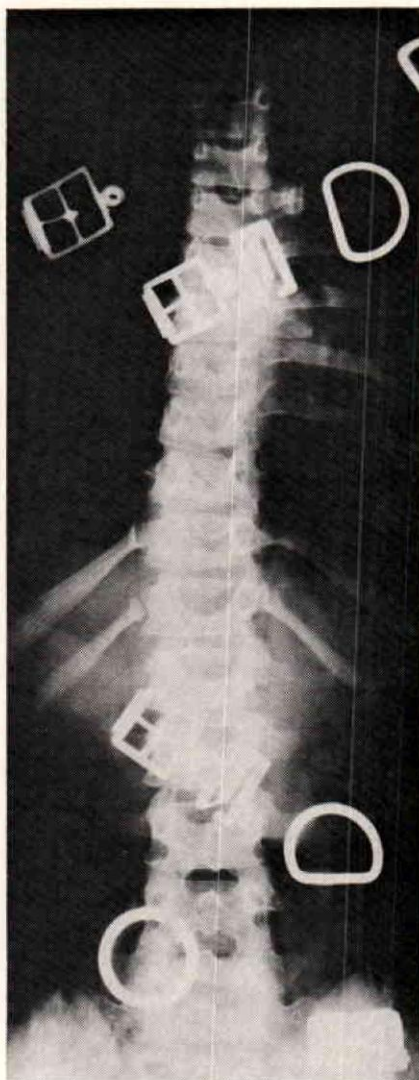


Figure 26

Figures 25 - 26—(a) A beginning thoraxal scoliosis in a 7-year-old girl. (Pictures taken in standing position). (b) The same scoliosis after 4 weeks of treatment with the bandage. A slight loosening of the scoliosis may be noted. Goal of the treatment is to arrest the progression of the scoliosis and achieve a more favorable situation for a later operation, or eventually to avoid such an operation entirely.

Corrective Splints for Club and Drop Hands Due to Dysmelic Disabilities*

By HERBERT SCHIEFEL

Orthopaedic Clinic, University of Muenster, Germany

Translated by SIEGFRIED W. JESSWEIN, C.P.O.

Birmingham, Michigan

The pathology of the thalidomide embryo encompasses all types of deformities. Prevalent are those of the upper and lower extremities caused by the action of the thalidomide on the embryo.

Thalidomide, containing the drug known as "Contergan" in West Germany, is generally held responsible for the catastrophic results which particularly affected the birth years between 1960-62. Due to the particular and problematic conditions of the misformed extremities the Orthopedic Technician was from the start engaged in the rewarding task of combatting these deformities. One of the most important pre-requisites for daily living activities of those severely handicapped children is to improve the usefulness of their arms and hands by mechanical means—if that can be done at all.

When we began the construction of these mechanical means we lacked experience and had only very primitive splints at our disposal. In February 1963 a special department for dysmelics was opened in our clinic. Through research and a great deal of trial and error we developed a new corrective hand splint showing definite improvements over previous ones.

Since then approximately 100 children have been fitted with these splints. No patent will be filed, but we hope that these unique splints will find appreciation and are therefore describing them below. The corrective club hand splint consists of only two major components, yet is finely adjustable. The particular qualities of this splint are its clear and economic construction giving maximum effect through a minimum effort.

Fig. 1 shows a severe club hand condition of an approximately 18 months old girl. Fig. 2 shows the same hand fitted with the corrective splint. Correction is very noticeable. The spring, constructed of a 1.5mm wire, pushes the hand toward a more normal position. The tension of the spring does not stop the normal hand motions but only limits them. The white knurled knob permits increase or decrease of spring tension. In order to increase or decrease dorsiflexion the nut directly above and to the right (as seen in Fig. 2) must be loosened and the base of the spring turned.

By varying the direction of the spring wire arm, which is directly connected to the palmar piece, pronation or supination of the hand may be influenced.

