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Orthotics and Prosthetics

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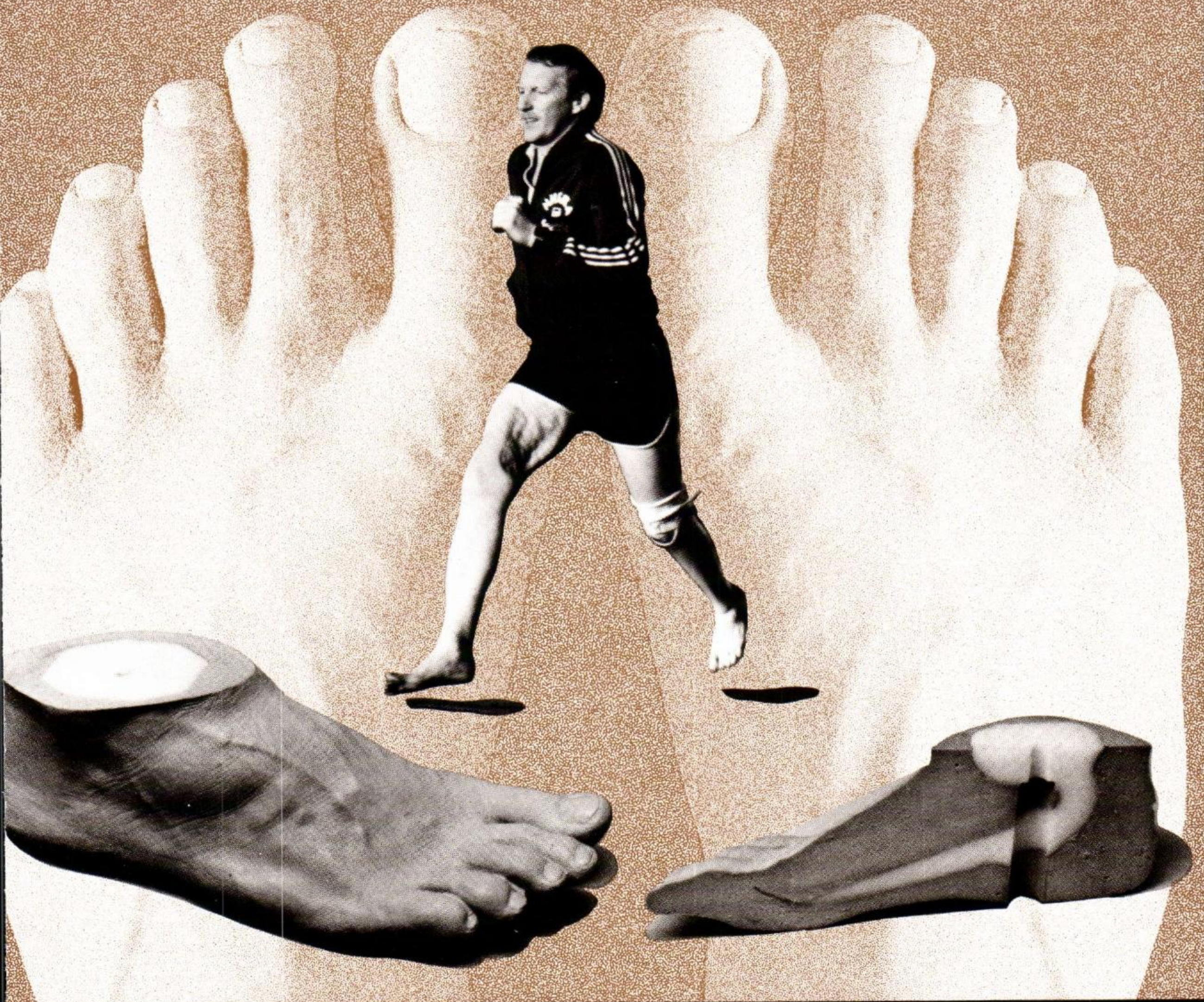

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1987

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August 7–8, Texas Association of Orthotists and Prosthetists and the Texas Chapter of the American Academy of Orthotists and Prosthetists Combined Meeting, Corpus Christi, Texas. Contact: Mike Allen, CPO, 2504 West Ohio, Midland, Texas 79701; tel. (915) 683-5280.

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August 17–21, Motion Control course, "Fitting Procedures for the Utah Artificial Arm and Hand Controller," 916 Area Vo-Tech Institute, White Bear Lake, Minnesota. Contact: Harold Sears, Ph.D., 95 South Elliot Road, #105, Chapel Hill, North Carolina 27514; (919) 968-8492.

August 20, GRAPH-LITE Orthotics, DAW Advanced Continuing Education Seminar. Contact DAW Industries, 5360-A Eastgate Mall, San Diego, California 92121, 1-800-824-7192.

August 21–22, Anatomical Design/Narrow ML Casting Brim, Advanced Modular Prosthetics. DAW Advanced Continuing Education Seminar. Contact DAW Industries, 5360-A Eastgate Mall, San Diego, California 92121, 1-800-824-7192.

August 21–22, Academy Continuing Education Conference, "Sports Injuries and Recreational Prosthetics," Amway Grand Plaza Hotel, Grand Rapids, Michigan. Contact: Academy National Headquarters, (703) 836-7118.

August 21–22, Charleston Bending Brace Seminar, Radisson Plaza Hotel, Orlando, Florida. Contact: Julie Sayago, Charleston Bending Brace Seminars, P.O. Box 1070, Apopka, Florida 37204-1070, or call 1-800-327-0073.

September 6–10, International Seminar on Prosthetics and Orthotics, Dan Accadia Hotel, Herzliya, Israel. Contact: ISPO 1987, P.O. Box 50006, Tel Aviv 61500, Israel; tel. (03) 654 571; TELEX: 341171 KENS IL, Fax: 972 3 655674.

September 11–12, Ohio Orthotics and Prosthetics Association/Ohio Chapter, American Academy of Orthotists and Prosthetists combined meeting, "Bridging the Profession," Dayton, Ohio. Contact: Norma Jean Finissi, Executive Director, O.O.P.A./Ohio A.A.O.P., 4355 North High Street, #208, Columbus, Ohio 43214; tel. (614) 267-1121.

September 21–27, AOPA Annual National Assembly, Hyatt Regency Hotel, San Francisco, California. Contact: AOPA National Headquarters, (703) 836-7116.

September 28–30, Hosmer Electric Systems Workshop and Seminar, Hosmer Dorrance Corporation, Campbell, California. Contact: Catherine Wooten, Hosmer Dorrance Corporation, 561 Division Street, Campbell, California 95008; tel. (800) 538-7748 or (408) 379-5151.

October 2–3, New York State Chapter AAOP Fall Seminar, Sheraton Inn and Conference Center, Utica, New York. Contact: David Forbes, CPO, (315) 736-0161.

October 9–10, Freeman Two-day Orthotic Fitters Workshop, Reno, Nevada. Tuition free. Contact: Cameron Brown 1-800-253-2091, in MI 1-800-632-2015.

October 12–15, Middle East Medicare 87 Exhibition, Exhibition Centre Bahrain, Bahrain. Contact: Garald G. Kallman, Kallman Associates, 5 Maple Court, Ridgewood, New Jersey 07450; tel. (201) 652-7070.

October 23–24, Academy Continuing Education Conference, "Hi-Tech in Prosthetics and Orthotics," The Lincoln Hotel, Dallas, Texas. Contact: Academy National Headquarters, (703) 836-7118.

October 24, Academy Northern California Chapter Seminar, San Jose, California. Contact: Robert A. Bangham, CO, c/o Hittenbergers, 1117 Market Street, San Francisco, California 94103.

November 11–13, Hosmer Electric Systems Workshop and Seminar, Hosmer Dorrance Corporation, Campbell, California. Contact: Catherine Wooten, Hosmer Dorrance Corporation, 561 Division Street, Campbell, California 95008; tel. (808) 538-7748 or (408) 379-5151.

November 15–18, All Americas Health '87 International Conference and Exhibition of Medical and Hospital Equipment, Curtis Hixon Convention Center, Tampa, Florida. Contact: John Sellers, City of Tampa International Trade Fair Advisory Committee, 600 Ashley Drive, Tampa, Florida 33602; tel. (813) 223-8421.

November 26–29, Medical/Hospitech 87, Bangkok International Exposition Center, Bangkok, Thailand. Contact: SKA International Services Ltd., 22/F. Tian An Centre, 151 Gloucester Road, Hong Kong.

December 7–11, Motion Control course, "Fitting Procedures for the Utah Artificial Arm and Hand Controller," UCLA Prosthetics Education Program, Los Angeles, California. Contact: Harold Sears, Ph.D., 95 South Elliot Road, #105, Chapel Hill, North Carolina 27514; (919) 968-8492.

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March 12, Academy Northern California Chapter Seminar, Oakland, California. Contact: Robert A. Bangham, CO, c/o Hittenbergers, 1117 Market Street, San Francisco, California 94103.

April 28–29, Region IV Meeting, Hyatt Regency Hotel, Memphis, Tennessee.

May 13–15, AOPA Region IX, COPA, and the California Chapters of the Academy Combined Annual Meeting.

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June 14–18, AOPA Regions VII, VIII, X, and XI Combined Annual Meeting, Seattle, Washington.

September 5–9, 16th World Congress of Rehabilitation International, Keio Plaza Inter-Continental Hotel, Shinjuku, Tokyo, Japan. Contact: Secretary General, 16th World Congress of Rehabilitation International, c/o the Japanese Society for Rehabilitation of the Disabled, 3-13-15, Higashi Ikebukuro, Toshima-Ku, Tokyo 170, Japan.

September 24, Academy Northern California Chapter Seminar, San Francisco, California. Contact: Robert A. Bangham, CO, c/o Hittenbergers, 1117 Market Street, San Francisco, California 94103.

October 25–30, AOPA Annual National Assembly, Sheraton Washington Hotel, Washington, D.C. Contact: AOPA National Headquarters, (703) 836-7116.

1989

January 31–February 5, Academy Annual Meeting and Scientific Symposium, Wyndham Hotel, Orlando, Florida. Contact: Academy National Office, (703) 836-7118.

February 9–19, American Academy of Orthopaedic Surgeons Annual Meeting, Las Vegas, Nevada.

May 12–14, AOPA Region IX, COPA, and the California Chapters of the Academy Combined Annual Meeting.

May 18–20, AOPA Region V Annual Meeting, Hotel Sofitel, Toledo, Ohio.

October 2–8, AOPA Annual National Assembly, MGM Grand Hotel, Reno, Nevada. Contact: AOPA National Headquarters, (703) 836-7116.

November 12–17, International Society for Prosthetics and Orthotics VI World Congress, Kobe Convention Center, Kobe, Japan. Contact: VI ISPO World Congress, Secretariat, c/o International Conference Organizers, Inc., 5A Calm Building, 4-7, Akasaka 8-chrome, Minato-ku, Tokyo, 107 Japan.

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January 22–28, Academy Annual Meeting and Scientific Symposium, Hyatt Regency Hotel, Phoenix, Arizona. Contact: Academy National Office, (703) 836-7118.

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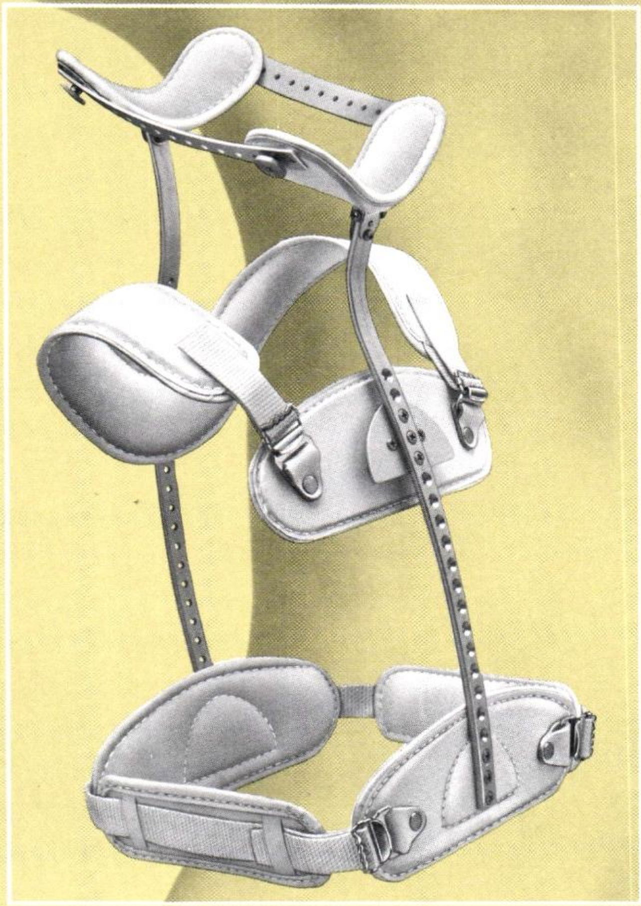

Orthotics and Prosthetics, Vol. 41, No. 2, pp. 18–22.

The Indiana University Clubfoot Orthosis

Karen C. Kohler, O.T.R.
Norman E. Brennan, C.O.
John Glancy, C.O.

INTRODUCTION

During the past 50 years, the treatment of clubfoot has been the subject of considerable controversy.[1] Talipes equinovarus (TEV), commonly termed "clubfoot," is considered the most significant congenital fixed deformity of the foot. It is found more in boys than girls and is considered a defect in prenatal development. Clubfoot may occur either unilaterally or bilaterally. In the newborn, clubfoot can be determined by an inflexible adducted forefoot, a varus heel, and a plantarflexed inverted foot that cannot be brought into a dorsiflexed or everted position.[2] The Indiana University Clubfoot plastic ankle-foot orthosis is indebted to the principles introduced by H. von Baeyer.[4] We have been providing this AFO since the mid-70s from the Orthotics Department, Indiana University Medical Center, James Whitcomb Riley Hospital for Children. The Indiana University Clubfoot AFO has become the preferred orthosis for postoperative orthotic management of clubfoot by the Orthopaedic staff at James Whitcomb Riley Hospital for Children.

The large majority of patients fitted are referred postoperatively. After six weeks, the physician removes the postoperative cast, then applies another cast for the remainder of the eight-week healing period. Before the second corrective cast is applied, the patient is referred to the Orthotic Department, where they will be cast and measured for their AFO. The patient then returns two weeks later for delivery and post-fitting evaluation in the Orthopaedic Clinic.

DESCRIPTION OF THE AFO

The anterior panel ground reaction force design ankle-foot orthosis is vacuum-formed[3] (Figure 1). The 1/8" polypropylene AFO is lined with 1/4" non-perforated Plastazote™, which is easily tolerated by the tender post-surgical foot.

After it cools, the formed plastic is then cut transversely, bisecting the malleolus (Figure 2). A 12mm wedge is cut into the lateral side, allowing for overcorrection and variability in range of motion. Slotted polypropylene slides 5/8" wide by 1/8" thick, have a milled slot 3/16" wide and 1 5/8" to 2" in length. These slides are placed medially and posteriorly, attaching the calf portion with the foot portion (Figure 3). The placement of these slides must allow the maximum amount of corrective eversion and dorsiflexion range. Nyloplex rivets are then used to attach these slides to the orthosis. Velcro® straps are used across the instep, across the anterior distal edge just proximal to the ankle, and at the posterior proximal calf. The overcorrection strap is attached at the head of the fifth metatarsal and is passed through a loop located 12mm distal to the fibular head. For dynamic correction, elastic is added to the lateral correction strap. The forces generated by the corrective strap are applied to the subtalor and talocrural joints to counteract the abnormal musculature imbalance caused by the antagonistic invertors and plantar flexors seen in clubfoot (Figure 2B).

