DECEMBER, 1963

ORTHOPEDIC & PROSTHETIC APPLIANCE JOURNAL

The Journal of the Limb and Brace Profession

ROBERT C. GRUMAN, C.P.
President 1963-1964, American Orthotics and Prosthetics Association

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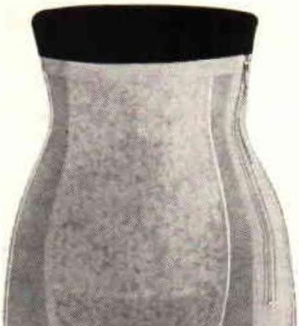

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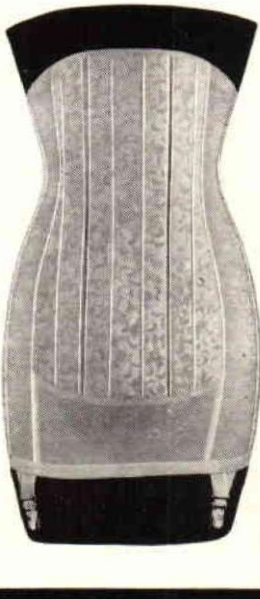

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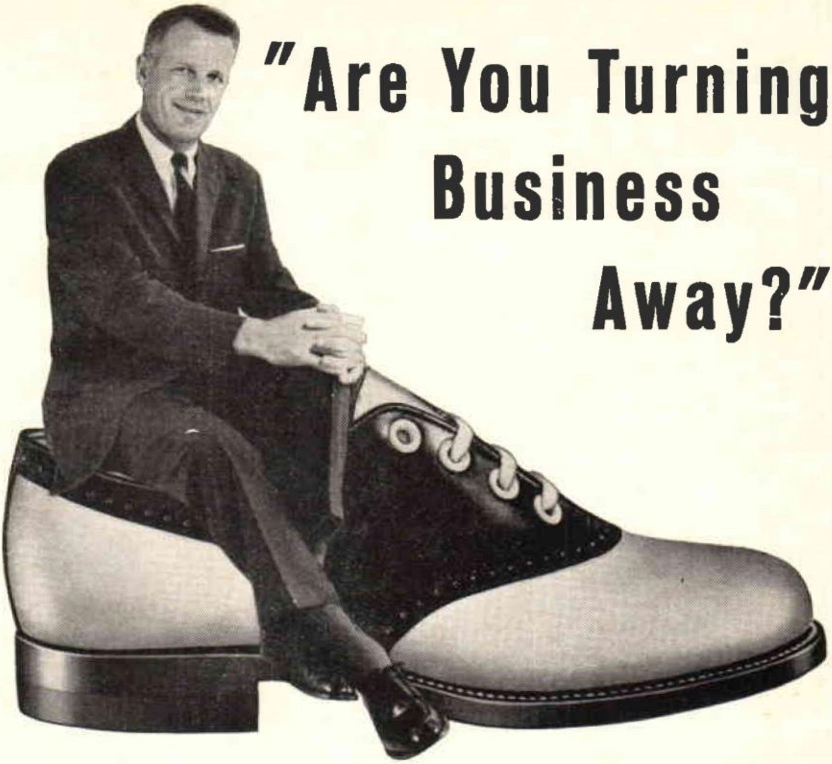

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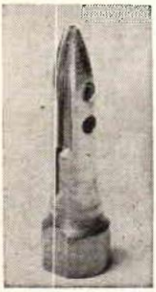

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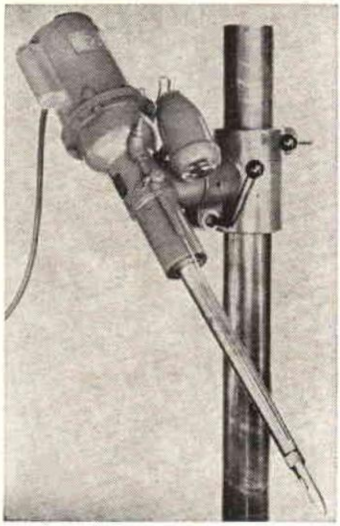

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An Approach to Bilateral Shoulder Disarticulation Harnessing

By CARL T. SUMIDA, C.P.O.

Research Prosthetist, Child Amputee Prosthetics Project, University of California, Los Angeles, School of Medicine

The most challenging problem in fitting patients with bilateral shoulder disarticulation amputations or congenital amelias has been to provide them with satisfactory bilateral terminal device function. In the past, separation of controls has been possible only by utilizing complex controls designs. Various approaches to this problem have been investigated, and a fair degree of success has been achieved with some adult amputees; however, attempts to provide bilateral upper-extremity child amputees with separation of controls have been totally unsatisfactory.

This failure has been due primarily to the musculoskeletal limitations of the patients: the bilateral shoulder disarticulation or above-elbow child amputee has very limited power and scapular abduction, and it is difficult if not impossible for him to operate a prosthesis throughout its functional range. However, he may have very good power sources in shoulder elevation, shoulder abduction, and trunk bending. In order to meet the excursion requirements, it seemed expedient to utilize these superior sources, if possible.

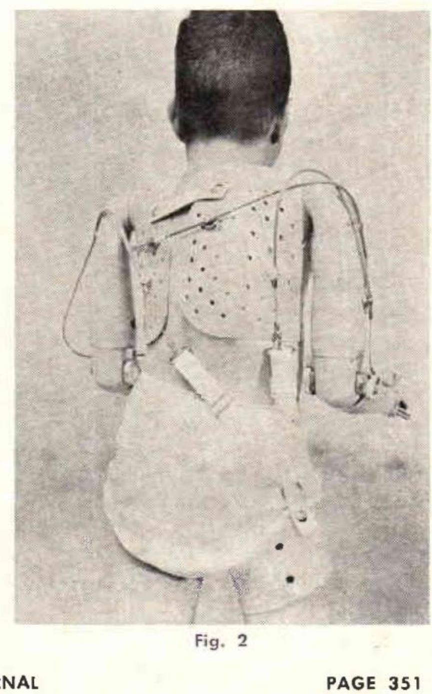

Fig. 2

Perineal straps have been used to tap these power sources, but the discomfort resulting from the use of a perineal strap made such designs unsatisfactory for children.