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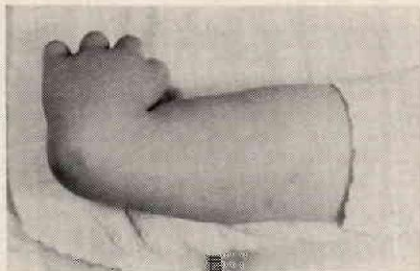


Figure 1

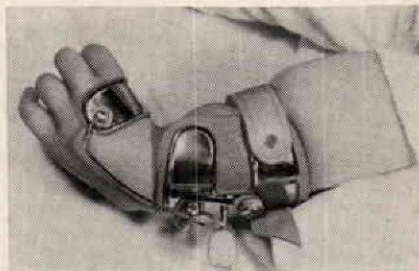


Figure 2

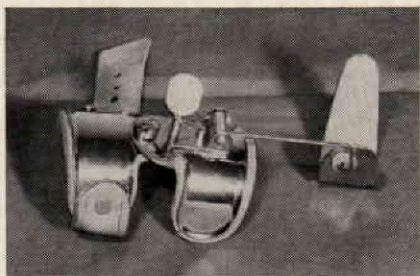


Figure 3

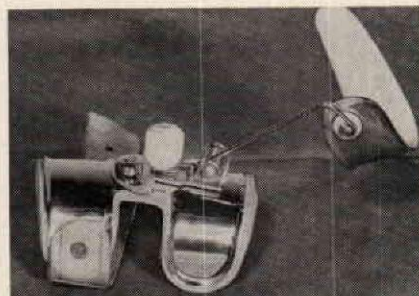


Figure 4

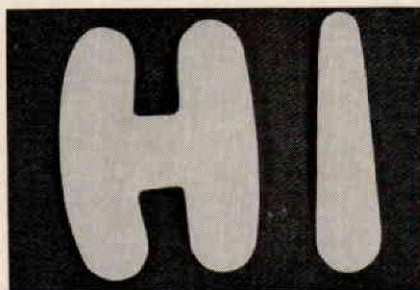


Figure 5

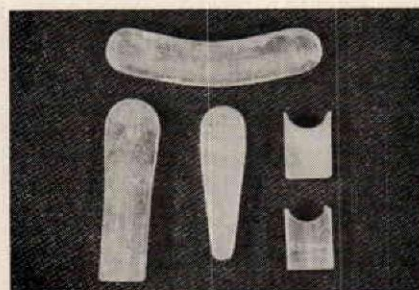


Figure 6

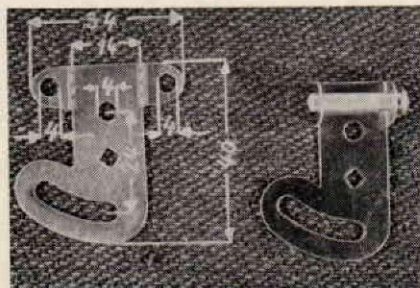


Figure 7

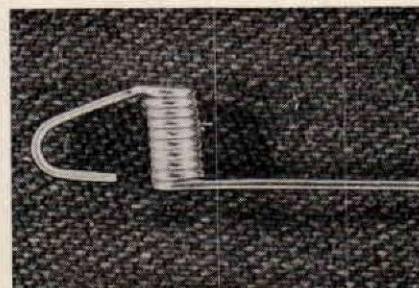


Figure 8

The position of initial adjustment may be considered correct when the white knob, as seen in Fig. 2, has been nearly turned off the threaded stud and yet the spring possesses sufficient force to influence the hand toward a corrected position. Clockwise turning of the knob increases the tension of the spring and thus increases the corrective force acting on the hand.

To fabricate this splint a plaster cast is not necessary. This we consider particularly favorable since all components are quite small. Also, to obtain a satisfactory cast with these small and restless children is very difficult.

It suffices entirely to cut a paper pattern of the "H" shaped forearm and the palmar piece (Fig. 5). One should be careful not to cut the forearm part too long so as not to interfere with elbow flexion. Saving of all patterns may come in handy for future re-use.

For material a hard rolled stainless steel of $\frac{1}{2}$ mm thickness is used.

The patterns are transferred to the SS (grain of SS being unimportant) and cut out on a fine toothed metal band saw.

In order to prevent skin pressure the edges are smoothed and slightly rolled. By means of some simply made tools this rolling can be easily and neatly done. Fig. 6 shows these tools. They were made of approximately $\frac{1}{4}$ " dural round stock. The rolling is performed by placing parts and tools in a vise and pressing them together.