This orthosis is used for at least six months and preferably up to a year. It is worn during the night and also during daytime naps. Straight last shoes are used in

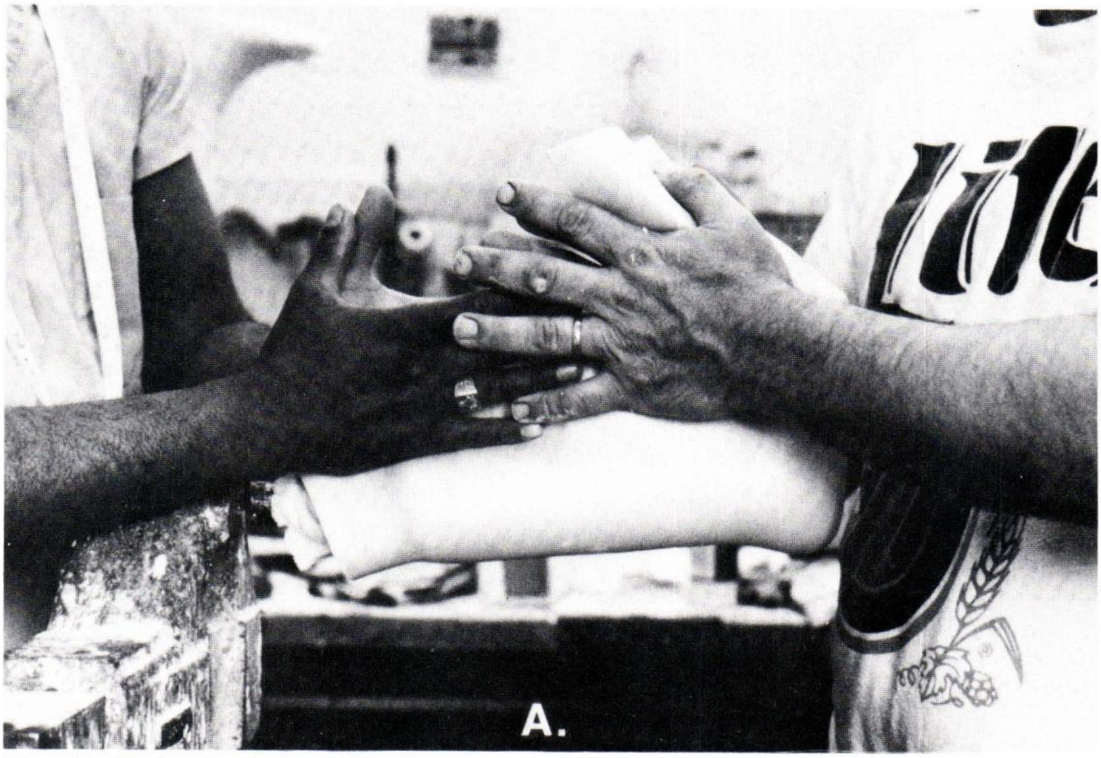

Figure 1A. The forming Plastazote™ lining.

Figure 1B. Positive model after vacuum forming over Plastazote™ lining.

Figure 1C. Technician trimming excess polypropylene before the material cools.

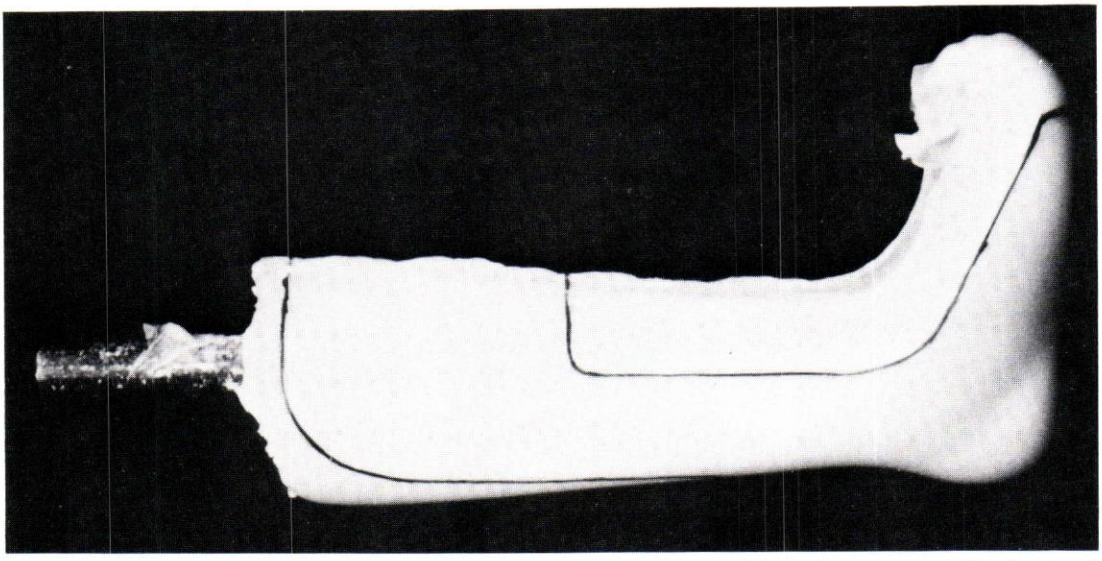

Figure 2A. Note weld on anterior panel. Trim lines allow removal of the AFO from the cast without having to cut the fused anterior panel.

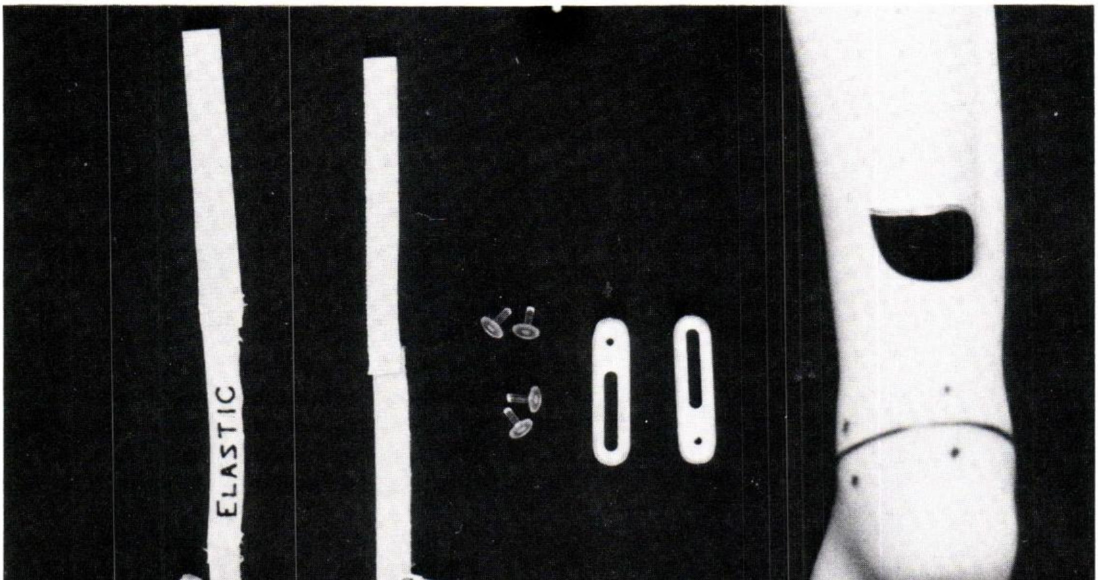

Figure 2B. Layout shows trim lines and slide attachments. Strapping is shown using either an elastic component or Velcro®. Left to right: 1) strap with elastic component, 2) Velcro® strap, 3) Nyloplex rivets, 4) Polypropylene slides and, 5) pre-marked AFO.

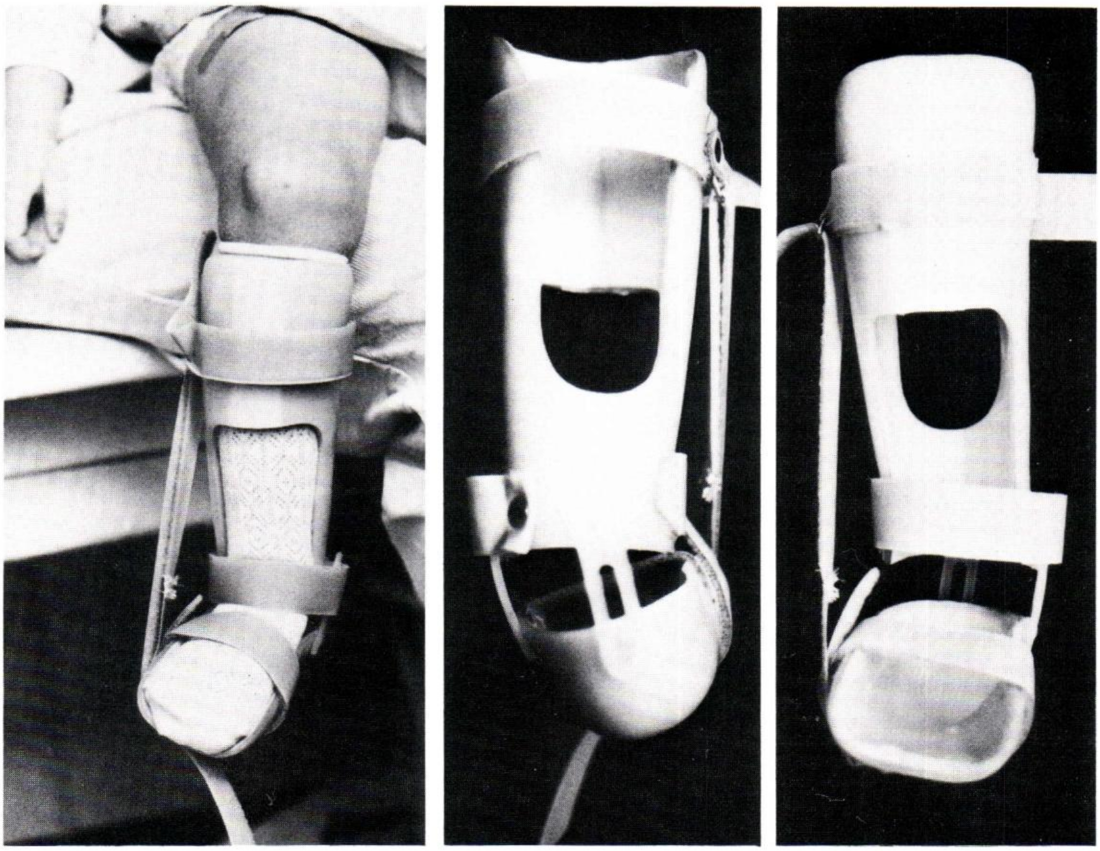

Figure 3. The finished AFO for right foot showing the range of correction possible.

conjunction with daytime weight bearing for both ambulatory and non-ambulatory patients. These shoes maintain the foot in a neutral position. This daytime approach of using straight last shoes allows the child greater comfort and normal development patterns are not hindered.

FABRICATION

- Use the conventional method of obtaining an AFO negative plaster impression. The ankle is held as close to a plantigrade position as possible at the time of casting. The medial aspect of the calcaneous and forefoot are maintained parallel to the mid-sagittal line.
- Modify the positive plaster model to your measurements, except for adding plaster of Paris to the heel in order to permit further correction.
- Vacuum form 1/8″ polypropylene over the positive model so that both the plastazote lining and the polypropylene seams are centered along the anterior of the model (Figures 1B and 1C).
- Draw the outline of an anterior panel ground reaction force type AFO. Trim distal to metatarsal heads, or include toes (Figure 2A).[3]
- Draw a line, bisecting as close as can be determined, between the medial and lateral malleolus transversely (On smaller children, a transverse line may be superior to malleolus to ensure a good grasp of the heel to hold the foot.) (Figure 2B).
- Slides are placed posteriorly and medially, and must be parallel not only to each other but also to the long axis of

the tibia. Remember that placement of these slides must enhance the greatest range of motion (Figure 2B).

- Draw a lateral wedge on the AFO using 6mm on calf portion and 6mm on foot portion. The size of the wedge may increase with the size of the child. Begin the wedge at the center of the posterior calf at the bisection line.
- Drill a #30 hole where marks have been placed for slide attachment. These holes are locations for 3mm nyloplex rivets.
- At this point, cut the AFO shell transversely on the premarked line. Cut out the wedge; smooth and finish all edges.
- Attach the slides, connecting calf and foot portions medially and posteriorly with nyloplex rivets (Figure 3B).
- Attach Velcro® straps, 1) across the instep, 2) across the anterior distal edge proximal to the ankle, and 3) across the posterior proximal edge of the calf portion. The overcorrection strap is attached on the lateral side of the foot portion at the fifth metatarsal head passing up through a loop located 12mm distal to the fibular head.

ADVANTAGES

A major biomechanical advantage of the Indiana University Clubfoot AFO is that it avoids adverse forces to the knee and hip joints.

This orthosis is lightweight, durable, and clinically adaptable to a continuous correction schedule. Due to the design, it is easily applied to the foot of an infant, and one orthosis usually is sufficient for the full length of treatment.

Early removal allows selective freedom of motion. Other advantages include less skin breakdown, better hygiene, increased comfort, and better acceptance.

SUMMARY

An anterior panel ground reaction force design ankle-foot orthosis is presented and its fabrication described in detail. The Division of Orthotics records show that since 1976, an average of 50 patients a year have been fit with the Indiana University Clubfoot AFO. The overall results have been excellent.

AUTHORS

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Norman E. Brennan, C.O., is Chief Orthotist at the Indiana University School of Medicine.

John Glancy, C.O., is Director of Orthotics at the Indiana University School of Medicine.

REFERENCES

[1]DeRosa, G.P., Dykstra, E.A., *Surgical Correction of the Resistant Clubfoot.* Foot and Ankle American Orthopaedic Foot Society. Chapter 27, pp. 215–221. Bateman, J.E. and Trott, A.W., editors. Thiem-Stratton, New York, 1980.

[2]Cailliet, R., *Foot and Ankle Pain.* 2nd edition, p. 95. F.A. Davis, Philadelphia, 1983.

[3]Glancy, J.J., Lindseth, R.E., "The Polypropylene Solid-Ankle Orthosis," *Orthotics and Prosthetics,* 26(1), March, 1972.

[4]von Baeyer, H., in Jordan, J.H., *Orthopedic Appliance.* Oxford University Press, New York, 1939, p. 277.

Orthotics and Prosthetics, Vol. 41, No. 2, pp. 23–28.

An Orthosis to Aid in Reduction of Lower Limb Spasticity

Arie J. Bronkhorst, C.O.
Gary A. Lamb, C.O., B.S.

INTRODUCTION

Since February, 1979 at the West Texas Rehabilitation Center Orthotics Department, lower limb spasticity has been treated with an orthosis that uses the same principles as some of the tone-inhibiting cast techniques[3, 4] (Figures 1 and 2). Twenty-one patients, all of whom were ambulatory with a plantar flexed gait, either bilaterally or unilaterally, have been treated with 37 orthoses. The goals of treatment were to improve ambulation and correct any present deformity. While the majority of the 21 patients were diagnosed as having cerebral palsy, three suffered from head injuries, three were idiopathic toe walkers, one had a psychomotor retardation, and one had a developmental delay following premature birth. Two, the cerebral palsy and psychomotor retardation patients, did not meet the goals of treatment.

CASE STUDIES

The first patient with an orthosis was a white male, age two years and five months, with cerebral palsy. When first seen, the patient had plantar flexion contractures and moderately pronated forefeet. The prescription called for bilateral conventional AFOs with 90° plantar flexion stops and metal sole plates. Prior to this, he had been wearing Rood shoes.†

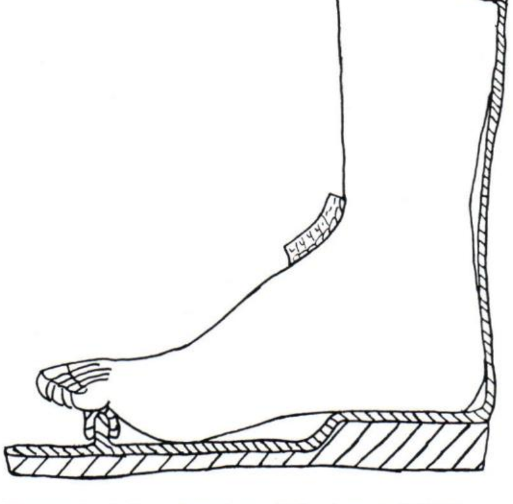

Figure 1. A line drawing of the tone inhibiting orthosis.

†Rood, M.S. Neurophysiological mechanisms utilized in the treatment of neuromuscular dysfunction. *American Journal of Occupational Therapy,* 1956, Vol. 19, pp. 220–224.

After three months, the metal sole plates had to be removed due to wear on the soles of the shoes and toe area. The patient was still walking on his toes and was having cramps in the calfs of his legs, accompanied by pes planus. The physician then recommended arch pads and medial heel wedges. Four months later, without previous orthotic success, plastic AFOs with spastic inhibitor bars were discussed with the physician and the parents.

Upon the initial fitting and wearing schedule of 24 hours per day for the first two weeks and then to a normal wearing schedule of eight hours per day, the patient began walking with a heel-toe gait. In three months, the range of motion at the ankle had greatly improved—he had from two to three hours of carry over and was able to walk heel-toe without the orthoses. Many modifications and orthoses were tried on this patient to find the most effective combination. One year after fitting, he could actively dorsiflex to 10° and only wore the orthoses one-half of each day. After two years and one month, he can actively dorsiflex to 20°, and walk 24 feet on his heels in full dorsiflexion, and he has developed a normal arch. We are still following this patient. Presently, he is wearing foot orthoses to reinforce normal arches and weight-bearing surfaces on the foot.