To overcome this problem of discomfort, and to provide a more stable anchor point than the perineal strap affords, a thigh cuff has been designed to solve these problems of comfort and function (Figures 1 and 2). This thigh cuff is similar to the top brim of an above-knee suction socket, and is quadrilateral in shape, thus allowing the forces exerted on the cuff to be distributed as evenly as possible.

Two types of material have been used in testing this design: the first was a laminated polyester (4110) which was found to have the disadvantage of being rigid, and caused discomfort when the patient was seated. Polyethylene sheet plastic was then tried and found to be much more suitable, providing the desired flexibility with no loss of strength.

When experimentation indicated that such a cuff would provide a very stable anchoring point, this anchor point was located on the lateral side and over the greater trochanter area. Both control straps were placed in approximately the same location, close to the hip axis: this provided automatic separation of controls, with a common anchor point but different control sources. No cross control mechanism was necessary. These bilateral controls can be operated singly or jointly, as the patient desires. Children who have been fitted with this type of control system now have sufficient power to achieve good bilateral function.

Fabrication of the Thigh Cuff

The technique used in taking the cast is similar to that employed in fitting an above-knee total contact socket. The lateral brim of the socket should be carried over the greater trochanter to provide enough material for the anchor point with its necessary fastenings.

The cuff should be placed on the dominant side: this placement is more efficient and also conserves energy. (Only shoulder elevation is required to operate the prosthesis on the cuff side, whereas on the opposite side a combination of shoulder elevation, shoulder abduction, and trunk bending is necessary.)

The cast is filled in the usual manner, then smoothed down and shaped to the proper quadrilateral conformation. The cuff should extend from two to three inches below the ischial seat level. It should not fit too tightly: approximately zero tension should be maintained circumferentially at the rim of the socket. One-eighth-inch polyethylene sheet is used, with dot snap fasteners for anchor points.

The polyethylene is measured and cut, then laid on a clean piece of paper and heated with a heat gun. Polyethylene is opaque at room temperature, but starts to become transparent when it reaches the proper molding temperature. At this point the heated polyethylene sheet is wrapped around the cast, with the seams overlapping on the lateral side of the cast. This double thickness will allow some adjustment when fitting initially for size. Once proper fit has been determined, the seams can be riveted with speed rivets. This double seam will provide additional strength at the point where the anchor snaps are to be positioned. All trims can be made with a knife or scissors, and the edges can be burnished with a felt pad on a grinding wheel.

The thigh cuff is then fitted to the patient, the area of the greater trochanter marked, and the snaps put on.

As this is not to be a weight-bearing cuff, an ischial seat shelf is not necessary. A slight flare is desirable, because it increases comfort in the sitting position. The perineal area should be very carefully fitted to make certain that the cuff is not pressing against the pubis or ramis, and that there is sufficient clearance in the crotch area.

Compensations for growth can easily be made by removing the rivets on the lateral side, readjusting the cuff for better fit and comfort, and then reriveting the seam.

Note, in Figure 3, the crossbar near the end of the control cable. This crossbar is held in place on the shoulder cap by means of a polyethylene crossbar strap, which swings very freely around the rivet point, thus compensating for any movement and almost cancelling out any cable fraying or breaking at this point.

This thigh cuff design has made it possible to take minimal action cases and provide them with a degree of function which had been quite impossible to achieve previously. Although future designs may provide even more function for the severely-involved bilateral upper-extremity child amputee, the results of fitting with the thigh cuff have been very gratifying—far superior to any system of cross controls or perineal strap design used previously.

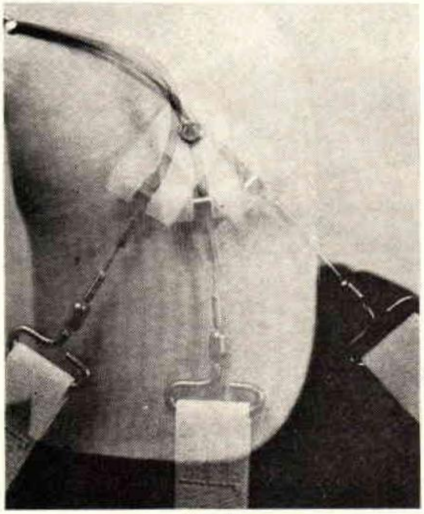

Fig. 3

CARL T. SUMIDA, C.P.O.

Editor's Note: In reply to the *Journal's* request, Mr. Sumida has given us a brief biography. Originally a native of Honolulu, Mr. Sumida came to California in 1949, where he received apprenticeship training at the R. E. Huck Co. in San Francisco, and later was employed at Laurence Orthopedic in Oakland. He returned to Honolulu in 1953 to open his own prosthetics shop, which he operated until 1957. He was employed at Peerless Prosthetics in Los Angeles from 1957 until he joined the staff of the Child Amputee Prosthetics Project at the University of California, Los Angeles, in 1960. Mr. Sumida is now Associate Specialist in Prosthetics at CAPP.

Bracing in Cerebral Palsy*

By Warren G. Stamp, M.D.

Associate Professor of Orthopedic Surgery, Washington University, St. Louis, Missouri

An Instructional Course Lecture, The American Academy of Orthopaedic Surgeons

In cerebral palsy, bracing may be made very simple or it may be very complicated. Overbracing can be as disadvantageous as inadequate bracing.

Definition of Cerebral Palsy

Cerebral palsy is a group of syndromes characterized by a permanent motor abnormality which is caused by involvement of the motor control center of the brain. Since no active disease exists, this definition excludes children with brain tumors, active encephalitis, and muscular dystrophy. It also excludes mental retardation. The diagnosis is not limited by age; but by common usage cerebral palsy is divided into two groups, infantile and juvenile. The upper age limit for onset of the original lesion in the juvenile form is eight years.