The forearm and palmar components are hammered over a concave block of wood (lead) and shaped to the desired form. The carrying and guiding component as well as the "T" shaped section plate are fitted with the holes and cut-outs as seen in Fig. 7. The two 4mm holes receive the studs employed to hold the spring. In the middle, below the other two holes a third one is drilled. This hole is fitted with a pin with a 3mm off-set and riveted to the forearm unit. This then becomes the point of rotation for the unit. A 4 by 16mm long threaded stud is riveted into the square hole. Another 4mm threaded stud, squared on one end, is then riveted to the forearm part passing through the elongated slot. When later fitted with a nut this part permits dorsiflexion positioning. A 1.5mm spring wire is used for the fabrication of the spring. The coil consists of about 9 turns wound over a 4mm drill. To begin with the shank should be allowed to be of adequate length. The opposite and shorter end is "U" shaped and wrapped around the long threaded stud.

When fabricating the spring, left or right winding must be observed in order to apply to the left or right hand respectively. The adjustment knob has a 4mm inside thread and consists of "Polyamid," a fiber of the perlon family (nylon). It is easily made on a lathe. The head of the knob should be knurled for better gripping. The thread in the knob should be loose so as to permit turning by hand, but not so loose as to permit accidental turning by the child.

The characteristics of Polyamid are very advantageous. It allows for a tight fitting knob which however is easily turned by an adult. The assembly of all parts is quickly done. The spring with its coil is inserted and held in place with a small guide pin—which will be riveted after the fitting. The adjustment knob is then placed on the threaded stud, see Fig. 9. The assembled part, with the adjustment knob, and spring is then mounted to the forearm shell. A synthetic washer of approximately 15 by 15mm is placed between the pivoting parts.

Prior to the fitting the forearm shell should be slightly padded with a 3mm fairly dense sponge rubber and be fitted with a small leather strap. The splint should now be fitted. Particular emphasis should be given to the