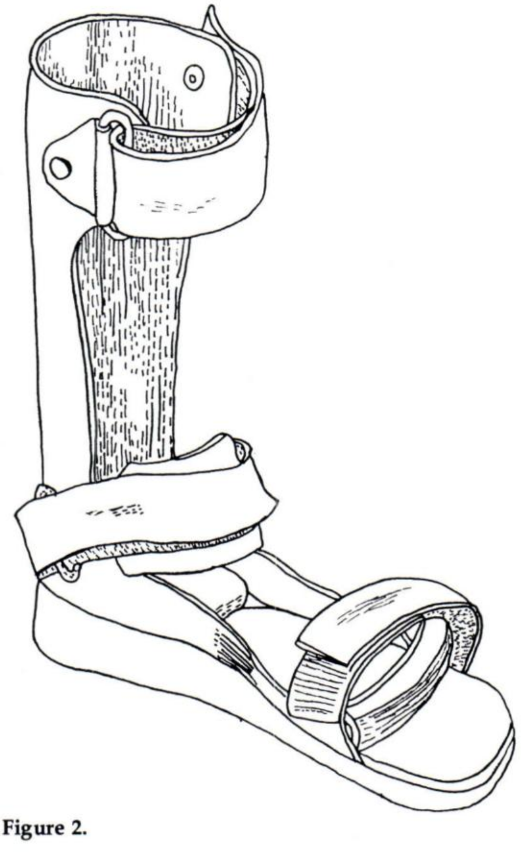

Figure 2.

Another patient, a 20 year old male automobile accident victim with a closed head injury, also improved successfully. This patient had been comatose for two and one-half months, with resulting bilateral plantar flexion contractures. After extensive physical therapy, he was referred to the orthotics department. He was ambulatory with two physical therapists assisting him, and his range of motion at the ankle was limited in dorsiflexion to neutral, with moderate extensor spasticity. He was fit with bilateral AFOs with spastic inhibitor bars and was instructed to wear them 24 hours per day initially and to ambulate in therapy only. When checked ten days later, he could be passively stretched to 5° of dorsiflexion, and stand and ambulate with minimal assistance from one person. The full day treatment was continued for two more weeks. Four weeks after fitting, he could be dorsiflexed 10° to 15° with minimal force and nighttime wear of the orthoses was discontinued.

The spastic inhibition bars and internal heels were removed two months after the initial fitting. On his next visit one month later, he exhibited a full range of motion at the ankle with active dorsiflexion to neutral. He was then instructed to wear the orthosis four hours per day. Three months and three weeks post-fitting, he could actively dorsiflex the right ankle 5° and the left ankle 15°. He was using a walker unassisted to ambulate without the AFOs in the evenings. After four months and three weeks of orthotic treatment, this patient is now wearing tennis shoes and using a quad cane.

FABRICATION OF THE ORTHOSIS

An impression is taken for an AFO without the heel board and at neutral if possible. Modification of the impression is done by wedging if the neutral position is not attained. The impression is extended anteriorly from the toes, maintaining the width of the metatarsal heads (Figure 3). This extension is approximately 2″ and is important for the placement of the spastic inhibition bar and to increase leverage. The build-ups are similar to that of a normal AFO. Be sure the sole is flat. Fill in any present arch and do not lose the metatarsal head reference marks. The malleoli are extended proximally 6mm (¼″) (Figure 4). Three-sixteenths inch polypropylene is used to vacuum form the AFO. The trimlines are like any AFO (i.e. proximally 20mm distal to the neck of the fibula; distally it is trimmed proximal to the metatarsal heads with the sole extended past the toes). There are three straps on the orthosis: a toe strap across the metatarsal head apices, a sable strap with padding, and the proximal calf strap (Figure 2). The spastic inhibition bar may be fabricated out of many types of materials. In the original design, a plastic welding rod was used and padded. More recently, neoprene crepe or plantation crepe has been hot glued in place.

The height of the bar varies according to the size of the patient. The important factor is to dorsiflex the toes, but not hyperextend them. A ⅝″ crepe sole or plantation crepe sole is then hot glued to the sole of the AFO to add rigidity and serve as a wearing surface, since no shoe is worn over the orthosis. In some cases the orthosis functions as described; however, the majority of the patients seen require a ¼″ crepe heel placed inside the orthosis. This height may vary with size and age of the patient (Figure 5). In the original design, this relief was done on the cast, making cast modifications more difficult and time consuming.

The placement of the spastic inhibition bar has proven to be critical. It must dorsiflex the toes, but not press on the metatarsals. This is best achieved in the following way. Have the patient don the orthosis before the spastic inhibition bar is in place and mark the sole for placement with the patient standing.

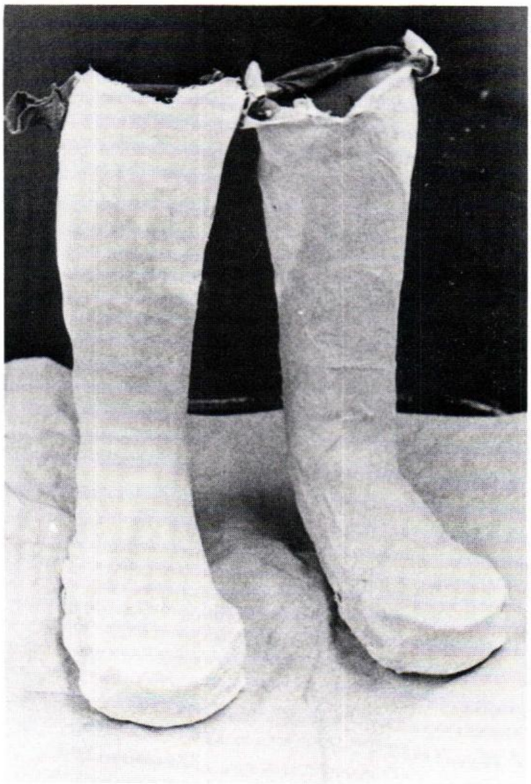

Figure 3. Impression extended anteriorly from the toes, maintaining width of metatarsal heads.

THEORY

Since there have been no kinematic studies explaining the mechanisms of the orthosis, we can only theorize at this point as to why the orthosis works. To do this, one must understand the basic reflexes affected in the foot. The majority of information is found in the cerebral palsy literature. Of key interest is the toe-grasping reflex of the foot and the associated pattern of extension. The ultimate adequate stimulus for these reflexes is not understood. In the newborn, the lightest touch

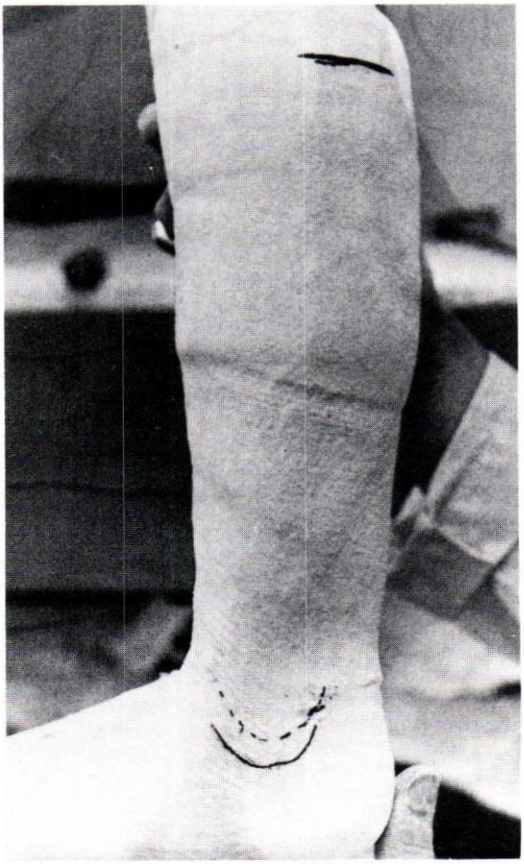

Figure 4. Malleoli extended proximally 6mm (¼").

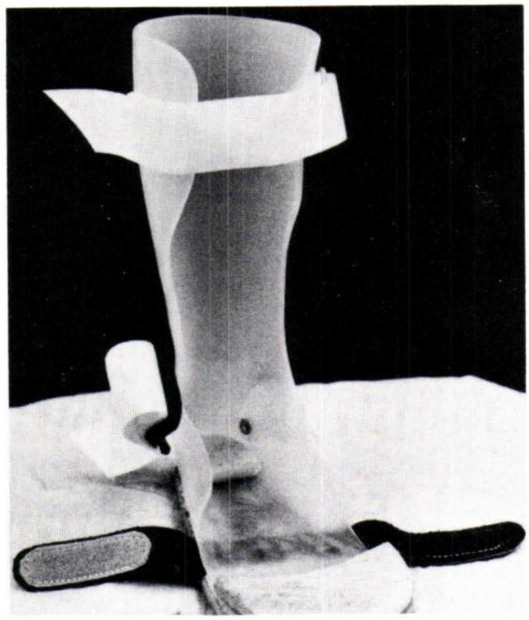

Figure 5. The ¼" heel is placed inside the orthosis.

on the ball of the foot is sufficient to produce the toe-grasping reflex. As the child matures, this sensitivity gradually diminishes as does the reflex.

If a reflex remains active for several years, which frequently occurs in children with cerebral palsy, there is often an unexplained spread of the reflexogenous area, with the result that spasticity occasionally includes the entire foot (Figure 6).

Tests were done to determine whether the four reflexes illustrated in Figure 6 were mediated through skin receptors, deep proprioceptive receptors, or both. Electromyographic results seem conclusive that these reflexes are mediated through skin receptors. All four reflexes were intensified by the placing of the subject in the upright position, by the startle reaction, and by the waves of increased ten-

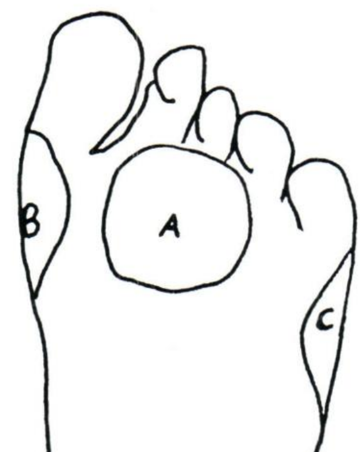

Figure 6. The typical reflexogenous areas (a) toe-grasping reflex, (b) inversion reflex, (c) eversion reflex, and (d) dorsiflexion reflex.

sion in the muscles of patients with athetosis. The reflexes were unobtainable during sleep and second-stage anesthesia. Because the toe grasp was the last to disappear, we concluded it was the strongest, most persistent reflex action pattern.[1]

In the reflex-induced deformities, dominant reflexes are pathologically hyperactive. This situation is usually encountered in cerebral palsy. One or more of the reflexes may persist throughout childhood and instead of gradually disappearing, become more active with time.

The primitive reflex of the extensor thrust, of which plantar flexion and inversion are strong components, is mediated by the lower third of the pons. This reflex is quite often found in the normal infant up to two months of age. The Positive Supporting Reaction, of which plantar flexion and inversion are also strong components, is mediated from the brain stem level and is found in normal children up to six months old.[2]

J.D. French, in a recent article in *Scientific American* (196:30), called "The Reticular Formation," sums up the brain stem functions this way, "It awakens the brain to consciousness and keeps it alert; it directs the traffic of messages in the nervous system; it monitors the myriads of stimuli that beat upon our senses, accepting what we need to perceive and rejecting what is irrelevant; it tempers and refines our muscular activity and bodily movements."

Since the lower third of the pons and the brain stem control the aforementioned primitive reflexes, it can be theorized that the closed head injury patients treated with this orthosis had sustained damage to the lower pons, or to structures which modulate the functioning of the lower pons.

The spastic inhibition bar on the AFO is theorized to reduce the stimulus to the reflexogenous area of the toe-grasp reflex. The heel placed inside the AFO is to increase the ground reaction forces in the reflexogenous area of the dorsiflexion reflex. The anterior extension, in conjunction with the AFO, increases the leverage, causing a downward moment at the calcaneous. The combination of the increased dorsiflexion and the inhibited toe-grasp reflex has proven useful itself in the treatment of plantar flexion spasticity of the lower limb.

A major consideration in application of the AFO's with spastic inhibition bars is the cooperation of the physician, the parents, and the therapists. The physician is instrumental in evaluating the radiologic structure of the feet, in determining whether the child might benefit from the AFOs, and determining whether additional support for the long term maintenance is indicated. The caretakers have the responsibility of placing the AFOs on the patient's feet in the morning and keeping them on until bedtime. The AFOs are not attractive and do cause comments and questions when the patient is in public. Many caretakers find this extremely difficult. It is also the caretakers' responsibility to bring the patient to therapy. Therefore, without full support, the effectiveness of the AFOs is compromised.

Several parents have reported that their child would ask for his AFOs if the parent forgot to put them on. This was regarded as an indirect indication that the child felt more secure in the AFOs and was thought to be a positive outcome by the therapist and the parents.

SUMMARY

This article presents two case studies involving the use of tone reducing orthoses. The orthoses utilize spastic inhibition bars to dorsiflex the toes which help break the spasticity patterns. There is also a discussion of the origins of spasticity and theory behind the effectiveness of the orthoses.

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A Commentary on the New England Preparatory Prosthesis

David M. O'Toole, M.D.
Donald R. DeCarteret, C.P.

INTRODUCTION

The major purposes of any preparatory prosthesis are early ambulation and residual limb conditioning. In any discussion regarding components or materials used in preparatory prostheses, it is important to keep these indications in mind.

Early ambulation is essential to prevent complications secondary to immobilization and to help the amputee achieve independent ambulation. Energy consumption during ambulation at lower amputation levels without a prosthesis is considerably higher than the energy used with a prosthesis. In the elderly dysvascular amputee, this is an important factor, as it is the practice of some surgeons to discharge their amputee patient with an appointment to see their prosthetist in two to three months.

Early ambulation may be achieved by immediate postoperative rigid dressings with a succession of sockets attached to a pylon and a prosthetic foot with appropriate suspension. Intermediate fitting occurs three to four weeks postoperatively. Ideally, while awaiting the prosthesis, the amputee is involved in a pre-prosthetic reconditioning program.

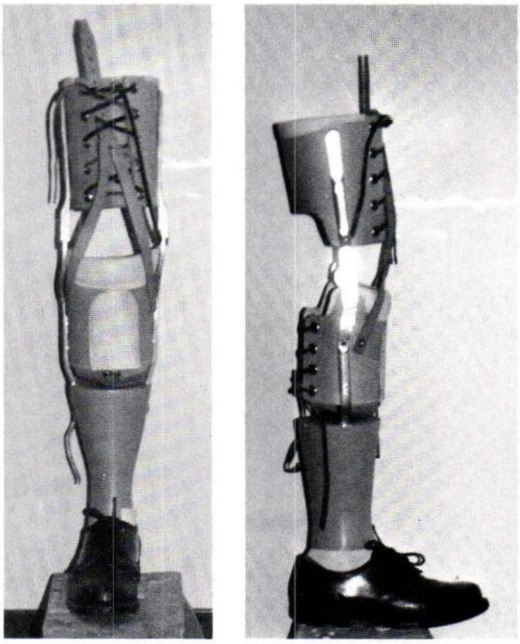
Residual limb conditioning is the second indication for a preparatory prosthesis. Edema must be controlled and the fragile soft tissues of the residual limb must be conditioned to provide the maximum protection possible. The diabetic, sensory impaired, dysvascular residual limb requires gradual conditioning with an appropriately fitting socket. Volume control with a shrinker is not enough to provide conditioning.

Preparatory sockets and prostheses fall presently into three categories:

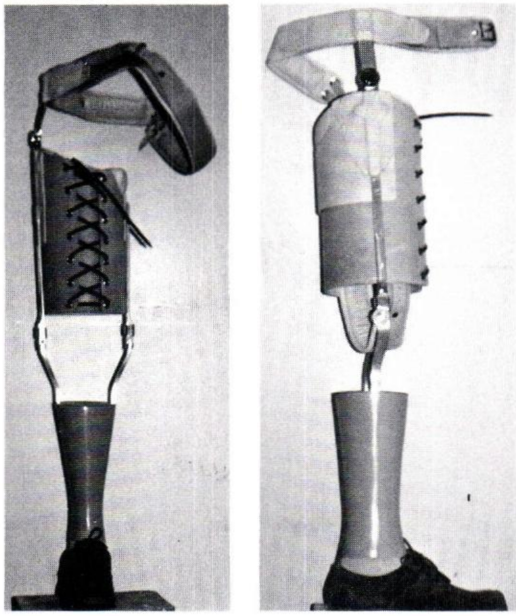
- Plaster of Paris sockets attached to pylons with appropriate suspension.
- Plastic sockets of varying materials, either total contact or "adjustable" with appropriate suspension.
- Leather adjustable sockets.

In the hands of a surgeon, a prosthetist, or a well-trained technician or therapist, plaster sockets must be carefully observed and changed as frequently as shrinkage occurs, in order to prevent residual limb trauma. This can be a logistical problem as the availability of a skilled technician is sometimes an issue. Alignment also may vary from one socket to the next.