Incidence

The incidence of cerebral palsy at the present time is said to be 7.5 children per 1,000 live births. Pearlstein estimates that there are 750,000 young people in the United States who have cerebral palsy. This estimate does not include adults. At present in a study underwritten by the National Institutes of Health, fathers and mothers are interviewed as soon as pregnancy is recognized. The information obtained is being tabulated on I.B.M. cards, and it is hoped that ultimately the true incidence of cerebral palsy, as well as the influence of the environmental factors responsible for it, will be found. Physicians of the Crippled Children Service saw 28,411 children with cerebral palsy in their clinics during 1959 (8 per cent of the total number of children seen).

Classification of Cerebral Palsy

The classification used most frequently has been that of Phelps (1950) which is as follows: (1) flaccid paralysis, (2) spasticity, (3) rigidity, (4) tremor, (5) athetosis, and (6) ataxia.

There are many classifications, but for the purpose of this discussion, two major divisions (pyramidal and extrapyramidal) and one mixed group will be used. The classification pyramidal (spasticity) accounts for 60 per cent; extrapyramidal accounts for 25 per cent (athetosis, 15 per cent; ataxia, 5 per cent; rigidity, 5 per cent); and the mixed classification includes 15 per cent. How strictly one adheres to the following definitions depends on how many patients fall into the mixed category.

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* From the St. Louis Unit Shriners' Hospital for Crippled Children, and the Division of Orthopedic Surgery, Washington University School of Medicine, St. Louis, Missouri. Reprinted from the *Journal of Bone and Joint Surgery*, October 1962, with the permission of the Editors and the author.

Spasticity

This is the so-called pyramidal-tract lesion characterized by a positive Babinski sign, ankle and patellar clonus, hyperreflexia, the exaggerated stretch reflex, the clasp-knife phenomenon, and a tendency for contractures to develop. In a group followed at the Boston Children's Hospital [1], 60 per cent of all spastic children had hemiplegia, and spastic children constituted 64.6 per cent of all those with cerebral palsy.

Extrapyramidal

Since the American Academy for Cerebral Palsy established a brain registry, a great deal of overlap has been found between clinical and pathological findings. Nonetheless, it is convenient to lump athetosis, chorea, ataxia, and rigidity into this second major category. They have in common hypoactivity of the deep tendon reflexes, absence of clonus and positive Babinski sign, frequent failure of contractures to develop, at least early in life, and a difference in the muscle tone. The stretch reflex and the clasp-knife phenomenon are not present.

In actual practice, the extrapyramidal group can be subdivided quite easily:

Athetosis: This is characterized by a series of involuntary muscle contractions resulting in unpredictable motions which may be rapid or slow and which are aggravated by stress or tension. It frequently is associated with either the Rh problem, ABO incompatibility, or anoxia which is bloodborne and not a result of trauma. Braces are used in athetosis primarily for training and not for the prevention of contractures.

Ataxia or incoordination: Strictly speaking, this condition is seen in most patients with cerebral palsy. It affects gait by causing poor balance. Usually the lesion is considered to be localized in the cerebellum. Because the problem is one of balance, braces are not of much value. Skis, weighted shoes, square heels, and so forth, give the child a wide base, and thus they may help him to walk earlier.

Rigidity: This is a sustained involuntary condition which gives the impression of pipe-stem rigidity whenever an affected joint is flexed or extended. Classically, the condition in children with extrapyramidal lesions can be relaxed by shaking the extremity involved (athetosis and rigidity); but in children with pyramidal-type lesions (spastic), the stretch reflex will not shake out and the extremity will remain stiff. Actually, rigidity is very similar to spastic tetraplegia, and only by careful examination can the two be differentiated. Braces may be of little value in rigidity but troublesome contractures should not be allowed to develop. Unfortunately, this condition usually is associated with widespread brain damage.

Mixed type: This is a combination of spasticity and athetosis. The series studied at the Boston Children's Hospital [1] revealed 13.1 per cent of the mixed type, while Pearlstein found that 17 per cent of the 5,000 cases he recently reviewed fell into the mixed type [2].

I shall discuss primarily the braces used in the spastic type of cerebral palsy. In spasticity, the deforming factors are the strong or spastic muscles rather than paralyzed muscles, as is the case in poliomyelitis. The result may be the same so far as the deformity is concerned, but the management of the deformity may be difficult because the spastic muscle is difficult to assess accurately.

Regardless of the difficulty, it is very important to fill out a muscle chart in cerebral palsy, the same as is done in poliomyelitis. It may be necessary to do a local nerve block to paralyze the spastic muscle in order to determine accurately the strength of the opposing muscles. For example, if the tight hip adductors are sectioned and the obturator nerve is excised, weakening of the spastic hip adductors will result. If this happens and the abductors are weak, the child may be unable to walk as well as he did prior to the operation.

In general, it is no problem to get the patient to wear a brace, but it is a problem to get the physician to order and to maintain the brace over a long period of time. I have been guilty of removing a brace too soon, only to see the deformity recur. Yet, we know that spastic muscles and tendons do not keep pace with bone growth.

There are two major types of braces: (1) permanent braces, such as those for poliomyelitis or other neurological conditions that are primarily associated with muscle weakness and (2) temporary braces, applied for a specific purpose, such as the prevention of contracture, as used in angulation deformities, for instance, genu varum or genu valgum. Once the child has reached adolescence, the brace frequently can be discontinued.

A brace is expected to prevent deformities by preventing contractures, correct existing deformities, assist in training and directing a specific motion, determine the possible effect of operation, and protect tendon and soft tissue after operation.

Fig. 1—Goodyear floor matting cut to fit the sole and heel of the shoe. This is a cheap but effective way to add a non-skid surface.

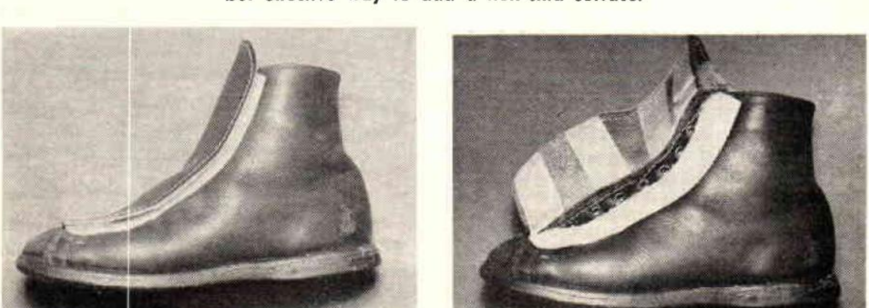

Fig. 2—Velcro has been sewn to the tongue of the shoe and along the margin of the eyelets. This non-skid material actually holds the shoe tighter than shoestrings.