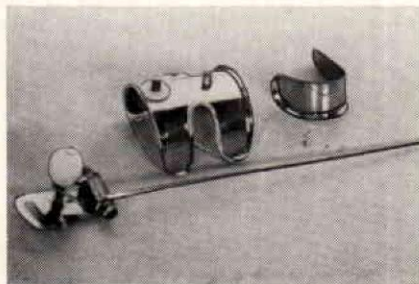


Figure 9

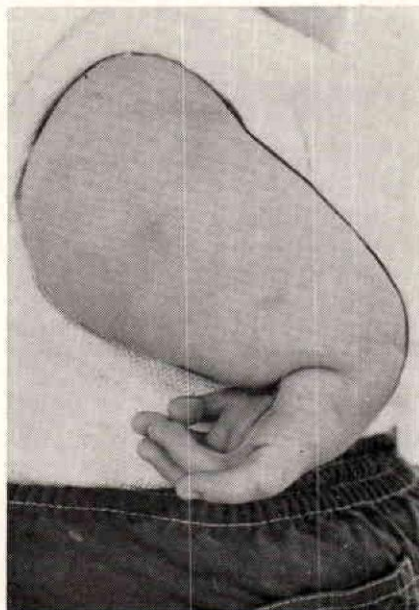


Figure 10

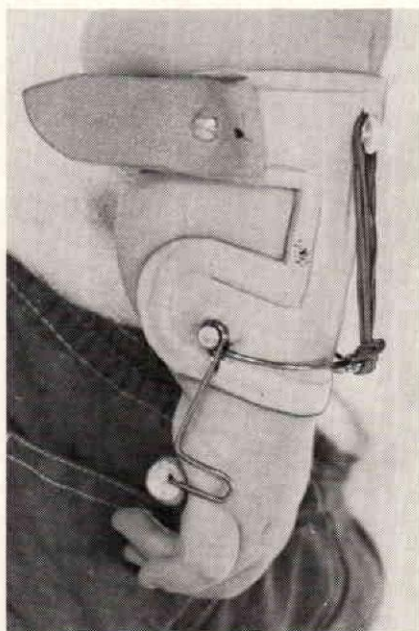


Figure 11

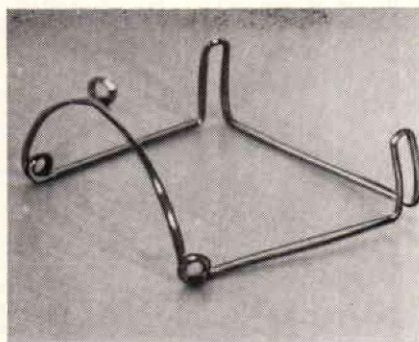


Figure 13

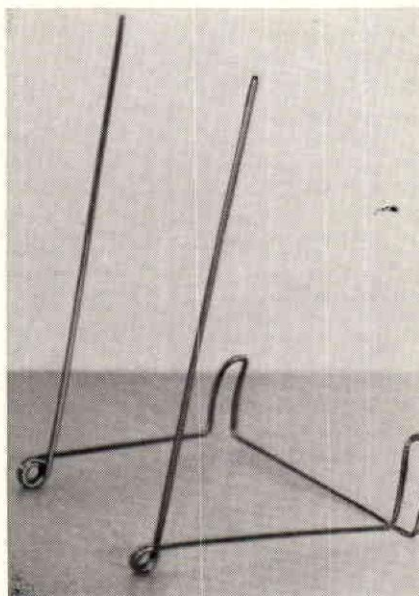


Figure 12

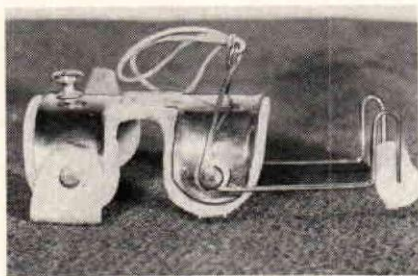


Figure 14

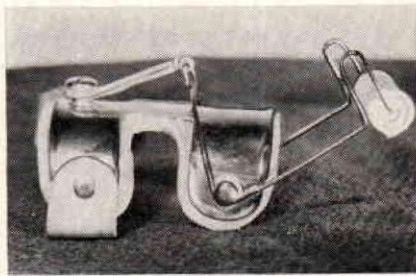


Figure 15

fit of the palmar piece. It must in no way limit prehension. Its narrowing as it encircles the hand should be noted.

The spring should be cut to the correct length, bent to an angle as seen in the pictures, and the end bent into a small loop. The palmar piece is riveted to the spring with a 3mm rivet with a washer in between. The palmar piece is then padded with a soft leather. Covering of the entire splint has been abandoned. The SS can be highly polished and thus give a lasting and more attractive appearance.

Parties interested in obtaining this splint can obtain small quantities of the components as seen in Fig. 9, directly from us. The control unit with the spring will fit all sizes of splints. It should merely be stated whether it is for the left or right hand.

Fig. 10 shows an extreme drop hand of a two year old. In order to lift this hand we fitted a spring-type corrective splint. The splint is simple, light and durable. Fig. 11 shows the same arm with the applied splint. The result is very satisfactory. Measuring for this splint is similar to the one previously described. In this instance the forearm shell is not applied to the ulnar side of the arm, as is the club hand splint, but to the dorsal side. In order to determine the size of the bail-like spring, a tracing of the forearm and hand is needed. The size and shape of the spring bail is correct when the two coils—which serve as rotation points—are congruent with the wrist joint and the bail is well fitted in the palm without hindering prehension. The bail passing through the hand will be covered with felt—constituting a roll.

The bail is made from a 1.5mm spring wire. Fig. 12 shows its shape. The loops are formed by winding the wire around a 4mm drill—giving it $1\frac{1}{2}$ turns. Two rivets, passing through the loops, will fasten the bail to the forearm shell. The lateral projections on the forward part of the bail prevent the hand from sliding off—as well as helping in the correction of adduction or abduction. These projections should be padded with a sponge rubber. The two ends will be shaped into a semi-circle and soldered. A small eye is then soldered to the center of the semi-circle. See Fig. 13. The lift of the hand is obtained by passing small rubber bands through the eye and over the stud of the forearm shell. The tension can be varied by the winding or unwinding of the rubber bands around the stud. See Fig. 14 and 15.

In Fig. 11 one of the older models is shown which previously were covered with leather.

Some Observations in the Field of Orthotics in Israel and the Scandinavian Countries

By MAXWELL H. BLOOMBERG, M.D., F.I.C.S.