The use of various types of plastic sockets is presently in vogue. These may be total contact, nonadjustable, or most commonly, they may attempt to achieve adaptation to rapid volume changes by using anteroposterior adjustability. The addition of multiple residual limb socks is used to accommodate volume changes. Because of the eventual loss of proper conformity of the socket to the limb as it conditions, new sockets may need to be fabricated. Suspension can be adapted to the needs of the individual patient.



Figures 1A and 1B. Anterior and lateral views of the below-knee variant of the New England Preparatory Prosthesis.



Figures 2A and 2B. Anterior and lateral views of the above-knee New England Preparatory Prosthesis (note the usage of drop locks at the knee).

THE NEW ENGLAND PREPARATORY PROSTHESIS

The geographic use of the adjustable leather above the knee or below the knee preparatory prosthesis has apparently been reduced to a few facilities in New England (Figures 1A, 1B, 2A, and 2B), hence the name. With the advent of space age technology, it suffers from an image problem, yet it is the major preparatory prosthesis used at the New England Rehabilitation Hospital. In the past five years, over 500 amputees have been gait trained using this prosthesis.

The New England Preparatory Prosthesis allows early ambulation in the below-knee amputee because of the capability of extending the thigh corset so that gluteal or ischeal weight-bearing can protect an unhealed residual limb (Figures 1A and 1B). The thigh corset in the below-knee and the drop-locked knee joints in the above-knee prosthesis give the stability needed for the geriatric, dysvascular amputee population (Figures 2A and 2B).

The laced adjustable socket assures proper fit, not only anteroposteriorly, but mediolaterally. Patella tendon bearing or ischeal weight-bearing is easily maintained.

Residual limb wrapping is not critical, because the adjustable socket becomes the shrinker. Only one residual limb sock is used, as excessive numbers of socks in plaster or plastic below the knee sockets causes all conformity of the socket to the residual limb to be lost, and essentially one is left dealing with a plug fit socket. The adjustable leather socket obviates the need for serial sockets, making the leather socket economical as well.

Major objections to the leather adjustable socket have centered about abnormal sheer forces and the production of edema in the open ended socket. These have not been shown to be factors in our experience.

SUMMARY

In this age of rapid technological advances, the New England Preparatory Prosthesis continues to perform well, and the goals of a preparatory prosthesis are achieved by its use. Its versatility has been one of its prime advantages, especially its easy adaptability which precludes the need for serial sockets. It is simple and durable. Not all amputees progress to definitive prostheses, and in some geriatric amputees, this is their permanent prosthesis. Active preparatory prosthetic users progress to definitive prostheses in six to 12 weeks and usually do not require gait training, except when above-knee amputees receive a non-locking knee unit in their definitive prosthesis.

It requires the work of a true artisan to be able to fabricate this prosthesis. However, the availability of well-trained leather workers is rapidly declining. It would appear that this portends a serious problem for the future of the New England Preparatory Prosthesis.

Based on our experience with the New England Preparatory Prosthesis, we do not wish to condemn progress, but rather to show how, in our experience, there is a place for the leather adjustable socket.

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Technical Note: Leatherwork Pattern Generation By Computer

Dale Soutter Glass, Sc.B.

INTRODUCTION

Traditional fabrication of thigh cuffs for knee-ankle-foot orthoses (KAFOs) requires the calculation of various lengths and angles derived from patient measurements; drawing the pattern takes approximately 30 minutes. A faster, more accurate procedure is desirable, and the wide-spread availability of computers make automatic pattern generation feasible.

MATERIALS AND METHODS

The practitioner, using standard techniques, records patient measurements for a conventional KAFO. The four measurements required to run the computer program are proximal and distal thigh circumference, cuff width and lateral rise. The program will run on a personal computer using BASIC language and an 80-column printer. The technician enters the patient name and input measurements. Then the computer will print out the 11 corner points of the cuff, patient information, and input measurements as shown in Figure 1. If the cuff is wider than the 8½" paper, the cuff will be printed out on two separate sheets, which can be taped together along register marks. The technician then merely connects the dots. The pattern is now ready to trial fit to the thigh section of the orthosis for any adjustments. Once the proper fit and overlap are assured, the leather cuff is then cut from the pattern. Standard sewing procedures are followed.

A flow chart of the program is shown in Figure 2. The program itself is shown in Figure 3.

DISCUSSION

Automatic pattern generation has reduced patient backlog by decreasing the technician time required to fabricate the cuff by 90 percent. Better quality control is possible using the computer generated pattern for several reasons: each cuff is drawn exactly the same for identical input measurements, objective evaluation of cuff fit is possible since fewer personal idiosyncracies are involved, and it is simple to redo the pattern if the measurements were mistaken.

There are some areas for improvement in the computer-generated cuff; the accuracy of the printout is limited by the printer—the best resolution is ⅛". A plotter would have much better accuracy and could simply draw the entire pattern, not just the corner points. As the cost of large paper plotters decreases, this will become economically feasible.

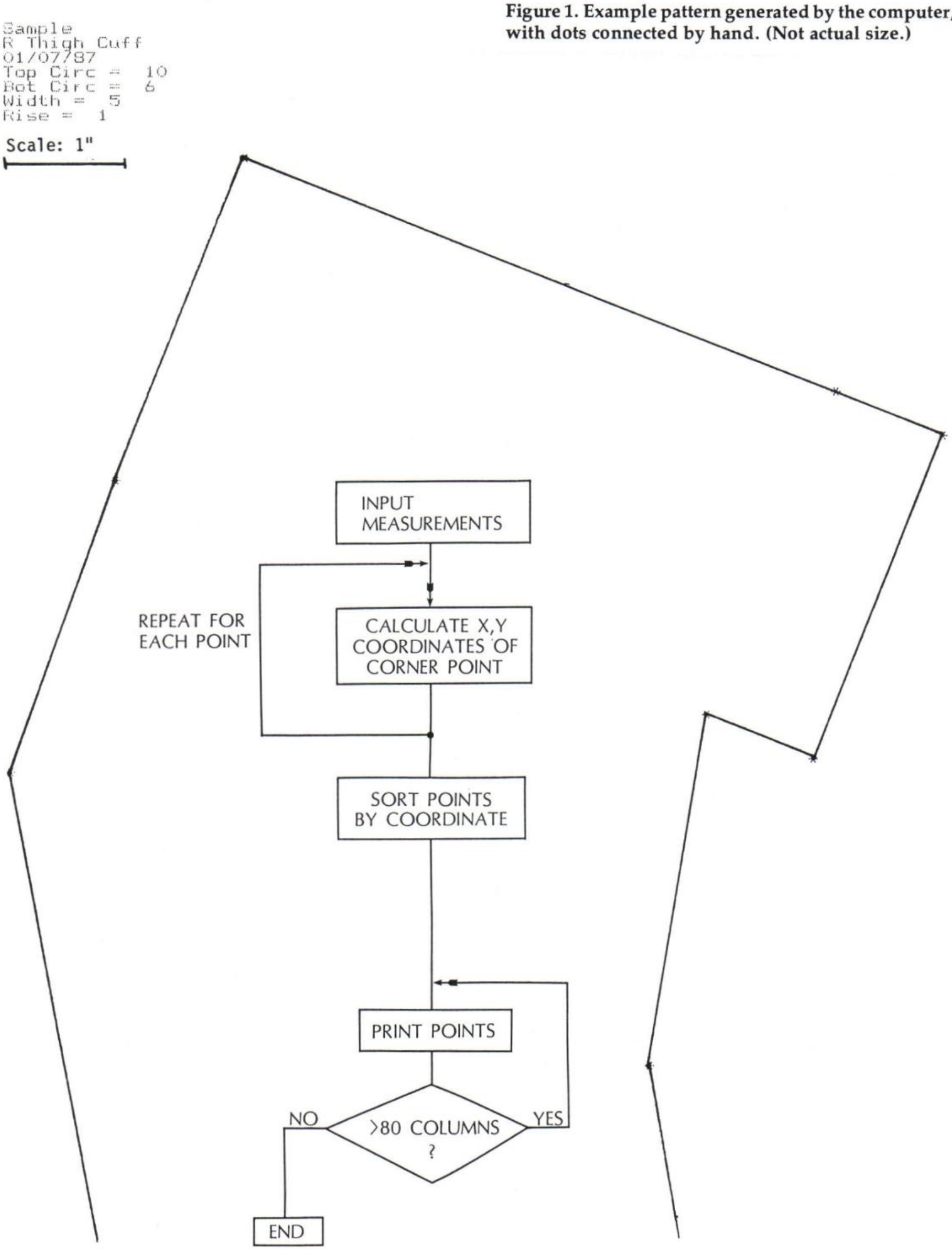

Figure 1. Example pattern generated by the computer, with dots connected by hand. (Not actual size.)

Figure 2 (inset). A flow chart of the program.

```
100 REM          * * * * * * * * * * * * * * * * * * * * * *
110 REM          *                                          *
120 REM          *                                          *
130 REM          *          Thigh Cuff Program              *
140 REM          *                                          *
150 REM          *            December 15, 1986             *
160 REM          *      Texas Scottish Rite Hospital        *
170 REM          *          Dale Soutter Glass              *
180 REM          *              CUFF.BAS                    *
190 REM          *                                          *
200 REM          * * * * * * * * * * * * * * * * * * * * * *
210 REM
220 REM
230 REM          -------------------><-------------------
240 REM
250 REM Clear all variables
260   CLEAR
270 REM
280 REM Define variable arrays
290   DIM CORDS(3,11) 'Stores x and y coordinates and INDEX for all points
300   DIM COORD(2,11) 'Stores x and y coordinates only for points with
310             'x coordinates < MAXWIDTH  (MAXWIDTH too small for printout)
320 REM
330 REM Define constants
340   TONG = 3      ' length of the tongue on the cuff
350   NUMPTS = 11  ' number of points in the cuff
360   BTAPER = .5 ' bottom taper shape distance
370   XSCALE = 10  ' printer set for 10 cpi
380   YSCALE = 8   ' printer set for 8 lines per inch
390   MAXWIDTH = 80  ' maximum width of the printout paper used (80 or 132)
400 REM
410 REM Input Data
420   BEEP
430   INPUT "Enter the patient's name --> ", NAM$
440   BEEP
450   INPUT "Which leg? R or L --> ", LEG$
460   BEEP
470   INPUT "Enter the date --> ",DAT$
480   PRINT "Enter the measurements: top,bot,width,rise"
490   INPUT "--> ", TOP,BOT,WID,RIS
500   BEEP
510   INPUT "Everything ok?  Type Y,N, or Q --> ", OK$
520   IF OK$ = "N" THEN 430 ELSE 530 'Re-enter Data
530   IF OK$ = "Q" THEN 540 ELSE 550 'Quit Program
540   PRINT "Program terminated at your request" :: END
550   IF OK$ = "Y" THEN 560 ELSE 510 ' Continue
560  REM
570  REM Calculate points
580    SIDE = (WID^2 + ((TOP - BOT)/2)^2)^.5 ' Pythagorean Theorem
590    ANGLE = ATN((TOP - BOT)/(2*WID))
600    LENGTHA = SIDE*(COS(ANGLE))
610    LENGTHB = SIDE*(SIN(ANGLE))
620    LENGTHC = TONG*(SIN(ANGLE))
630    LENGTHD = TONG*(COS(ANGLE))
640    LENGTHE = COS(ANGLE)
650    REM
660    REM Calculate x and y coordinates for each point
670     FOR INDEX = 1 TO NUMPTS STEP 1
680       IF INDEX = 1 THEN 690 ELSE 730
690          XVALUE = LENGTHA + LENGTHE
700          YVALUE = 0
710          GOSUB 5000
720          GOTO 1230
730       IF INDEX = 2 THEN 740 ELSE 780
```

```
740           XVALUE = 0 + LENGTHE
750           YVALUE = LENGTHB
760           GOSUB 5000
770           GOTO 1230
780        IF INDEX = 3 THEN 790 ELSE 830
790           XVALUE = LENGTHC + LENGTHE
800           YVALUE = LENGTHB + LENGTHD
810           GOSUB 5000
820           GOTO 1230
830        IF INDEX = 4 THEN 840 ELSE 880
840           XVALUE = LENGTHC + BTAPER + LENGTHE
850           YVALUE = LENGTHB + LENGTHD + (.5*BOT)
860           GOSUB 5000
870           GOTO 1230
880        IF INDEX = 5 THEN 890 ELSE 930
890           XVALUE = LENGTHC + LENGTHE
900           YVALUE = LENGTHB + LENGTHD + BOT
910           GOSUB 5000
920           GOTO 1230
930        IF INDEX = 6 THEN 940 ELSE 980
940           XVALUE = LENGTHC + WID + LENGTHE
950           YVALUE = LENGTHD + TOP
960           GOSUB 5000
970           GOTO 1230
980        IF INDEX = 7 THEN 990 ELSE 1030
990           XVALUE = LENGTHC + WID + LENGTHE
1000           YVALUE = LENGTHD + (.75*TOP)
1010           GOSUB 5000
1020           GOTO 1230
1030        IF INDEX = 8 THEN 1040 ELSE 1080
1040           XVALUE = LENGTHC + WID + RIS + LENGTHE
1050           YVALUE = LENGTHD + (.25*TOP)
1060          GOSUB 5000
1070          GOTO 1230
1080       IF INDEX = 9 THEN 1090 ELSE 1130
1090          XVALUE = LENGTHC + WID + LENGTHE
1100          YVALUE = LENGTHD
1110          GOSUB 5000
1120          GOTO 1230
1130       IF INDEX = 10 THEN 1140 ELSE 1180
1140          XVALUE = 0
1150          YVALUE = LENGTHB + SIN(ANGLE)
1160          GOSUB 5000
1170          GOTO 1230
1180       IF INDEX = 11 THEN 1190 ELSE 1240
1190          XVALUE = LENGTHC
1200          YVALUE = LENGTHB + LENGTHD + SIN(ANGLE)
1210          GOSUB 5000
1220     GOTO 1250
1230    NEXT INDEX ' Loop counter increment for calculate points
1240    PRINT "Error in number of points: contact your local programmer"
1250 REM
1260 REM  Sort points (Sorted in order of increasing y coordinate values.  If
1270           '    two y coordinates are the same, then those points are ordered
1280           '    by increasing x coordinate values.)
1290   SWITCH$ = "FALSE"  'Initialize
1300    FOR I = 1 TO (NUMPTS-1) STEP 1
1310      IF CORDS(1,I)>CORDS(1,I+1) THEN GOSUB 6000 ELSE 1320  'Swap Y
1320        IF CORDS(1,I)=CORDS(1,I+1) THEN 1330 ELSE 1340  'Y's are equal
1330          IF CORDS(0,I)>CORDS(0,I+1) THEN GOSUB 6000 ELSE 1340  'Swap X
1340    NEXT I
1350   IF SWITCH$ = "TRUE" THEN 1290
1360 REM
1370 REM Print Points
```

```
1380 REM
1390  OPEN "LPT1:" AS #3
1400  PRINT #3,CHR$(27);CHR$(48)  'Sets vertical line spacing to 8 lines/inch
1410 REM
1420   REM Heading for first printout page
1430    PRINT #3,CHR$(12)  'Form Feed
1440    PRINT #3,NAM$;TAB(MAXWIDTH);"!";TAB(1)
1450    PRINT #3,LEG$;" Thigh Cuff";TAB(MAXWIDTH);"!";TAB(1)
1460    PRINT #3,DAT$;TAB(MAXWIDTH);"!";TAB(1)
1470    PRINT #3,"Top Circ = ";TOP;TAB(MAXWIDTH);"!";TAB(1)
1480    PRINT #3,"Bot Circ = ";BOT;TAB(MAXWIDTH);"!";TAB(1)
1490    PRINT #3,"Width = ";WID;TAB(MAXWIDTH);"!";TAB(1)
1500    PRINT #3,"Rise = ";RIS;TAB(MAXWIDTH);"!";TAB(1)
1510    PRINT #3,CHR$(10)  'Line Feed
1520   REM Rescale x coordinate values so that minimum value (MIN) >= 0
1530    MIN = 0  'Initialize
1540    FOR PT = 1 TO NUMPTS STEP 1
1550      IF CORDS(0,PT) < MIN THEN MIN = CORDS(0,PT)
1560    NEXT PT
1570    FOR PT = 1 TO NUMPTS STEP 1
1580     CORDS(0,PT) = CORDS(0,PT) - MIN
1590    NEXT PT
1600   REM  TEST to see if all points can fit on width of printout paper or not
1610    TEST$ = "TRUE"  'Sufficient MAXWIDTH assumed
1620    FOR PT = 1 TO NUMPTS STEP 1
1630      IF CORDS(0,PT) > MAXWIDTH THEN TEST$ = "FALSE"
1640    NEXT PT
1650    OLDY = 0  'Initialize
1660    IF TEST$ = "TRUE" THEN GOSUB 7030 ELSE GOSUB 8050
1670  REM
1680  CLOSE #3
1690 REM
1700 REM End of the program
1710 PRINT " All Done!  To do the other leg type RUN, to quit type SYSTEM
1720 END



5000 REM--------------------------------------------------------------------
5010  REM Subroutine ->Creates the array CORDS(3,11):Called by Calculate Points
5020   LET SCALEDX = CINT(XVALUE * XSCALE)
5030   LET SCALEDY = CINT(YVALUE * YSCALE)
5040   IF LEG$ = "R" THEN 5050 ELSE 5070
5050      CORDS(0,INDEX) = MAXWIDTH - SCALEDX
5060      GOTO 5080
5070   LET CORDS(0,INDEX) = SCALEDX
5080   LET CORDS(1,INDEX) = SCALEDY
5090   LET CORDS(2,INDEX) = INDEX
5100 RETURN
6000 REM--------------------------------------------------------------------
6010 REM Subroutine which swaps two coordinate sets
6020   TEMP(0,I)=CORDS(0,I)
6030   TEMP(1,I)=CORDS(1,I)
6040   TEMP(2,I)=CORDS(2,I)
6050   CORDS(0,I)=CORDS(0,I+1)
6060   CORDS(1,I)=CORDS(1,I+1)
6070   CORDS(2,I)=CORDS(2,I+1)
6080   CORDS(0,I+1)=TEMP(0,I)
6090   CORDS(1,I+1)=TEMP(1,I)
6100   CORDS(2,I+1)=TEMP(2,I)
6110   SWITCH$ = "TRUE"
6120 RETURN
```

```
7000 REM-----------------------------------------------------------------
7010 REM Subroutine which prints points if MAXWIDTH is wide enough
7020              ' (Called by TEST)
7030   FOR PT = 1 TO NUMPTS STEP 1
7040     FOR Y = OLDY TO (CORDS(1,PT)-2) STEP 1
7050       PRINT #3,TAB(MAXWIDTH);" ";TAB(1)  'Print Blank line
7060     NEXT Y
7070     OLDY = CORDS(1,PT)
7080     IF CORDS(0,PT) = MAXWIDTH THEN 7090 ELSE 7110
7090       PRINT #3,TAB(CORDS(0,PT));"*";TAB(1)
7100       GOTO 7120
7110     PRINT #3,TAB(CORDS(0,PT));"*"
7120   NEXT PT
7130 RETURN
8000 REM-----------------------------------------------------------------
8010 REM Subroutine which prints points if MAXWIDTH is not wide enough
8020              ' (Called by TEST)
8030   REM
8040   REM Print points with x coordinates <= MAXWIDTH
8050   COUNT = 0  'Initialize
8060   FOR PT = 1 TO NUMPTS STEP 1
8070     IF CORDS(0,PT) <= MAXWIDTH THEN 8080 ELSE 8130
8080       COUNT = COUNT + 1
8090       COORD(0,COUNT) = CORDS(0,PT)
8100       COORD(1,COUNT) = CORDS(1,PT)
8110       CORDS(0,PT) = -1
8120       CORDS(1,PT) = -1
8130   NEXT PT
8140   SUM = COUNT
8150   OLDY = 0  'Initialize
8160   FOR COUNT = 1 TO SUM STEP 1
8170     FOR Y = OLDY TO (COORD(1,COUNT)-2) STEP 1
8180       PRINT #3,TAB(MAXWIDTH);"!";TAB(1)
8190     NEXT Y
8200     OLDY = COORD(1,COUNT)
8210     PRINT #3,TAB(COORD(0,COUNT));"*"
8220   NEXT COUNT
8230   REM
8240   REM Print points with x coordinates > MAXWIDTH
8250   PRINT #3,CHR$(12)  'Form Feed
8260   PRINT #3,"-"
8270   PRINT #3,"-"
8280   PRINT #3,"-"
8290   PRINT #3,"-"
8300   PRINT #3,"-"
8310   PRINT #3,"-"
8320   PRINT #3,"-"
8330   PRINT #3,CHR$(10)   'Line Feed
8340   OLDY = 0  'Initialize
8350   FOR PT = 1 TO NUMPTS STEP 1
8360     IF CORDS(1,PT) < 0 THEN 8450
8370     FOR Y = OLDY TO (CORDS(1,PT)-2) STEP 1
8380       PRINT #3,"!"
8390     NEXT Y
8400     OLDY = CORDS(1,PT)
8410     IF CORDS(0,PT) = 2*MAXWIDTH THEN 8420 ELSE 8440
8420       PRINT #3,TAB(CORDS(0,PT) - MAXWIDTH);"*";TAB(1)
8430       GOTO 8450
8440     PRINT #3,TAB(CORDS(0,PT) - MAXWIDTH);"*"
8450   NEXT PT
8460 RETURN
```