Fig. 3-A

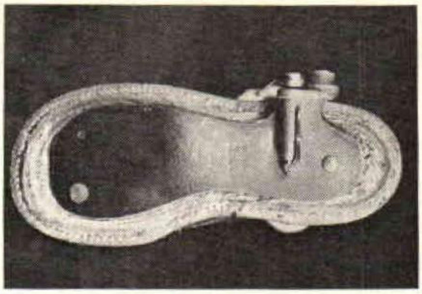

Fig. 3-B

Fig. 3-A—The sole shows the effect of a tight heel cord on a shoe that does not have a shoe plate. The equinus deformity of the heel persisted despite the short brace and the high-top shoe. T strap shown is one used most commonly at the Shriners' Hospital.

Fig. 3-B—Shoe plate placed between the inner and outer sole must extend to near the end of the shoe and definitely must extend beyond the metatarsophalangeal joints. This is one of the Pope short braces and demonstrates the spring which keeps the brace in place.

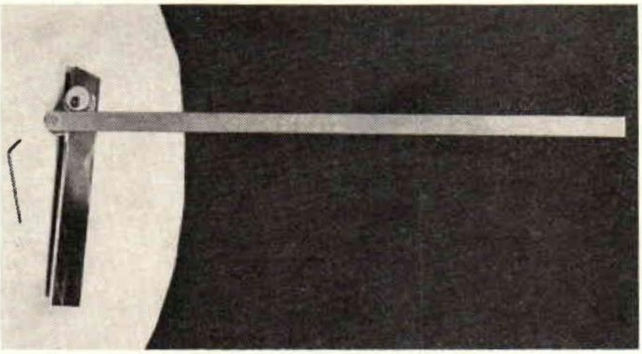

Fig. 3-C—Pope short brace in the rough before the sole plate was altered to fit specific sole size.

Lower-Extremity Braces

Most braces are effective only when they are properly anchored to the extremity and thus a good snug-fitting, high-top shoe is required. The problem encountered most frequently is the equinus deformity secondary to spasticity of the triceps surae muscle group. In spastic hemiplegia the shoe size of the involved foot may be from one-half to a full size smaller than that of the normal foot. In addition to this over-all atrophy of the foot the heel itself may be narrower. The involved leg will be shorter, and the bone age, calculated with the normal extremity, will be retarded. Thus, it may be necessary to obtain mismated shoes to get a good fit. I recommend high-top shoes for all children who have tight heel cords and who require some type of brace. This shoe fits the heel snugly and gives a better purchase for the T strap if one is indicated.

I have not used shoes that lace in the back to enable observation of the heel. The shoe may be fitted with an extra strap over the dorsum of the foot to hold the forepart of the foot down in the shoe and thus prevent the heel from sliding up. Another simple check is to lace the shoes in the reverse direction with the bow at the base of the tongue.

A rubber traction grip made from floor matting may be applied to the sole of the shoe (Fig. 1). Pearlstein obtains these mats in sheets. Then he applies the mat to the shoes with the grain of the mat running in different directions and observes the child to see which position of the mat affords the child the most traction. In many of our public buildings, hospitals, and schools, the floors are kept highly polished. On such slippery floors, this device may be a very simple method of offering the child a little more security.

No brace will hold the ankle if the shoe does not first hold the foot. Some of the shoes have velcro applied to obviate tying the shoestrings (Fig. 2). This adds to the child's independence and may be especially helpful to the child with quadriplegia. If low quarter shoes can be used, the type that has a flip tongue eliminates the tedious job of tying shoestrings.

Figures 3-A and 3-B show what may happen if a sole plate is not inserted in the shoe. I am sure the physician in this case thought that he was correcting the equinus deformity with a short brace and a shoe, but the shoe broke in the shank so that the heel was still in equinus. If this condition were left unchecked, it would contribute to a rocker-bottom deformity which is frequently seen in the child with spastic hemiplegia or paraplegia. Foot plates should be inserted into the sole of the shoe so that as the leather softens this situation does not develop. The plates come in three sizes and must extend nearly to the end of the sole of the shoe. Extension to just the metatarsophalangeal joint is not sufficient. The child with a mild equinus deformity, whose foot can be stretched passively to 80 degrees and who can get his heels on the floor when standing, does not require a shoe plate.

The T strap is required when valgus or varus cannot be controlled with the brace. As a rule, the simple T strap that is demonstrated in Figure 3-A is used. In more severe cases it may be necessary to attach the strap along a more extensive origin (Fig. 4).

Fig. 4

Fig. 5

Fig. 4—Other type of T strap frequently advocated for correction of varus or valgus deformity. It allows a more extensive origin of the T strap.

Fig. 5—Shoe is placed on the foot first. After the heel has been secured, the short brace is attached to the shoe.

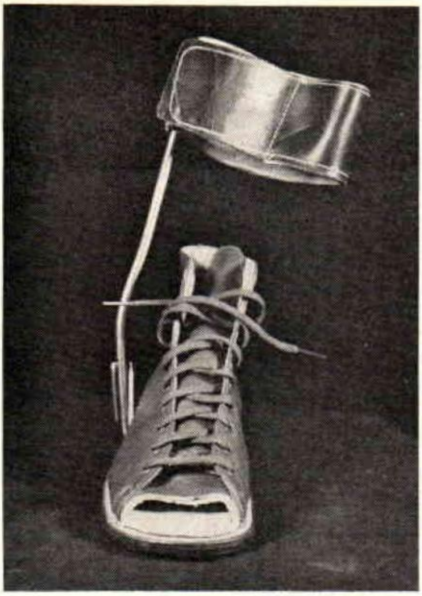

Fig. 6

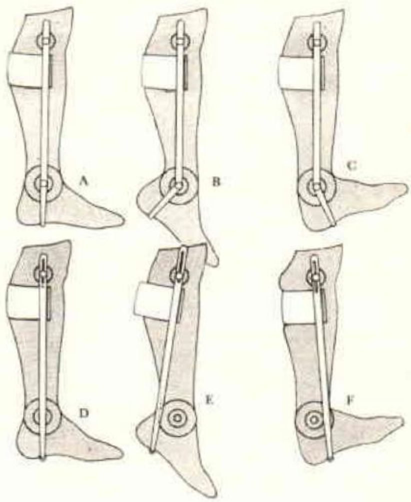

Fig. 7

Fig. 6—With a single upright brace, it is relatively easy to accommodate for valgus or varus deformity. If the round caliper is used, flexion or extension can be managed in the same manner.