73 Cedar Street, New Britain, Connecticut

Israel

During the month of May 1965, I was privileged to give a course in Orthotics at the Tel Hashomer Hospital, Israel, under the auspices of Professor Ernst Spira of the University of Tel Aviv. I had the opportunity to visit the Prosthetic and Orthotic shops at the Tel Hashomer Rehabilitation Center and those of Haddasah Hebrew University in Jerusalem.

Israel, a young energetic country, composed of a large segment of highly educated and well trained people, is particularly interested in the accelerated progress of all phases of living. The study of Prosthetics and Orthotics is no exception. One can't help being impressed with the youthful attitudes of the desire to learn new methods and techniques.

There are about 74 Orthotists and Prosthetists in Israel, many having received their training in the United States. All braces are closely evaluated to determine their usefulness. Many new braces are being tested. The use of aluminum is a problem because of erosion from perspiration and sand. This problem is being solved by the use of coating to prevent disintegration of the metal. Pre-fabricated parts as made in the United States and West Germany are still in small supply. Considerable interest is shown in the desire to progress in this direction.

Their enthusiasm to show progress is beyond description. In one instance, Jimmy Shaltiel, Orthotist for the University of Jerusalem, visited me at the hotel at midnight for a "discussion." This discussion lasted for several hours terminating in his brace shop in the early morning hours. It is remarkable what work in quality and quantity can be produced in a small shop. I wonder what he might accomplish with more modern equipment. Jimmy expressed a desire to exchange ideas with other Orthotists. His address is P.O. Box 1222, Jerusalem, Israel. He is particularly interested in Scoliosis and he is doing excellent work with the use of the Milwaukee Brace.

Scandinavian Countries

In the countries I visited there were many combined Orthotic and Prosthetic shops with 100 or more employees—usually part of a large hospital complex. They are run efficiently in their own way. Most of their supplies including pre-fabricated parts and plastics are imported from West Germany. A plastic commercially known as Ortholen has replaced the metal cuff of short and long braces. This plastic, beige in color, is hard, light weight, heat controlled, and can be drilled, sawed, fashioned cold by hammering and may be cupped as desired. It is supplied in sheets in varying thicknesses.

At the Orthopedic Shop Sahlgrenska Sjukhuset, Gothenberg, Sweden, Mr. Ake Magnuson demonstrated a new method of coating aluminum by incorporating a powder in the heated metal. The powder "Rilson" is blown on heated aluminum forming a smooth coating which does not chip even with hammering. Many plastics are used in this shop.

Norway is attempting to solve the problem of lack of coordination between the Orthotist and the Physician. Dr. Thomas Wyller, an Orthopedic Surgeon, operates once a week in the local hospital and the remainder of the week is spent in the Orthotic and Prosthetic shop. A clinical session is held weekly. An extensive program is being planned to include research as well as expanding the clinic. Dr. Wyller is particularly interested in the use of the Milwaukee Brace.

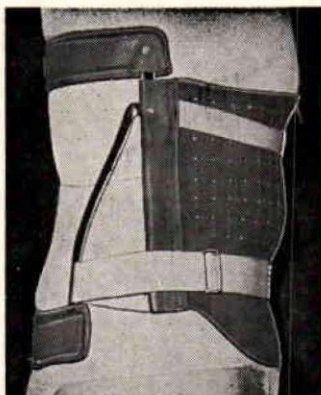
In Helsinki, Finland, Professor Kallio at Toolo Hospital, is interested in the immobilization and mobilization of joints and is coordinating this work with the Orthotic shops.

My regrets are that I was not able to stay for a longer period of time.