SUMMARY

Leatherwork pattern generation by computer provides a cost-effective means of saving technician time, decreasing patient backlog, and improving quality control. The program is easy to use and effective.

ACKNOWLEDGMENTS

The author wishes to thank Darrell Webb, R.T.O., and Rober Carlisle, R.T.O., for their work on this project.

AUTHOR

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Orthotics and Prosthetics, Vol. 41, No. 2, pp. 39–42.

Case Study: A Modification for Reciprocating Gait Orthosis Use with Bowel and Bladder Involvement

Steve Levin, C.O.
Robert Martinez

INTRODUCTION

The increasing acceptance and use of the Reciprocating Gait Orthosis (RGO) has been well documented in articles and lectures.[1,2,3,4] In the Spina Bifida clinic at The Orthopaedic Hospital of Los Angeles, the RGO has become an integral part of the comprehensive program of orthotics, physical therapy, and surgery.

DISCUSSION

While the advantages of RGO use over more conventional types of orthoses are significant, there are times when these advantages come into conflict with the practicality of a person's lifestyle. A case in point involved an eight year old male spina bifida child with an L-3 lesion level and bowel and bladder involvement. He had been ambulating the past three years in bilateral single upright knee-ankle-foot orthoses (KAFOs) with no pelvic or thoracic extensions. Though the knee joints could be locked, the patient had developed a preference to use the orthoses unlocked. This made ambulation easier for him, though he was significantly flexed at the hips and knees. Locking the joints eliminated the knee flexion, but did nothing to keep the hips extended. The physician was concerned about the possibility of hip flexion contractures developing with his increasing size and age. Placing him in conventional thoraco-lumbo-sacral-hip-knee-ankle-foot orthoses (TLHKAFOs) would eliminate this problem, but would also result in a swing through gait pattern, meaning a possible increase in energy expenditure and a cosmetically unsatisfactory gait.

The clinic team decided that this child was ideally suited to use the RGO, yet one extenuating circumstance had to be dealt with. The child always had been placed in special schools because his spina bifida caused difficulty with personal hygiene. He was now in the process of being taught to change his own diapers and his success at doing this would make him a candidate to progress into a regular school environment. While his KAFOs did not provide an ideal ambulation pattern, they did permit relatively good access to the gluteal and perineal areas for diaper care. The application of an RGO system, with the pelvic band and thoracic extensions, would significantly improve his gait, but could also be a limiting factor in his ability to change his diapers and proceed with other hygienic measures. The child's chances to progress to a normal school setting could be severely diminished should he be un-

Figure 1. Reciprocating Gait Orthosis utilizing single lateral uprights and polypropylene pretibial shells.

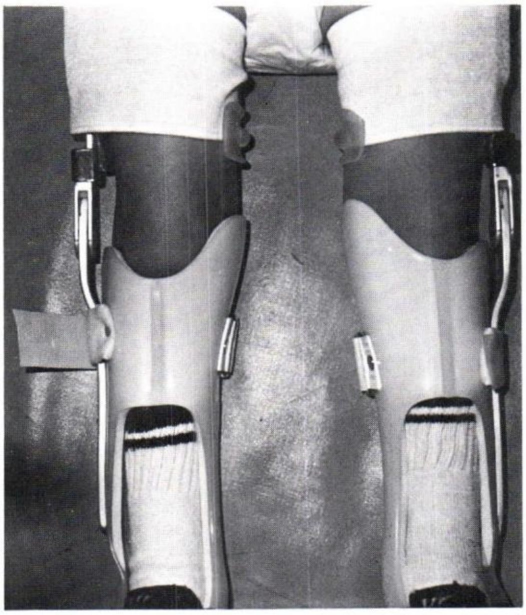

Figure 2. Elastic straps at the thigh help to control tissue dispersion.

able to accomplish these tasks while using the new orthoses. Thus, modification of certain aspects of the RGO system became necessary.

The basic design of the RGO, which the patient uses, is relatively unchanged with single lateral drop lock knee joints and polypropylene pretibial sections (Figure 1). The thigh shells are also polypropylene, but only 1½" wide. Attached laterally and wrapping medially is a 4" wide elastic thigh strap. The plastic acts in conjunction with the high medial walls of the ankle-foot orthoses (AFOs) to provide medial stability, while the elastic straps help to control tissue dispersion (Figure 2). The straps are coated with Scotchguard™ to reduce the problem of soiling. The importance of this design is that it allows easier access to the perineal area by simply disengaging the strap (Figure 3).

The most significant modification to the system relates to the posterior aspect of the pelvic section. In most conventional orthotics, as well as the RGO, the pelvic band, whether standard or butterfly, is placed in such a position that access to the

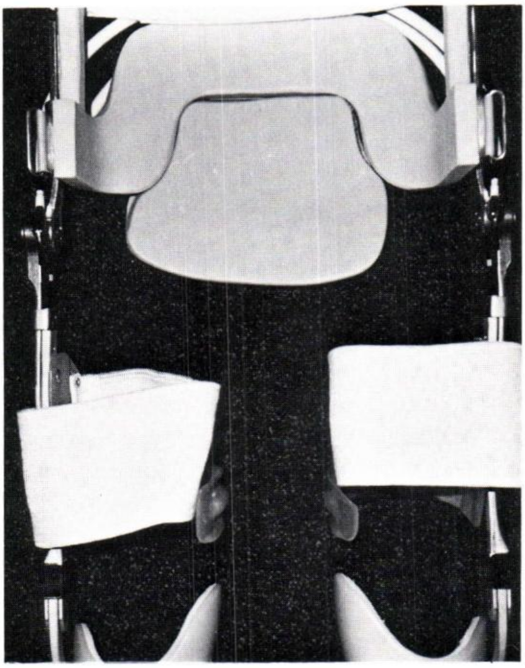

Figure 3. Easy access is gained to the peroneal area by disengaging the "Scotchgard®" thigh straps.

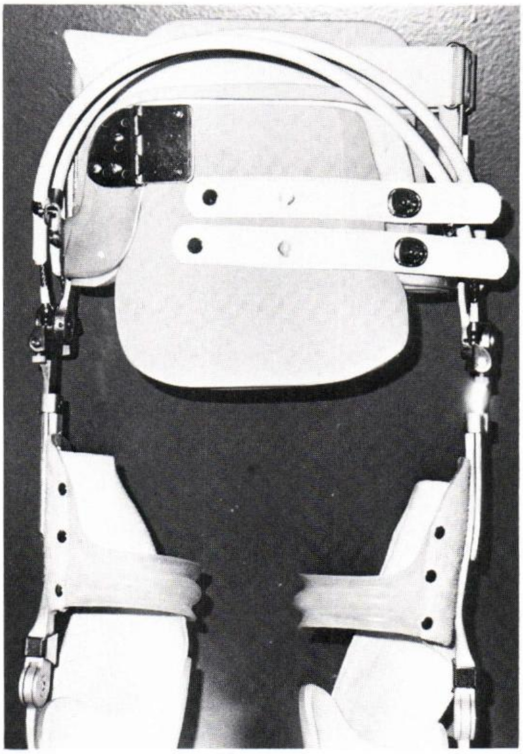

Figure 4. "Lift-a-dot" closures connect the hinged posterior portion to the other extension.

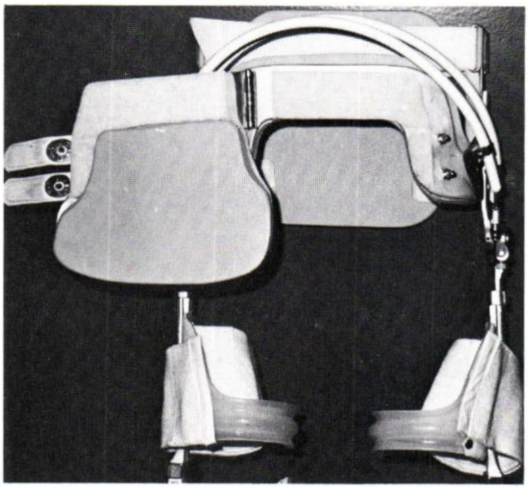

Figure 5. Posterior portion of pelvic band showing hinged portion in the open position.

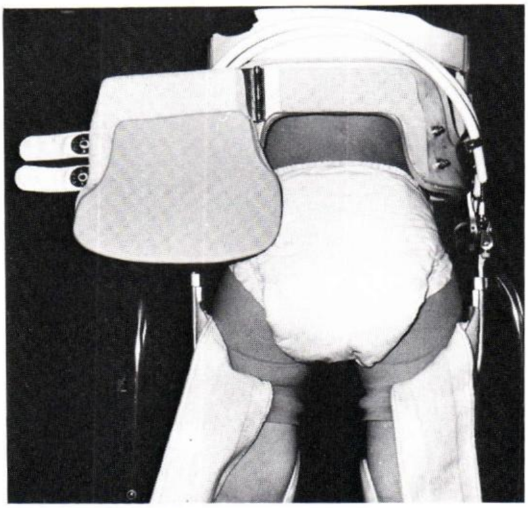

Figure 6. Posterior portion of pelvic band demonstrating access to patient for hygiene.

gluteal or distal spinal areas is difficult at best. What we have done is to almost reverse the normal butterfly band design and extend it proximally, forming it into a modified thoracic band. In order to maintain gluteal control, an extension of 1/8" Kydex with one-half Plastazote™ padding is attached to one side of the band through means of a metal hinge joint. Two leather straps riveted onto the extension connect the extension on the other side by "lift-a-dot" closures (Figure 4). Adhesive hook and pile are added as shown to make opening and closing the "door" easier. When opened, the areas are much more accessible to the patient (Figure 5). Another advantage of the Kydex extension is that length and shape can be easily modified by trimming the plastic and not needing to worry about the exact placement of the metal pelvic band (Figure 6).

CONCLUSION

Upon follow-up, the patient has been able to make excellent use of the modifications and has not experienced any difficulty in using the orthoses. Plans are proceeding for him to be mainstreamed into regular school in the near future.

ACKNOWLEDGMENTS

Special thanks to Toshie Setoguchi, R.P.T., for her concern and encouragement in the treating of this patient.

AUTHORS

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Robert Martinez is supervisor of orthotics for central fabrication at Orthomedics, Inc., 2950 East Imperial Highway, Brea, California 92621.

REFERENCES

[1]Douglas, R., and Parson, P., "The LSU Reciprocating Gait Orthosis," *Orthopaedics,* 1983, 6, pp. 834–9.

[2]McCall, R., and Douglas, R., "Surgical Treatment in Patients with Myelodysplasia Before Using the LSU Reciprocating Gait System," *Orthopaedics,* 1983, 6, pp. 843–8.

[3]McCall, R., and Schmidt, W., "Clinical Experience with the Reciprocal Gait Orthosis in Myelodysplasia," *Journal of Pediatric Orthopaedics,* 1986, 6, pp. 157–61.

[4]Yngue, D., et al., "The Reciprocating Gait Orthosis in Myelomeningocele," *Journal of Pediatric Orthopaedics,* 1984, 4, pp. 304–10.

Orthotics and Prosthetics, Vol. 41, No. 2, pp. 43–46.

A New Plastic/A New Technique

George B. Counts, Jr., C.O.

INTRODUCTION

Since the advent of high temperature plastics such as polypropylene, we have been able to supply patients with light, cosmetic, form fitting plastic jackets. Our problem has always been the time consuming steps of fabrication. Postoperative jackets usually are not measured until the patient is able to tolerate the process of casting; then we are rushed by everyone concerned to apply the orthosis as soon as possible. Many times the physician will merely apply a postoperative body cast to avoid a weekend layover in the hospital.

The fitting process is sometimes quite difficult due to the guesswork involved in cast modification. Many times several adjustments are needed to obtain the proper fit.

Over a five year period, we have developed a new plastic[†] and a new technique of fabricating plastic jackets as well as other commonly used orthoses. Now the patient can be measured, fitted, and dismissed from the hospital in one day.