Fig. 7—Comparison of the anatomical ankle joint with ankle-heel caliper. With unlimited ankle motion it is possible to get undue calf pressure in extreme dorsiflexion, but this problem seldom exists in cerebral palsy. (Reproduced with permission from Orthopaedic Appliances Atlas, Vol. 1, p. 372.)

Short Brace

A short brace is used for control and not for support in the child with spastic hemiplegia or paraplegia. The same brace that is used in poliomyelitis may be used in cerebral palsy. Whether one uses a short brace of the double upright type or a single upright brace makes very little difference, except that there are a few specific advantages to the short brace with a single upright and round caliper fitting into the stirrup. Figure 5 demonstrates how the shoe can be applied first and then the brace fitted into the shoe. If this is done one can be more confident that the heel is fitting snugly into the shoe at the time of application of the brace. Figure 6 shows that the caliper may be bent to allow for either a valgus or a varus deformity without harming the alignment of the ankle joint. In a double upright brace, such bending of the upright would alter the alignment of the ankle joint so that it would have a tendency to bind. This is especially true with a long lower-extremity brace.

The Phelps brace comes in different sizes so that an orthotist should be able to apply the brace quickly and inexpensively. One may use a brace with either an inside or an outside upright depending on the need for a T strap. The arguments against the brace with the ankle joint located in the heel stem from the fact that the joint is not at the level of the anatomical ankle joint. From a practical standpoint, this does not seem to make much difference because children with cerebral palsy have a limited range of motion in the ankle. A child with a full range of ankle motion conceivably could have undue pressure from the calf band on the gastrocnemius when the foot is put into maximum extension (Fig. 7).

The offset ankle joint, manufactured by the Pope Manufacturing Company, Kankakee, Illinois, has a specific advantage (Fig. 3-C). With a fixed equinus deformity, correction can be obtained gradually by turning the offset with an Allen wrench. This allows the braceman a little more leeway when the apparatus is applied; in addition, it can be adjusted as the equinus deformity is stretched out. We have had some difficulty in small children with the brace breaking at the attachment of the caliper. In older children the caliper is larger and we have not had this problem.

We have not had enough experience to say that the klenzak ankle joint should never be used. It has been the impression of other authors that the spring action of the klenzak ankle gives constant passive resistive exercise to the gastrocnemius group of muscles and thus aggravates the equinus deformity rather than correcting it. Duncan, from Seattle, stated that he has used this type of ankle joint without any apparent difficulty. It would not seem to me that the amount of tension ordinarily found in the klenzak ankle joint would be enough to give harmful passive resistive exercises to the triceps muscle and thus contribute significantly to further shortening. On the other hand, if the triceps surae is structurally short, the tension within the klenzak ankle joint would not be enough to correct the deformity. In other words, I suspect that much of the difficulty with the klenzak ankle joint with a spastic triceps surae has been overemphasized.

The short brace used most frequently at the Shriners' Hospital in St. Louis is the double upright with limited ankle motion as shown in Figure 3-A. The caliper is fixed to the shoe, and the ankle joint is maintained essentially in the anatomical position. Velcro has replaced the buckles on our new braces.

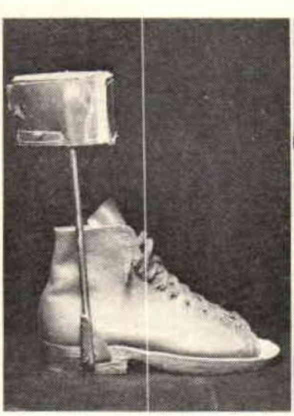

Fig 8

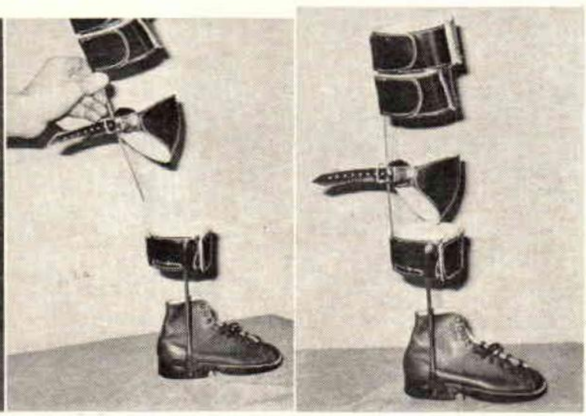

Fig. 9

Fig. 8—Phelps brace used as a night brace. The shoe can be applied to the foot and the brace attached later. Dorsiflexion can be altered by bending the round caliper. Note velcro replacing buckles and straps.

Fig. 9—Short brace can be converted to a long night brace by the addition of an insert in the calf band. This is useful in simple knee-flexion contractures.

Night Splints

Before discussing the long brace for the lower limb, I would like to mention the indications for night splints and the type that I use. I frequently see children who walk on their toes when they first arise in the morning, and then, as the day passes, they are able to get their heels on the floor. These children definitely should have a night brace to hold the foot to a right angle. This can be accomplished by using an old brace (Fig. 8). The toe may be cut out if the shoe is too short, and a large woolen sock may be pulled over the shoe so that the bedclothes are not soiled. The same result can be obtained with a plaster mold. For a child who has an associated contracture of the hamstring muscles, a simple attachment may be added to the night brace to help control the contracture of the hamstrings (Fig. 9). Many children who have undergone lengthening of the heel cord perhaps could have been saved this procedure by the use of the night brace. It is important to explain to parents early in the course of treatment that a child may require some type of night brace until he has completed his growth. If this is understood and the other children in the clinic are also using night braces, very little resistance will be encountered.