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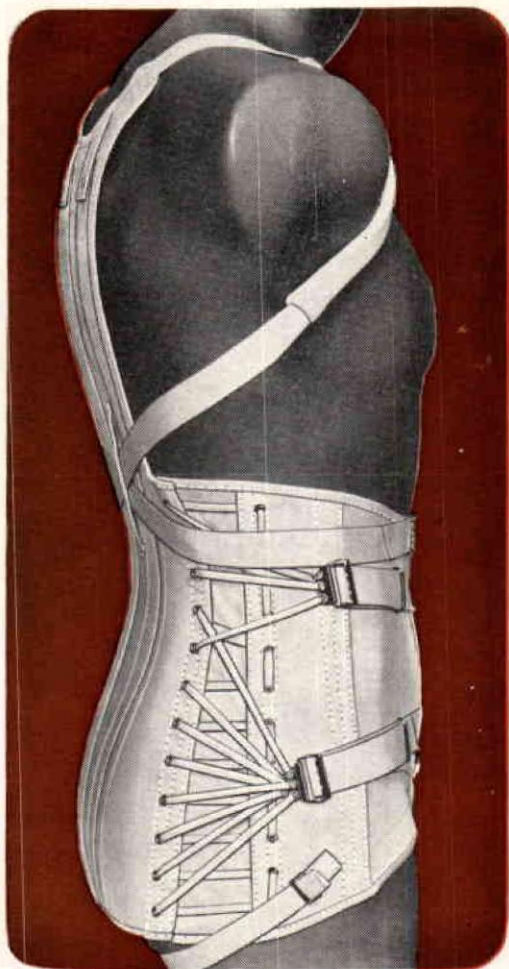
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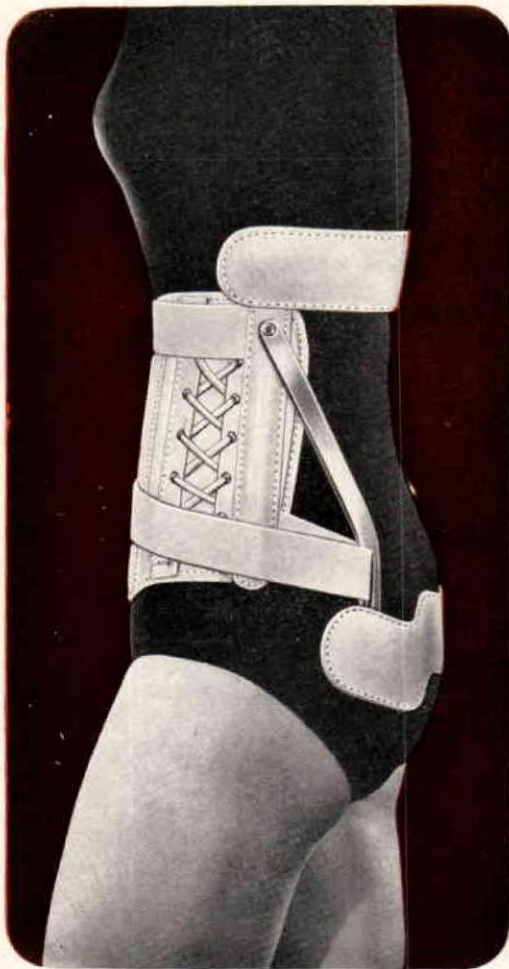
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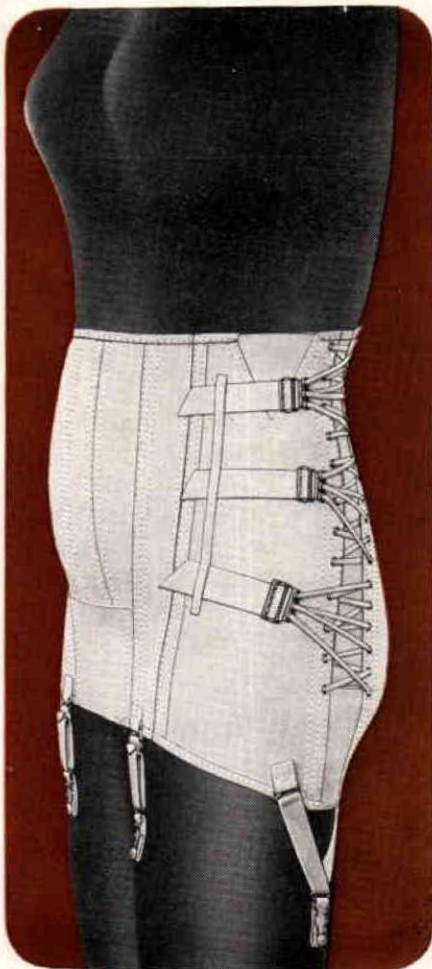