The plastic has many of the characteristics of polyethylene. It is strong, durable, yet somewhat flexible. One can rivet, stitch, or glue attachment straps to the material. Spot adjustments can be made with a heat gun. Trim lines are cut with scissors or a jig saw.

[†]Mold-A-Brace, C.H. Martin Co., 329-331 Marietta Street, N.W., Altanta, GA 30313.

[††]Available in Adult (S, M, L), Children (Infant-Adolescent).

MATERIALS

The plastic comes in metal cans in pint and quart quantities. Each orthosis is made from a cotton pattern which comes in various sizes.[††] A toaster oven or inexpensive convection oven is used to heat the plastic to 190°–200°F, causing it to melt. A heavy roller is used to spread the plastic throughout the pattern.

METHOD

We will illustrate only the fabrication of a postoperative body jacket, other orthoses vary slightly according to pattern construction.[†] If the jacket is to be fabricated at a location other than our office, we heat the plastic to 250° and wrap each can in several layers of paper for insulation, which keeps the plastic liquid for over three hours.

- Select proper size by applying the pattern on the patient (Figure 1). Each jacket has an anterior and posterior section.
- Unzip and remove the anterior section with the patient in the supine position.
- Open the can of plastic and pour into the anterior section (Figure 2).
- Smooth the plastic throughout the pattern with the roller (Figure 3), making sure an even coat is obtained by gently running your hand over the entire section (Figure 4). Adhesive tape can be used to close the top of the pattern, preventing leakage.

Figure 1. Select proper size by fitting pattern to the patient.

Figure 2. Pour the plastic into the anterior section of the jacket.

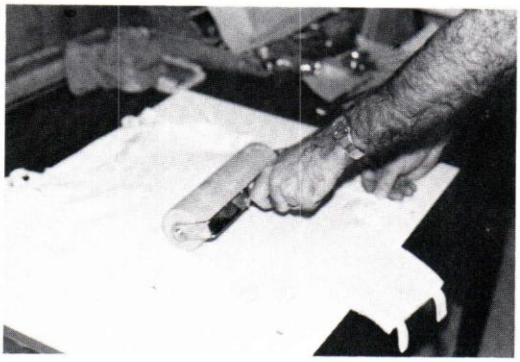

Figure 3. Roll the plastic throughout the anterior section.

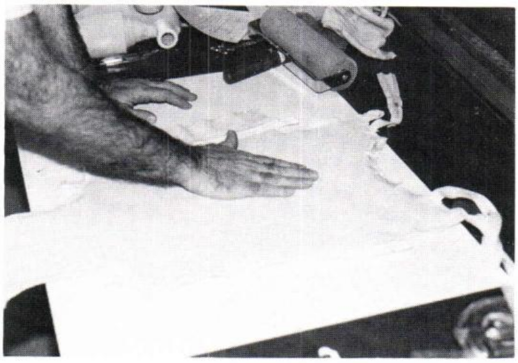

Figure 4. Feel with the hands to check the consistency.

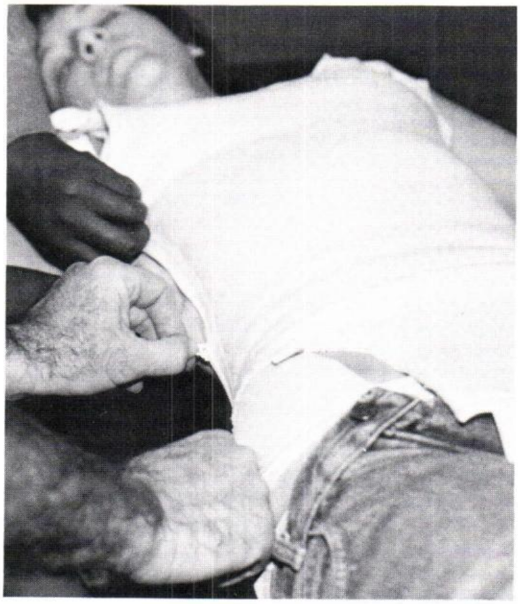

Figure 5. Reapply the anterior section.

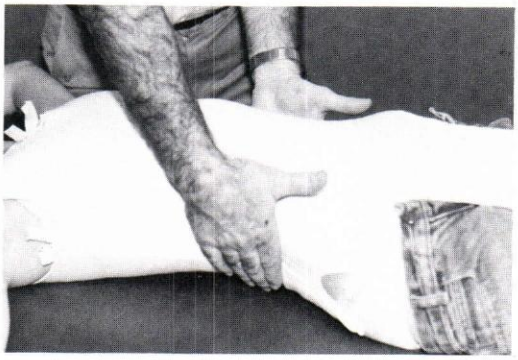

Figure 6. Tie the shoulder straps, pull bottom to stretch out wrinkles, and smooth with hands.

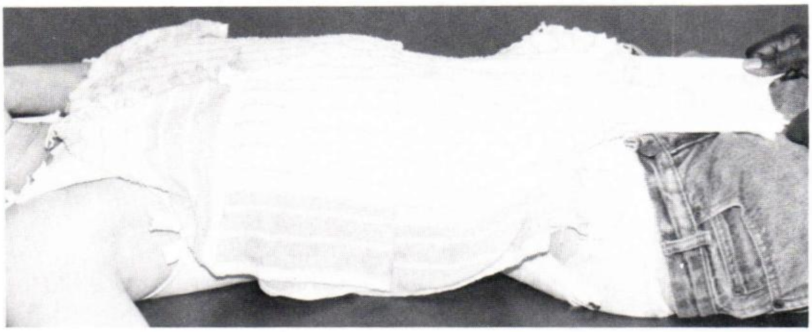

Figure 7. Cool with cold wet towels.

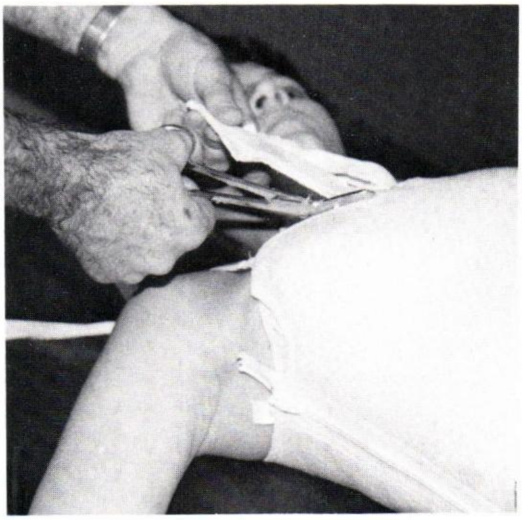

Figure 8. Cut trim lines with bandage scissors.

- Reapply the anterior section to the patient (Figure 5), tie shoulder straps, and pull the bottom to stretch out all wrinkles. Use your hands to help smooth and mold the fabric as you would if applying a plaster negative (Figure 6). Always be sure the proximal end is free of wrinkles, even if you must hold it taut.
- Apply cold wet towels to the garment to hasten the hardening of the plastic (Figure 7). This requires five to eight minutes.
- When hardened, simply cut trim lines with bandage scissors (Figure 8) and remove the anterior section. If any wrinkles appear, use an ordinary heat gun to smooth them out.
- Apply another anterior section to the patient and log roll to the prone position.
- Remove the posterior section and repeat the steps of pouring, smoothing, reapplying, stretching, cooling, and trimming.
- Transport the jacket to your lab for completion. It is as simple to finish as a univalve or bivalved jacket. Zippers are removed as we feel they limit the patient to one tightness; Velcro® straps are substituted.
- Return the jacket to the patient. The only tool needed may be scissors to further trim the jacket if the patient is allowed to sit.

DISCUSSION

By molding the jacket directly on the patient, a perfect fit is virtually assured. Patients who have previous experience wearing other types of jackets or casts report 100 percent preference for this method. They enjoy the soft feeling of the plastic and the fact that there is no proximal slippage when changing positions.

Patients and physicians appreciate the advantages of additional days of postoperative healing before measurement and same day fabrication.

This is a technique that is not easy to perfect. Practitioners electing to incorporate it into their practice should be prepared to practice many times before becoming proficient in the method.

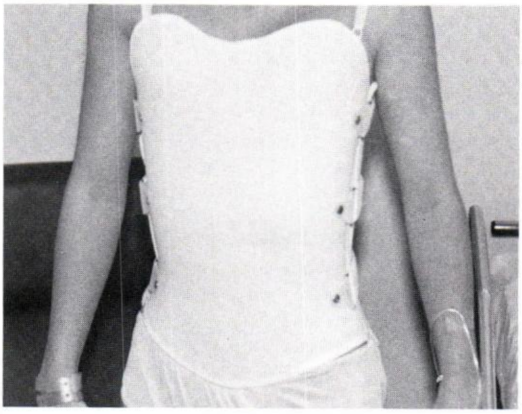

Figure 9. Patient in the standing position wearing the finished jacket.

Figure 10. Patient in the sitting position wearing the finished jacket.

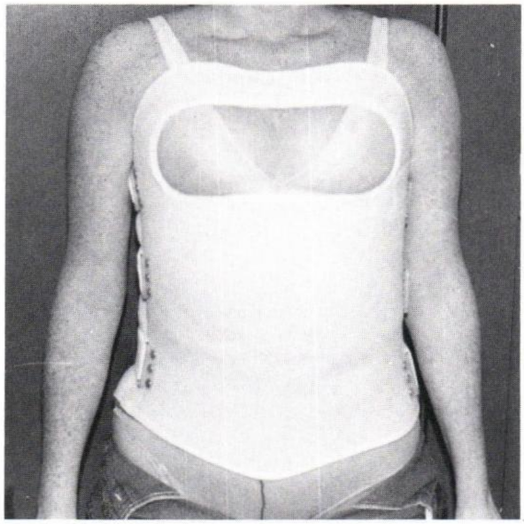

Figure 11. The patient wearing the finished jacket with a cut out for the breasts.

CONCLUSION

Physicians in our area now use the custom formed jackets described in this article instead of casts when time is of the essence.

Plaster modifications, vacuum forming, and the use of central fabrication labs have been eliminated by this method.

We have found better satisfaction with the products fabricated by this method from nurses, therapists, physicians, and patients than from any other device we have ever produced.

AUTHOR

George B. Counts, Jr., C.O., is in private practice with C.H. Martin Company, 329 Marietta Street, N.W., Atlanta, Georgia 30313.

Orthotics and Prosthetics, Vol. 41, No. 2, pp. 47–52.

Technical Note:

The Layering Technique for Heating Sheet Plastics

Eric Schwelke, C.P.
Arthur A. Scheinhaus

INTRODUCTION

Orthotic and prosthetic practitioners have become familiar with different forming procedures using heated sheet plastics, including potential problems with large positive plaster models (specifically adult size knee-ankle-foot models) when using the drape vacuum forming technique. Other problems include ovens with inadequate dimensions and configuration for heating sheet plastics, or multi-level ovens with uneven heating characteristics which cause one sheet to be ready for molding before the other.

A technique for the vacuum forming of knee-ankle-foot positive models in two sections has recently been described.[1] A similar technique is being used in our facility; however, because of our oven design and size, a different method for heating two plastic sheets at the same time is used. This method can be utilized in ovens with one shelf or any oven configuration and shelf size which will hold sheet plastic large enough to cover the average size ankle-foot positive model.†

†We are referring to gas and electric heated air circulating ovens. We have no experience with infrared ovens.

DISCUSSION/PROCEDURE

The heating tray should be prepared by fully covering and affixing a sheet of fluorglass Teflon® sheeting†† to the tray. This facilitates the removal of the heated plastic. Our facility uses a gas fired baker's oven with a single heating tray mounted on steel drawer slides attached to the side walls of the oven. The Teflon® sheeting is clamped to the heating tray (Figure 1). Plastic pieces for the proximal and distal sections are cut to the appropriate size and the positive plaster model is prepared as stated in the aforementioned article.[1] Either piece may be placed on the Teflon® covered heating tray first. A second piece of Teflon® sheeting cut to the same size as the heating tray is then placed on top of the first plastic piece. The remaining plastic piece is then placed on top of the second Teflon® sheet, forming a layer (Figures 2, 3, and 4).

Depending on the physical location of the oven and the vacuum source, the molding procedure can then be performed by one individual experienced in the drape vacuum forming technique. However, two experienced individuals will almost always ensure a successful procedure. When the top plastic piece is ready for molding, the

††Readily available from orthotic and prosthetic suppliers.

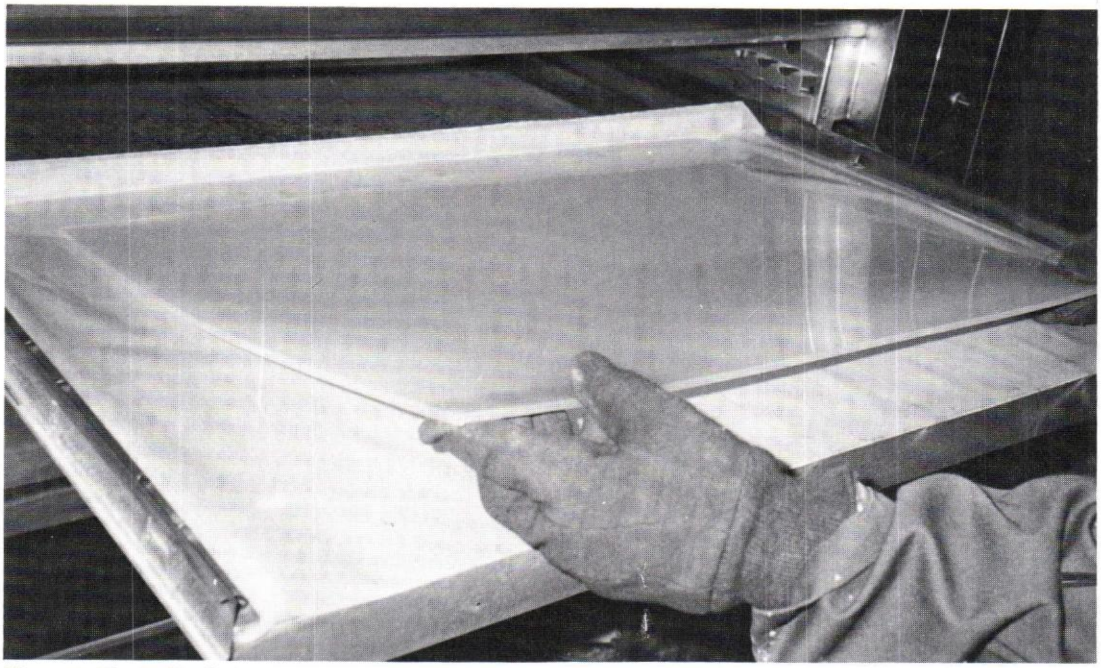

Figure 1. The Teflon® sheeting is clamped to the tray.

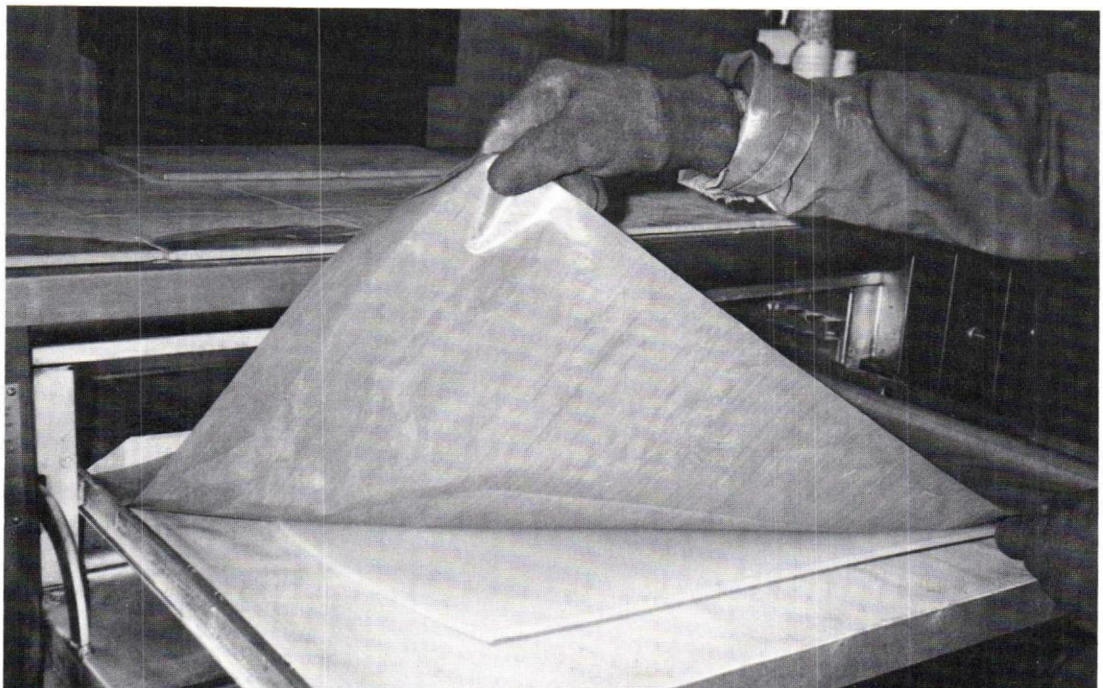

Figure 2. A second Teflon® sheet is placed over the platic.