Long Braces for the Lower Extremity

There is disagreement about the merits of the double upright versus the single upright long brace. Until a few years ago, we rarely used anything at the Shriners' Hospital but a double upright brace. The double upright brace is the most efficient, but if we remember that, for the most part, we are bracing to control deformity and not for support, I think that we will

Fig. 10

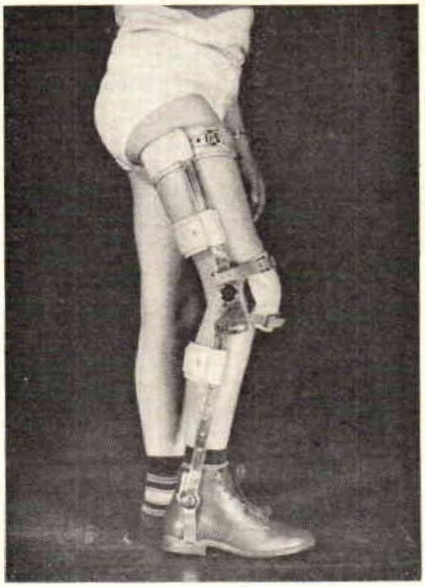

Fig. 11

Fig. 10—A single upright long brace does not control or correct knee-flexion contracture. A double upright brace with a knee pad should have been prescribed for this girl. An Eggers procedure could make bracing easier or, perhaps, unnecessary.

Fig. 11—Knee-flexion contracture being reduced by means of a long brace with a dial lock at the knee. As the contracture is reduced, tension can easily be altered by changing the position of the bolt in the dial lock.

Fig. 12-A

Fig. 12-B

Simple type of bale lock that does not incorporate a spring or multiple moving parts. In Fig. 12-A, the knee is locked and the elastic strap keeps the lock tight. In Fig. 12-B, upward pressure on the half ring forced the lock to unhook.

often find that the single upright brace will accomplish the same objective. If one is trying to correct deformity, not just to maintain the present status, a bilateral upright brace should be ordered in nearly all cases. For the last several years I have used many single upright long braces. One of their main advantages is that allowance for flexion deformities and angulation deformities at the knee and ankle is easier to make with the single upright, and it frequently is easier to make the single upright brace fit. Also, when it becomes necessary to lengthen the brace only a single upright must be changed. Although it is slightly cheaper and slightly lighter, these considerations alone are not sufficient for choosing the single upright brace.

I believe there are fewer indications for the single upright long brace than there are for the single upright short brace. The leather cuffs support the leg very nicely in the brace; and if an inside T strap is required and one prefers not to use an inside bar, a short inside caliper may be added for attachment of the T strap. For the control of knee flexion, it is necessary to use the double upright brace with a knee pad. The inadequacy of a single upright long brace and a pelvic band in flexion contracture of the knee is shown in Figure 10.

In children with flexion deformities of the knee, the dial lock (Fig. 11) may be used; and, after the contracture has been straightened, the knee joint of the brace can be altered to a movable joint. During the stretching of the hamstring muscles, I keep the knee joint locked. In our clinic, we have not had enough experience with the dial lock to be certain that it is advantageous; however, Pearlstein seems to be very pleased with it. If one wants to stretch out hamstring muscles with a dial lock, the calf band or cuff should be posterior to the calf and should not press on the tibia anteriorly, since this may lead to subluxation of the tibia on the femur.

Knee Joints, Locks and Pads

For years I have used the regular drop-lock at the knee. On children with adequate manual dexterity this lock is perfectly satisfactory. However, it seems to me that it would be much better to give some of these children a bale lock (Figs. 12-A and 12-B). The bale lock allows automatic release of the knee joint and adds to the wearer's independence. The main objection is that the lock may be released inadvertently, but this has not been a major problem. The upkeep is no more than in the simpler mechanical devices.

In some cases it might be better to use the Warm Springs type of knee lock, which can be released at the level of the hip joint by pulling on the control lever (Fig. 13). On patients with a spastic or an athetoid condition, the lock will have to withstand a great deal of stress. In athetosis, I recommend a double upright long brace because of the torque applied to the knee joint and to the uprights of the brace. A single upright brace manufactured

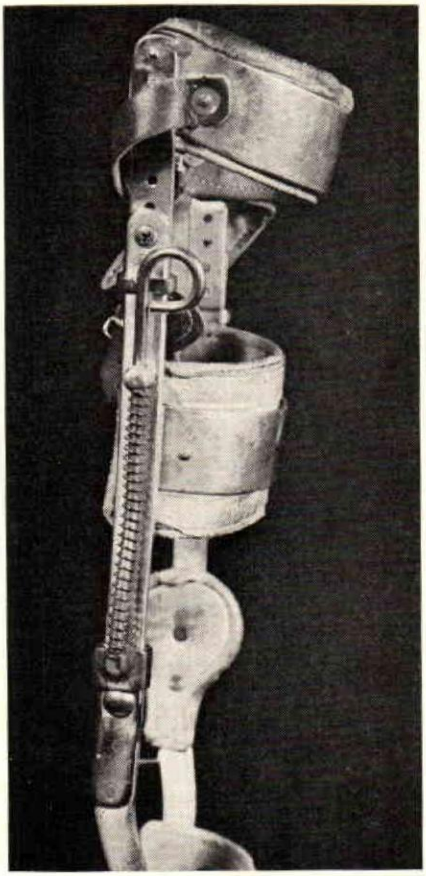

Fig. 13

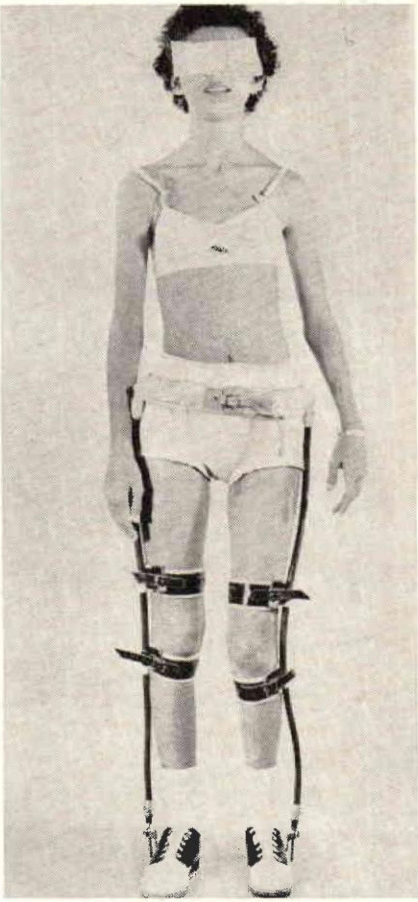

Fig. 14-A

Fig. 13—Close-up of the drop lock at the knee. A cord can be attached to the ring, making it easier for the child to release the lock.