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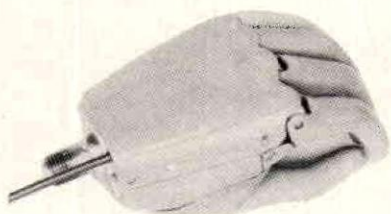
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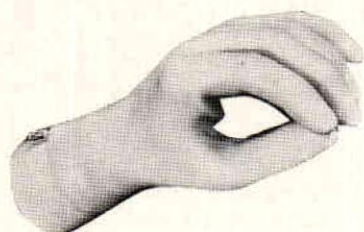


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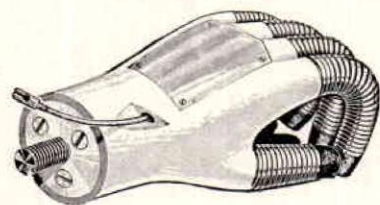
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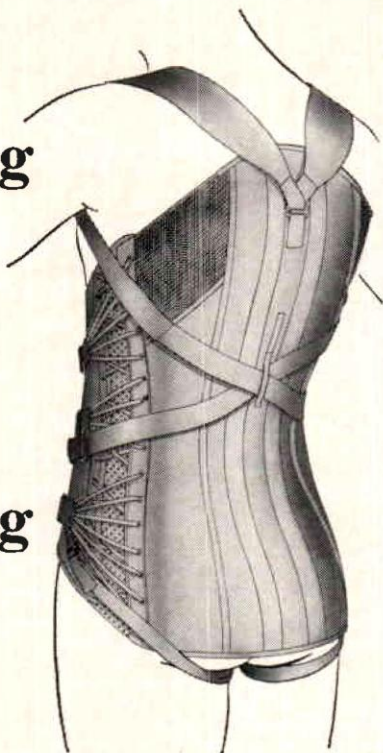
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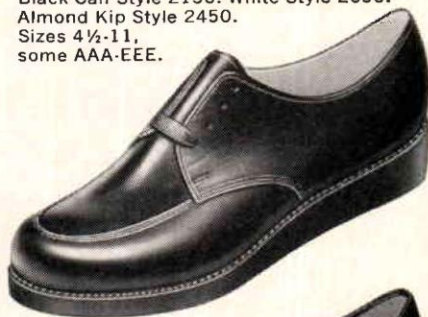
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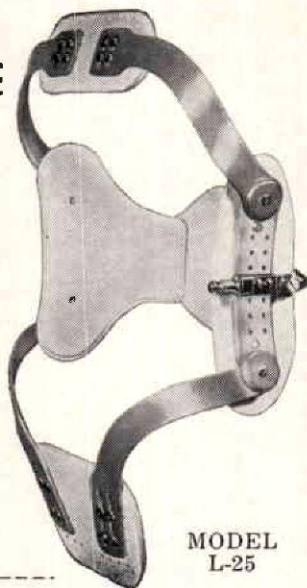