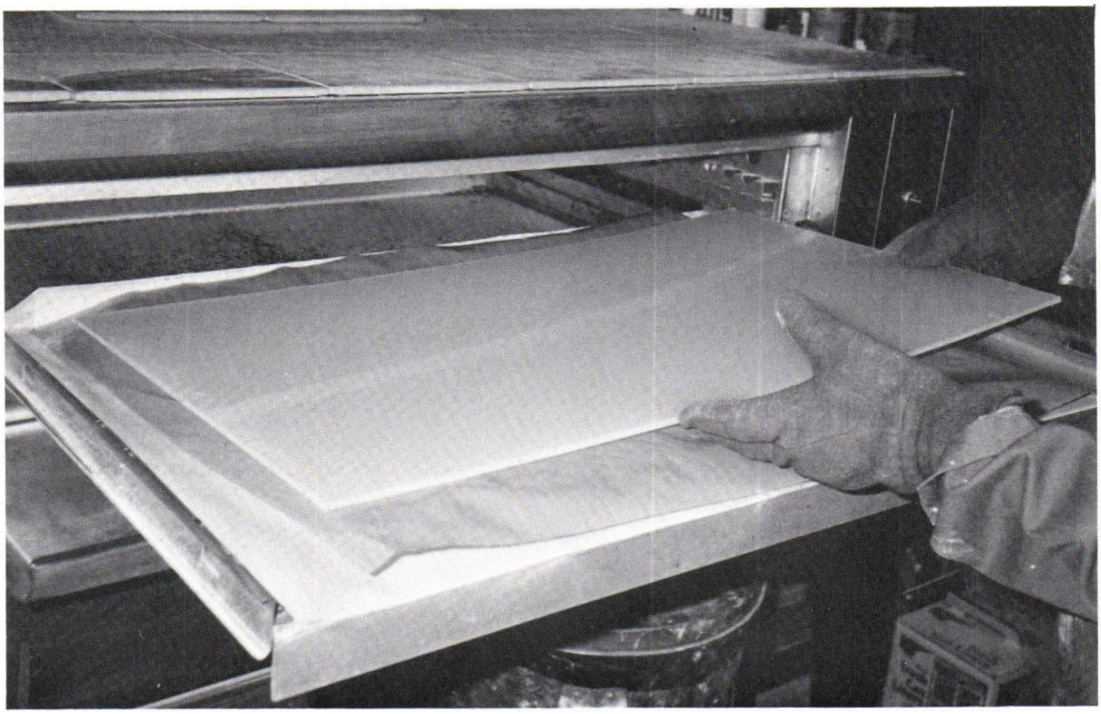

Figure 3. The second sheet of plastic is placed over the Teflon®.

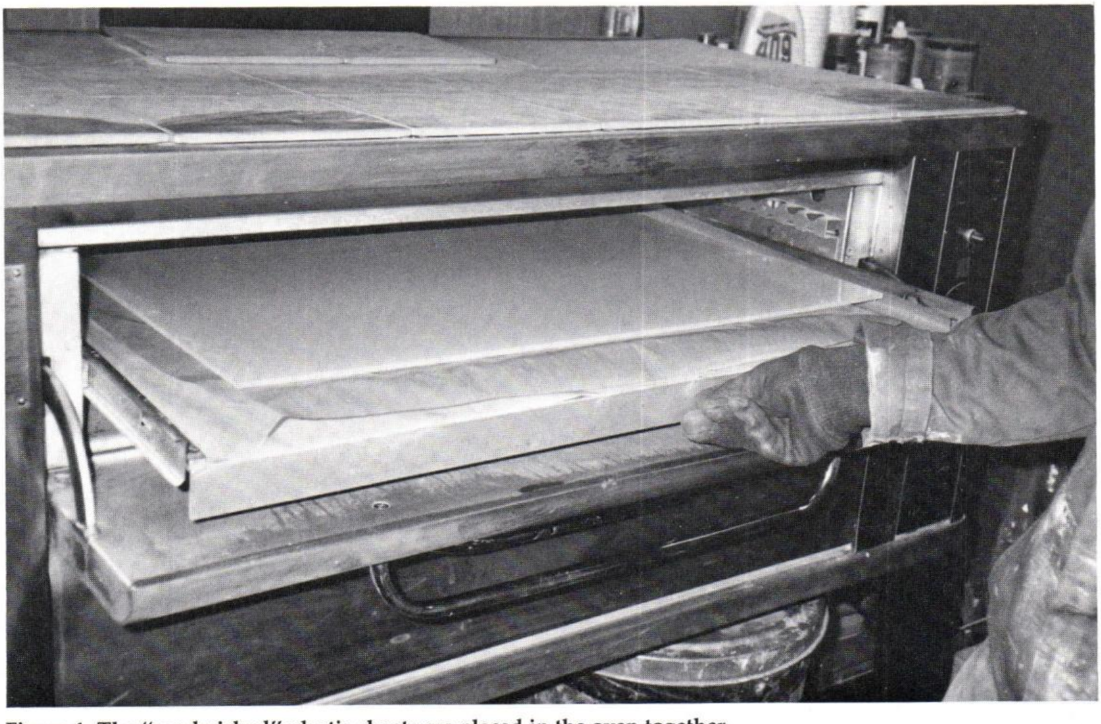

Figure 4. The "sandwiched" plastic sheets are placed in the oven together.

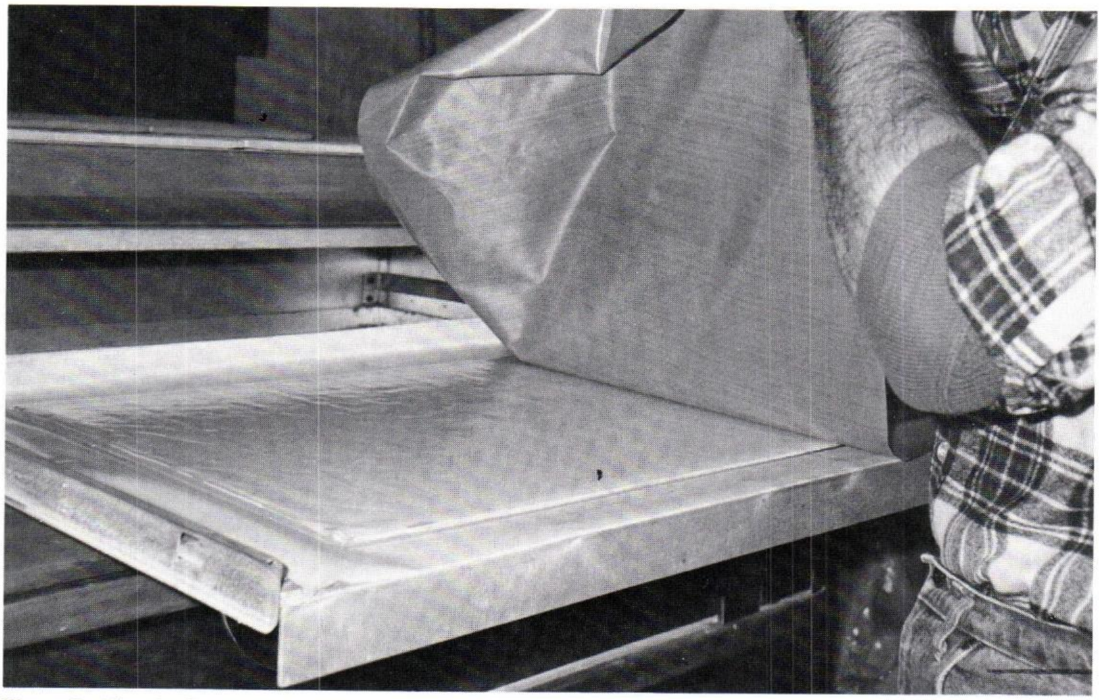

Figure 5. After the first sheet of plastic is applied to the positive model, the second layer of Teflon® is removed.

Figure 6. The second sheet of plastic is now ready to apply to the positive model.

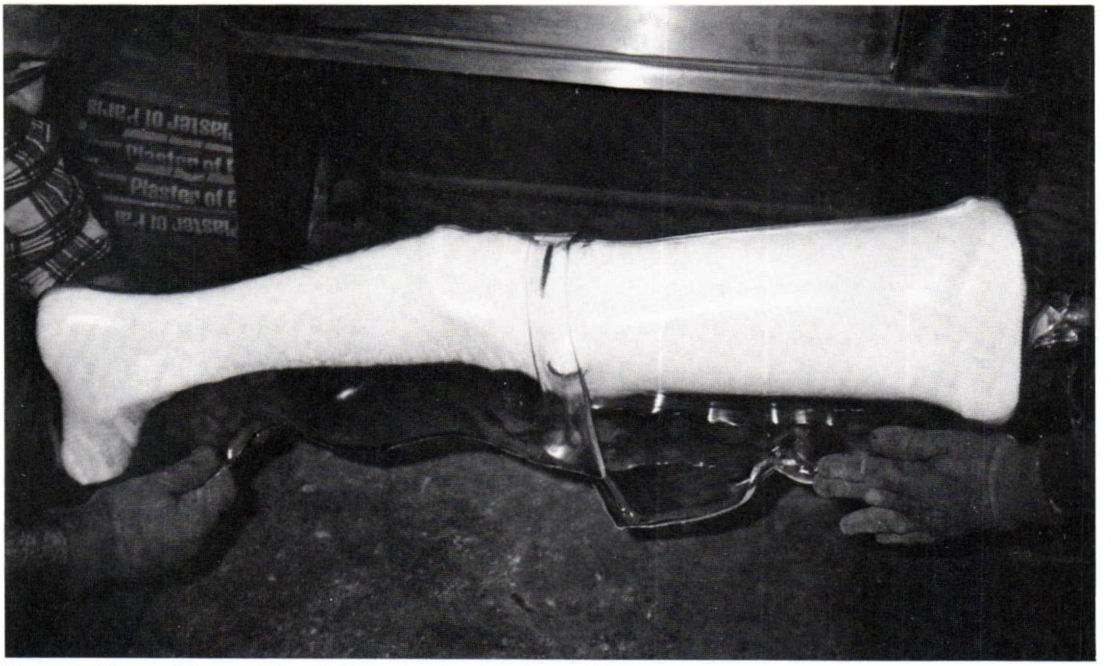

Figure 7. The positive model with both sheets of plastic applied.

bottom piece will also be ready. We have not experienced the timing difficulties of heating two separate plastic sheets at the same time, which can occur in multi-level ovens due to uneven heating. The top plastic piece is removed from the oven and placed in the appropriate position on the positive model. The second Teflon® sheet is now peeled off, exposing the second or bottom plastic piece, which is then removed and placed on the model (Figures 5 and 6). The standard drape vacuum forming technique is followed from that point (Figure 7).

ADVANTAGES AND DISADVANTAGES

The advantages of this system include:

- Small ovens without multiple shelves can be used in fabrication.
- Plastic sheets heat simultaneously and uniformly, speeding the vacuum forming process and with less risk of plastic overheating.

A disadvantage of this system is the plastic may take on the texture of the Teflon® sheeting. However, it is visible only upon close inspection and has not been a problem cosmetically.

SUMMARY

Due to limited oven size and configuration, a layering technique of heating two plastic sheets simultaneously prior to the drape vacuum forming process has been discussed. This technique has been used at our facility for over one year with great success, and can also be adapted for use with multi-level ovens without the timing problems associated with multi-level heating.

REFERENCE

[1]Showers, D.C., "The 'Overlap' Bisectional Forming Technique in Orthotics," *Orthotics and Prosthetics*, 1986, 39(4), pp. 48–54.

AUTHORS

Eric Schwelke, C.P, is president of Ultrapedics, Ltd., 2625 East 13 Street, Sheepshead Bay, New York 11235, and is a graduate of the Baccalaureate program in Orthotics and Prosthetics of New York University.

Arthur A. Scheinhaus is presently affiliated with Ultrapedics, Ltd. as prosthetist and technical consultant. He was formerly a research prosthetist with the Veterans Administration Prosthetic Center, and a member of its Special Clinic Team.

Orthotics and Prosthetics, Vol. 41, No. 2, pp. 53–54.

Academy College Fund Survey Results

John C. Lewis, Ed.D.

We were fortunate to have received 190 surveys in response to the American Academy of Orthotists and Prosthetists College Fund Survey. Many of the surveys returned to us were accompanied by letters including suggestions, approvals, and sharp criticisms. The following highlights are presented.

DEMOGRAPHY

155* Orthotics or prosthetics practitioners
7 Institutional practitioners
4 Researchers
24* Patient care facility owners
4 Work with patient care facility owners
3 Instructors, teachers, professors
3 Institutional heads
0 Supplier firm owners
0 Work with supplier firm owners

*Denotes primary affiliation of respondent, although several checked more than one category.

PREPARATION

34 High School
39 Associate Degree
113 Bachelor Degree
24 Other: Masters (14), Ph.D. (2), Post B.S. Credits (5), Post high school college credits (4)

CERTIFICATION

159 Yes
1 No

CERTIFICATION AREA

44 CP
52 CO
96 CPO
8 Unknown

NUMBER OF YEARS SERVICE

39 0-5 (15 who would be willing to enroll)
52 6-10 (21 who would be willing to enroll)
32 11-15 (10 who would be willing to enroll)
33 16-20 (7 who would be willing to enroll)
13 21-25 (1 who would be willing to enroll)
10 26-30
9 31-35
8 36 and over
4 Unknown

STATEMENTS CHECKED WHICH WERE BELIEVED TO BE TRUE

185 Aware of Academy's efforts to promote degree
15 Never heard of project
189 Feel need for more understanding of Orthotics
180 Feel need for more understanding of Prosthetics
77 Interested in developing, promoting or teaching in the doctoral program
127 Interested in taking some of the courses

58 Interested in enrolling to secure degree
31 Little to be gained in the field by this project
122 Great deal to be gained in the field by this project
105 See O&P personnel to be regarded on same plane as are physicians

AUTHOR

John C. Lewis is a consultant for the Academy College Fund Board of Trustees.

SCIENTIFIC SESSIONS

SCIENTIFIC SESSION I

Wednesday, September 23, 1987
"Training for the 21st Century"

1:00 p.m.– 1:10 p.m.	**Opening Comments** Frank Floyd, C.P.O. Charles White Tina Hittenberger, C.O.
1:10 p.m.– 1:55 p.m.	**How to Retain Your Humanism in the Face of this Technological Explosion** Robert Lang, M.D.
1:55 p.m.– 2:55 p.m.	**Automated Fabrication: Revolution in a Profession** D. Boone
2:25 p.m.– 2:40 p.m.	**The Pillet Aesthetic Upper Extremity Prosthesis** Jean Pillet, O.T., M.D.
2:40 p.m.– 3:00 p.m.	**How to Get the Information You Need** Marion Hall, O.T.R.
3:00 p.m.– 3:45 p.m.	*Coffee Break*
3:45 p.m.– 4:15 p.m.	**Unreasonable Risk, Safety in the O/P Facility** Dale Berry, C.P.(C)
4:15 p.m.– 5:00 p.m.	**Problems, Pitfalls & Parents of Handicapped Children: A Pediatrician's View** Charlotte Thompson, M.D.

SCIENTIFIC SESSION II

Thursday, September 24, 1987
"Orthotic Focus"

8:30 a.m.– 8:45 a.m.	**Orthotic Treatment of Charcot Feet** Michael White, C.O.
8:45 a.m.– 9:00 a.m.	**A New Biomechanical Approach to Foot Orthoses though a Direct Molding Technique** Aharon Bar, D.Sc.
9:00 a.m.– 9:30 a.m.	**Total Hip Arthroplasty and Dislocation-Ambulatory Treatment with Hip Abduction Orthosis** Jeffery J. Yakovich, C.O.
9:30 a.m.– 9:45 a.m.	**Plastic A-Frame** Andrew H. Meyers, C.P.O.
9:45 a.m.– 10:05 a.m.	**Effects of Different Ankle Foot Orthoses on the Kinematics of Hemiplegic Gait Patterns** Steven Hale, C.O.(C)
10:05 a.m.– 10:30 a.m.	*Coffee Break*
10:30 a.m.– 10:45 a.m.	**Variations in the Human Subtalar Joint & Some Orthotic Implications** Jan Bruckner
10:45 a.m.– 11:00 a.m.	**Functional Forefoot Drop and Orthotic Management of the Foot/Ankle Complex** John Glancy, C.O.
11:00 a.m.– 11:15 a.m.	**Stabilizing Eversion-Inversion Injuries of the Ankle and The Biomechanical Requirements of an Ankle Orthosis** Dennis E. Vixie
11:15 a.m.– 11:45 a.m.	**Management of the Post-Polio Patient** Barbara L. Bammann, M.D.