Fig. 14-A—This patient walked with severe medial femoral torsion, with associated scissoring. Injection with 1 per cent xylocaine gave a good preoperative estimate of anticipated results. She was followed in an alemite twister made from grease-gun cable.

Fig. 14-B—Twister may be attached directly to the shoe or brace; torsion is adjusted by loosening the socket with an Allen wrench, applying desired twist, and then tightening the socket.

by the Pope Foundation has a reinforced joint with roller bearings designed to withstand the torque. It comes in several sizes and can be assembled by a competent orthotist in a relatively short time.

On children with a tendency to genu valgum, one can use either a strap to prevent knock knees or a leather button on the medial upright to apply pressure over the medial femoral condyle. Genu varum is very rare in the child with cerebral palsy. I prefer the button since the pressure is more or less constant whether the child is standing or sitting. The position of this button must be checked frequently, because unless it is accurately placed, it moves anterior to the knee joint when the child sits and does not give the desired pressure. In addition to this, normal growth of the child will alter the position of the button so that it may be ineffective. Perhaps the button should be in the shape of a c rather than a round circular pressure pad. If both knee flexion and genu valgus are present and moderately severe, the knee pad will be more effective.

Medial Femoral Torsion

If the medial femoral torsion is a severe problem, one may add some type of rotator device to the brace. The girl shown in Figure 14-A was able to walk without braces, but she had severe medial femoral torsion. After injection of 1 per cent xylocaine into the obturator nerve on the left, the scissoring and internal rotation were much reduced. Several days after injection the obturator nerve was surgically sectioned on the left, and tenotomy was performed on the adductor longus muscle. A b lateral long cast in mild abduction was used for four weeks and then followed with bilateral twisters. Presently, I am using the grease-gun cable (alemite) as the twisting device. This is anchored to a pelvic band, and the distal end may be attached either to the proximal portion of the short brace or to the shoe if the child does not require a brace. We hope we can correct medial or lateral torsion by this means. Rotation can be increased or decreased by adjustment of the torque at the insertion of the cable. The twisters may be changed from one pair of shoes to another by using a skate type of attachment for the insertion of the alemite cable. Although we have not used the rotators as a night splint, they certainly could be so used.

In dealing with medial femoral torsion with a mild amount of lateral tibial torsion, it may be that the cables could be attached to a form-fitting femoral cuff. In our institution elastic twisters have not been very satisfactory. A child I saw in Chicago recently who was using the elastic twisters is shown in Figure 15. The corset should be applied with the child lying

Fig. 15

Fig. 16-A

Fig. 16-B

Fig. 15—Elastic twisters have the advantage of being light but have the disadvantage of requiring a corset. Also the elastic bands lose their elasticity and must be replaced.

Fig. 16-A—The Miller twister is a tightly coiled spring which is effective in controlling rotation. A plastic cover has been placed over the spring to reduce wear and tear.

Fig. 16-B—The twister has been attached directly to the short brace.

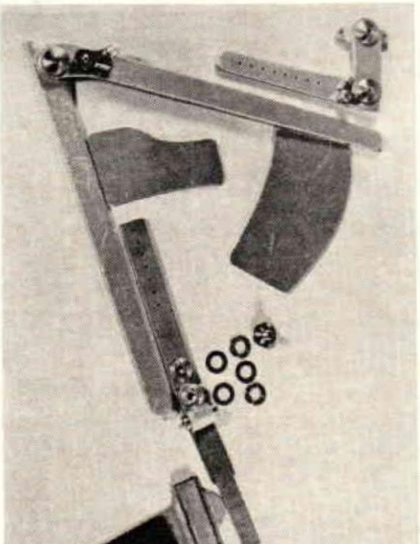

Fig. 17-A

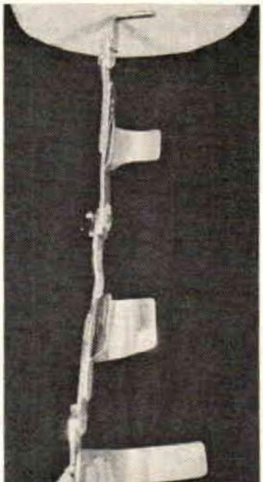

Fig. 17-B

Fig. 17-A—The Newington brace before fitting and assembly. The ankle joint has been disassembled to show the component parts.

Fig. 17-B—The assembled Newington brace. The pelvic band has been cut in half for demonstration and the sole plate has not been applied.

down, and it should fit snugly and hug the iliac crest. The device may be quite annoying, particularly in hot weather, as the twisters tend to chafe the legs when the child walks. Another type of twister consists of a spring attached to the pelvic band and to the shoe in a way similar to the alemite cable (Figs. 16-A and 16-B).

The spring is covered with a plastic tubing. This apparatus is rather expensive since the spring breaks frequently.

Fig. 18-A

Fig. 18-B

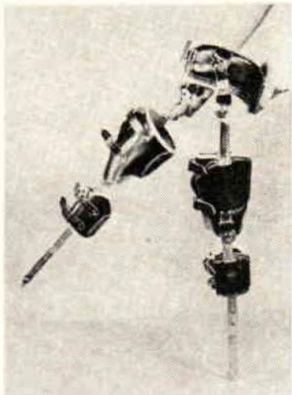

Fig. 18-C

Fig. 18-A—Patient with poliomyelitis demonstrating the straight pelvic band. With a mild hip-flexion contracture the buttocks would slide under the band, giving the child very little support.