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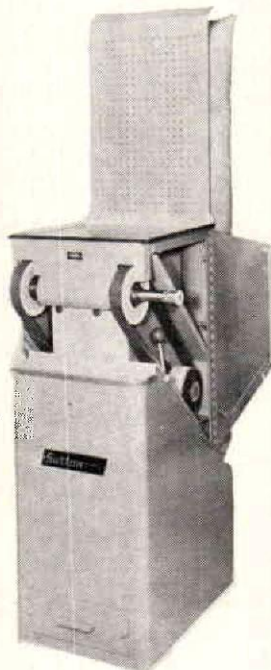
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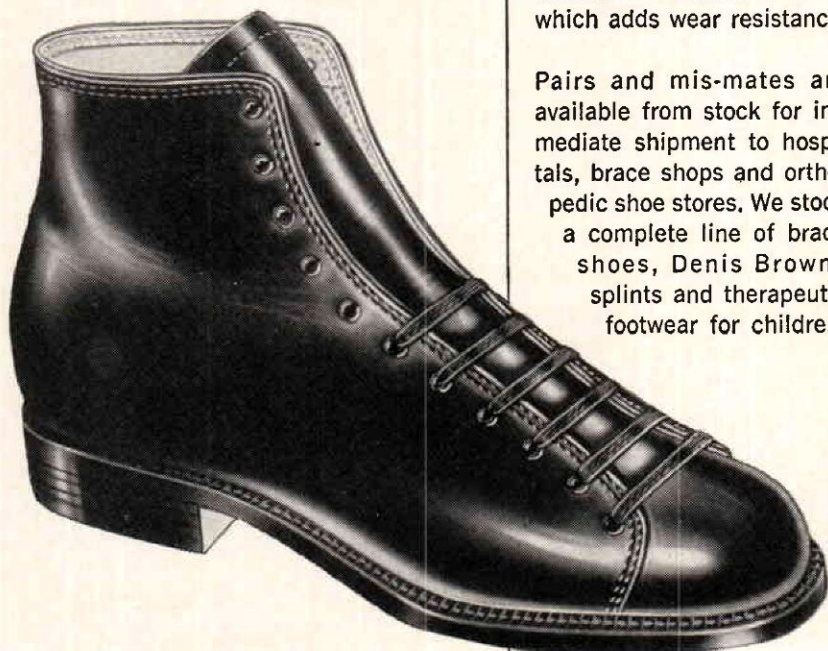
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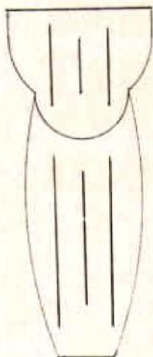
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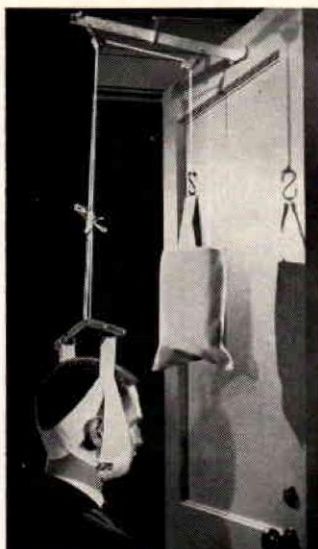
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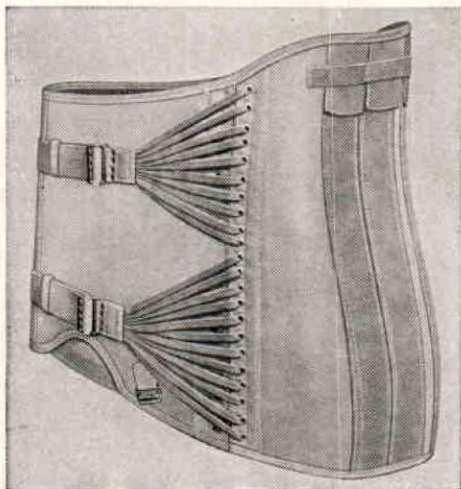
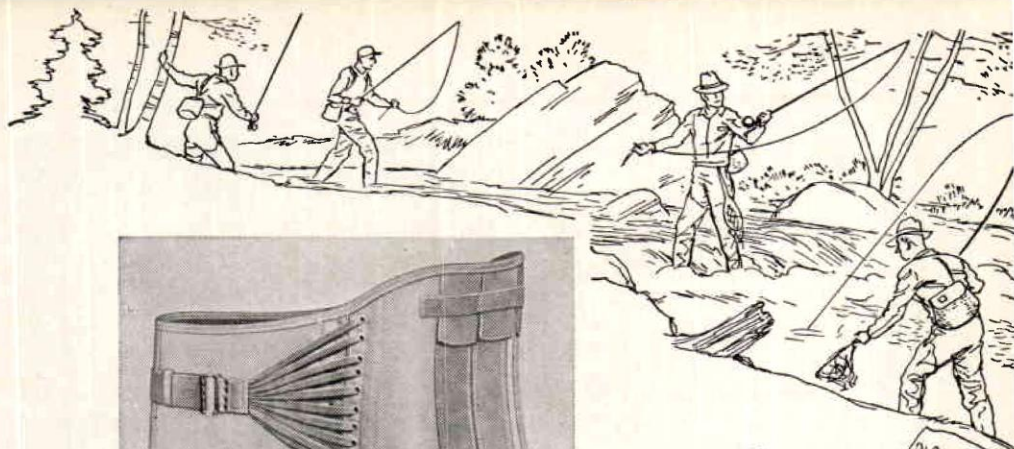
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