11:45 a.m.– 12:00 noon **Rationale & Design of an Ankle-Foot Orthosis Integrated with Functional Neuromuscular Stimulation**
Philip Muccio, C.P.O.

SCIENTIFIC SESSION III

Friday, September 25, 1987
"Prosthetic Breakthroughs"

1:00 p.m.– 1:15 p.m. **How Injection Molding Can Be Used in Prosthetics** and **Injection Molding: A Step By Step Technique**
Wayne A. Koniuk, C.P.

1:30 p.m.– 1:45 p.m. **Installation Procedure and Prosthetic Foot Bolt Performance**
David G. Firth

1:45 p.m.– 2:15 p.m. **Energy Cost and Gait Study of Dynamic Response Prosthetic Feet**
Ed Ayyappa, C.P.O.

2:15 p.m.– 2:45 p.m. **Kinematic and Kinetic Analysis of the Above-Knee Amputee Swing Phase Walking at Three Different Speeds**
Steven Hale, C.O.(C)

2:45 p.m.– 3:15 p.m. **The "Gator" Leg: A Specially Modified Prosthesis for a Professional Heavyweight Boxer**
Michael J. Quigley, C.P.O.

3:15 p.m.– 4:00 p.m. *Coffee Break*

4:00 p.m.– 5:00 p.m. **Prosthetics and Gait Stump Motion**
ISPO Special Guest Speakers:
Martel and Mensch

5:00 p.m.– Conclusion **Orthotics and Prosthetics Journal Award Winner**

SCIENTIFIC SESSION IV

Saturday, September 26, 1987
"New Points of View"

8:30 a.m.– 8:45 a.m. **A Special Team for Amputation, Mobility, Prosthetics/Orthotics**
Jerrie Larsen, R.N., M.A.

8:45 a.m.– 9:00 a.m. **Patient Friendly Functional Device (Peed)**
Mark R. Moseley, C.P.

9:00 a.m.– 9:20 a.m. **Is Simple Better? Designing A Multi-Axis Ankle to 'Minimums'**
A. Aulie

9:20 a.m.– 9:35 a.m. **Bacteria Present in Prosthetic Sockets**
Glenn M. Kays, C.P.O.

9:35 a.m.– 10:00 a.m. *Coffee Break*

10:00 a.m.– 10:15 a.m. **Bio-Mechanical of Low Profile vs. Milwaukee Braces in Orthotic Treatment for Idiopathic Scoliosis**
A. Patwarham

10:15 a.m.– 10:30 a.m. **Orthoses for Spinal Fractures: An Update**
D.G. Shurr

10:30 a.m.– 10:45 a.m. **Effect of a Rigid Brace on Back Pain**
Stig Willner, M.D.

10:45 a.m.– 11:00 a.m. **A Spinal Orthosis for Dynamic Extension**
Bill Carlton, C.O.

11:00 a.m.– 11:15 a.m. **The Anterior Shell Spinal Orthosis: An Alternative TLSO**
Michael Schuch, C.P.O.

BPDC SEMINAR

How To Value Your Business

Friday, September 25, 1987
8:00 a.m.–12:00 Noon

Every business manager or owner should plan to attend this four hour course on "How To Value Your Business." AOPA's Business Procedures and Data Committee planned the course after receiving requests from AOPA members who are interested in how to determine an accurate valuation of their business for:

- Mergers and Acquisitions
- Viability, Capital Adequacy and Bankruptcy
- Litigation and Expert Testimony
- Employee Stock Ownership Plans
- Estate and Gift Taxes
- Stock Options and Other Equity-Based Employee Incentives
- Preferred Stock Recapitalizations and Partnership Capital Freezes

"Valuations are used in a variety of financial transactions," said BPDC Chairman Don E. Hardin. "This course, developed specifically for our members, will review the relevant qualitative and quantitative factors which need to be considered in determining the value of a business."

The course will be presented by professionals in the field, who are specialists in finance, accounting, business, and management. Sign up for this informative and inexpensive ($25.00) course when you register for the Assembly.

1987 ASSEMBLY EXHIBITORS

R.G. Abernethy Industries, Inc.
Acor Custom Footwear
Alden Shoe Co.
Apex Foot Health Industries, Inc.
Becker Orthopedic Appliance Co.
Bell-Horn Co.
Birkenstock
Otto Bock
Bremer Orthopedics, Inc.
Campbell-Childs
Camp International
Cascade Orthopedic Supply
Classic Custom Shoe Corp.
DAW Industries
Dobi-Symplex, Inc.
Don Joy
Durr-Fillauer Medical, Inc.
Financial Guardian
Arthur Finnieston, Inc.
Flex-Foot, Inc.
Florida Brace Corp.
Friddle's Orthopedic Appliances, Inc.
General Medical
The Hood Company
Hosmer Dorrance Corp.
Innovation Sports
IPOS USA
Johnson's Orthopedic Appliances, Inc.
Kingsley Mfg. Co.
Knit-Rite, Inc.
LaCal, a division of USMC
Lenox Hill Brace Company
Liberty Mutual
Maramed Precision Corp.
M.J. Markell Shoe Co., Inc.
C.H. Martin Company
Northeast Paramedical Ind.
Ohio Willow Wood
Orthofeet
Orthomedics, Inc.
Pel Supply Co.

Physical Support Systems
PMT
Rehabilitation Technical Components, Inc.
Roloke
Selomas, Inc.
Seton Products
Jim Smith Sales, Inc.
Southern Prosthetic Supply
Sports Supports, Inc.
Ralph Storrs, Inc./CASH
Townsend's Orthotics, Inc.
Tribar Orthopedic, Inc.
Truform Orthotics and Prosthetics
Tru-Mold Shoes, Inc.
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Classified Ads

In order to properly calculate the number of words in (and the cost of) a classified advertisement, add up every character in the ad, including commas, hyphens, etc. Divide the sum by five (we consider a word to consist of 5 characters) to find the total number of words. Then figure the cost based on these rates: MEMBERS—first 30 words $32.00. Each addiitonal word $1.50. NON-MEMBERS—first 30 words $78.00. Each additional word $4.00. Responses to AOPA Box numbers are forwarded unopened free of charge and kept confidential. Advertisements are to be paid in advance. Make checks payable to AOPA. Send to AOPA, 717 Pendleton Street, Alexandria, VA 22314. No classified ads will be taken by phone.

ORTHOTIC TECHNICIAN

Position available in NYC. Skills in plastic and metal desired. Competitive salary. Prosthetic knowledge helpful. Send resume to: AOPA Box 70787, 717 Pendleton Street, Alexandria, VA 22314.

Expanding corp. seeking locations in any state for qualified prosthetists w/ established clientele. Certification not req. Start at top salary, plus ins. Be your own boss! Write to: AMERICAN PROSTHETICS CORP., 2301 Huron Parkway, Ann Arbor, MI 48105.

CP—Prefer Eligible CPO. Aggressive private practice, room to move into management position. Good benefits and salary. Send resume or call: Professional Orthopedic Services, G-5105 West Bristol Road, Flint, MI 48507; (313) 732-9020 (ask for John).

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(214) 827-2021

CP/CO/CPO

Growing company in SW sunbelt needs professional staff persons for immediate openings. Direct patient, physician, therapist contact. Excellent salary and benefit package. Send resume and salary history in confidence to: AOPA Box 70887, 717 Pendleton Street, Alexandria, VA 22314.

San Diego, CA

CPO or CP/CO having skill in other discipline, needed for patient management, clinic, and fabrication skills in San Diego County. Competitive salary and excellent benefit package. Send complete resume to: AOPA Box 70487, 717 Pendleton Street, Alexandria, VA 22314.

The *University of Michigan Hospitals* has positions available immediately for a **Certified Orthotist** with upper limb experience and a **Certified Prosthetist.**

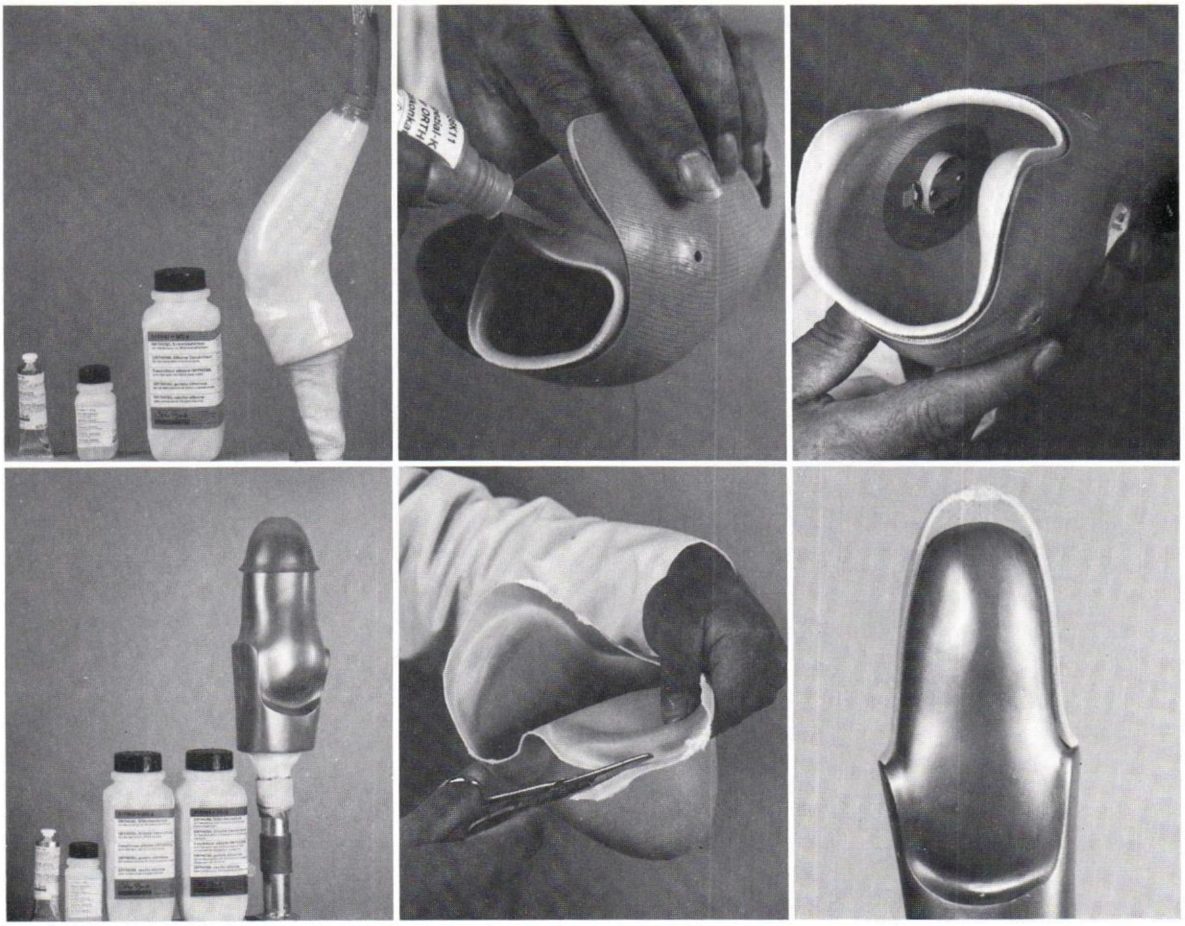
Position offers excellent professional working relationships with physicians. Benefits, salary commensurate with ability.

Send resume to: Orthotics/Prosthetics Department, 1500 E. Medical Center Drive, University Hospital 1D220, Box 0042, Ann Arbor, MI 48109/0042; (313) 936-7044. A non-discriminatory, affirmative action employer.

CPO or CO needed for established O&P practice in southern CT. Duties would include: patient management, clinical work, and fabrication.

Please send resume and salary requirements to:

Robert D. Press, CPO
1985 Barnum Avenue
Stratford, CT 06497



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CO or CPO

The University of Kansas Medical Center has a position available immediately for a **Certified Orthotist.** Located in the Kansas City metropolitan area, Kansas University hospital is a 500 bed acute care hospital with a 20 bed rehabilitation medicine unit. Outpatient specialty clinics include Muscular Dystrophy, Spina Bifida, Cerebral Palsy, as well as treating patients requiring a broad spectrum of orthoses. Position also offers professional relationship with physicians and other allied health team members, and excellent fringe benefits. Send resume to: Paul Trautman, CPO, University of Kansas Medical Center, 39th and Rainbow Boulevard, Kansas City, KS 66103; (913) 588-6548.

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Wausau Hospital Center, a 300-bed acute care accredited regional trauma center, has a full time Orthotics/Prosthetics position available. We are rapidly expanding in rehabilitative medicine, including Orthotics and Prosthetics.

The position requires a professional trained in Orthotics and Prosthetics: certified or eligible.

We offer an excellent salary and fringe benefit package.

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Employment Manager
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Positions are now available in our new facility due to expansion. Responsibilities include patient care, clinic attendance and business management. We are looking for hardworking aggressive individuals who take extreme pride in everything they do. Excellent benefits. Salary commensurate with experience and skill.

Contact:
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Biocare Inc.
615 W. Roosevelt Road
Maywood, IL 60153
(312) 344-9200

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V.R. Rothschild, CP
c/o Rothschild's Orthopedics
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Forestville, MD 20747
Phone: (301) 736-9351

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Reply to: AOPA Box 70587, 717 Pendleton Street, Alexandria, VA 22314.

The Veterans Administration Medical Center, Kansas City, MO is recruiting for two *Orthotist/Prosthetists* (one as leader). Duties include measuring patients, fabrication and fit for a broad range of disabilities. Attends clinics in three hospitals (KC, Topeka, and Leavenworth). Salary appropriate to training and experience (5-5½ years minimum), excellent government benefits. Contact: Personnel Service, VA Medical Center, Kansas City, MO 64128-2295. Phone (816) 861-4700, Ext. 285. *The VA is an Equal Opportunity Employer.*

CPO

Opening available for an experienced CPO who is interested in future management of a branch office. Individual must be innovative, commited to quality patient care, and sales oriented. A knowledge of DME is also helpful. Health benefits, pension and profit sharing, life and disability insurance. Send resume or call:

John Ficociello, CPO
Yankee Medical, Inc.
276 North Avenue
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(802) 863-4591

STAMP Prosthetist (VA Special Team for Amputation, Mobility, Prosthetics)—Career position as an integral member of a multi-disciplinary amputation program utilizing immediate postoperative prosthetic management. Daily contact with leaders in the field of amputee patient care/research/education. Two fully equipped labs staffed by three certified professionals addressing a challenging and appreciative patient population. Our 340 bed acute care facility overlooks the beautiful San Francisco Bay Area, an exceptional cultural and recreational environment. This position provides excellent health care and vacation benefits.

Interested individuals should submit a resume defining experience and education to: VA Medical Center, 4150 Clement Street (662/05), San Francisco, CA 94121; (415) 750-2107. U.S. Citizenship required. EOE.

Prosthetic technician, must be able to handle vacuum forming and be experienced in prosthetic finishing techniques. Excellent salary and medical benefits commensurate with experience.

Send resume to:

Myron P. Griffin, CPO
Orthopedic Services, Inc.
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(915) 532-4444

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Immediate opening in Christian firm for a mature prosthetist. Salary open, paid health insurance. Contact: AOPA Box 70187, 717 Pendleton Street, Alexandria, VA 22314.

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Full or part time position available for individual experienced in plastic O&P fabrication. NYC Area. Contact:

TMR Orthotic & Prosthetic Services
24-18 Ditmars Boulevard
Astoria, NY 11105
(718) 726-8477

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Teter Orthotics & Prosthetics, Inc.
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(616) 947-5701

CERTIFIED ORTHOTISTS/PROSTHETISTS

Positions with FUTURE. Expanding satellites. Patient management, clinic attendance, fabrication, physician contact, COMPETITIVE SALARY, and EXCELLENT BENEFIT PACKAGE. Send resume and salary history in confidence to: A.O.S., P.O. Box 16012, Phoenix, AZ 85011.

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CPO wanted for progressive O&P facility in the Northeast. Excellent opportunity to express and develop your thoughts and skills in management, evaluation, and fabrication techniques. Potential to manage branch facility. Must be creative and self-motivated. Send resume and salary requirements to: AOPA Box 60387, 717 Pendleton Street, Alexandria, VA 22314.

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Full or part time position. Experience a plus. Brooklyn, Nassau area. Salary commensurate with experience. Call (718) 376-0878. Ask for Paul.

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Green Bay, WI 54301

American Orthotic and Prosthetic Association
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Alexandria, VA 22314