Fig. 18-B—The pelvic band with the inferior portion being curved to fit the proximal portion of the sacrum. Also demonstrated is the joint located at the pelvic band.

Fig. 18-C—Demonstration of the amount of motion possible at pelvic-band joint when the hip joints are locked.

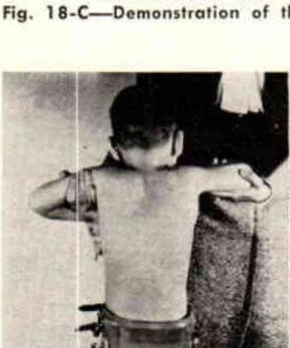

Fig. 18-D

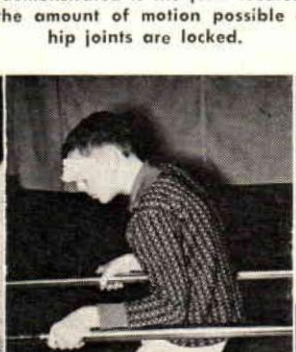

Fig. 18-E

Fig. 18-F

Fig. 18-D—Extreme extension of the pelvic band to hold the buttocks forward.

Fig. 18-E—This child is able to walk with difficulty between parallel bars.

Fig. 18-F—With proper bracing, including double upright long braces and pelvic band, the child is able to walk without support. Properly selected surgical procedures might give him greater or total relief from braces.

Long Braces with a Pelvic Band

I believe that we frequently can eliminate the double upright brace if we attach the brace to the pelvic band. Leather cuffs can be made to hold the legs very securely. The weight and bulkiness of a double upright brace with a pelivc band can be a real problem to both parents and child. Certainly the long brace with a pelvic band may be very useful. On the other hand, it is a very cumbersome piece of equipment and should be recommended only after due consideration.

It is important that the brace be strong and the hip locks arranged so that they can be locked and unlocked. The pelvic band must be so constructed that it will give support over the sacrum. Otherwise, the band will slip and much of the support will be lost. If the band is constructed like a poliomyelitis brace, the same problem is present. The difficulty can be avoided by curving the band so that some pressure will be applied to the sacrum or by use of butterflies, which are extensions from the pelvic band.

The Newington Home brace is prefabricated and it may be ordered and assembled by the orthotist. Figure 17-A shows the Newington brace unassembled, and Figure 17-B shows it assembled but without any of the leather work. It is important that long braces with a pelvic band be well balanced, and one simple test is to see if the brace can stand by itself. The pelvic band should be removed as soon as possible since it leads to further weakness of the gluteus medius muscle. A simple friction joint with a drop lock is used at the Shriners' Hospital. If free motion is required, the lock can be taped or a simple latch can be attached to hold it up. Recently following a suggestion by the Pope Foundation, I have allowed 20 to 30 degrees of motion at the pelvic band so that the hip joint is still partly locked, giving the child sufficient support (Figs. 18-A through 18-F). If scissoring is a

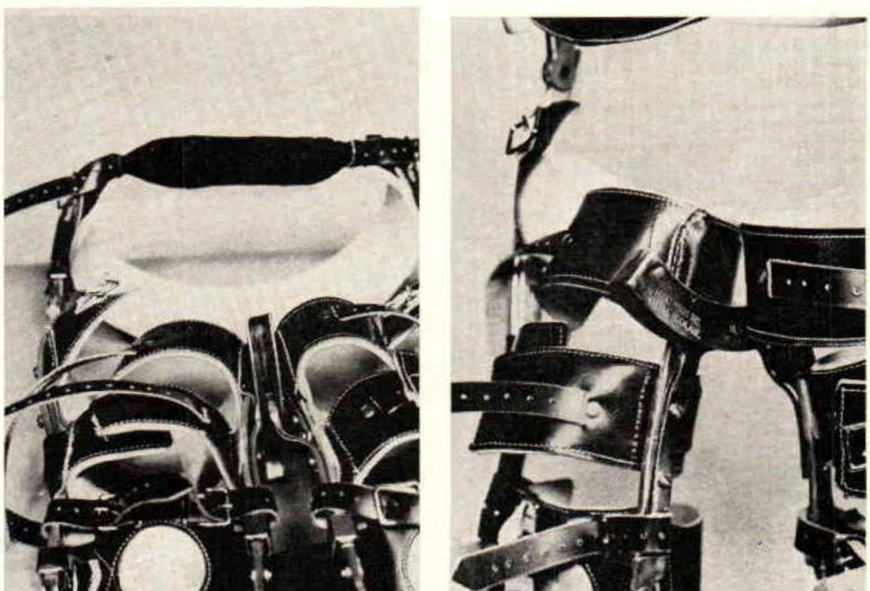

Fig. 19—Trolley may be added to the brace to control scissoring. A long brace with a pelvic band should be attempted first and, if scissoring persists, the trolley can easily be attached.

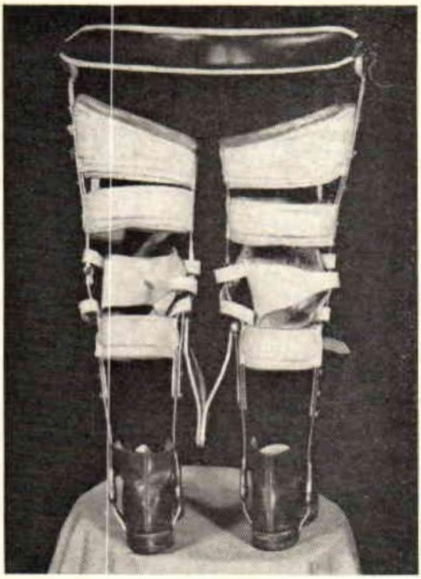

Fig. 20-A

Fig. 20-B

Fig. 20-A—A simple antiscissoring device consists of two pieces of steel with a simple axis joint.

Fig. 20-B—Trochanteric extensions added to long braces; a leather strap between these extensions can be tightened to aid in correcting medial or lateral torsion, depending on whether the strap is posterior or anterior.

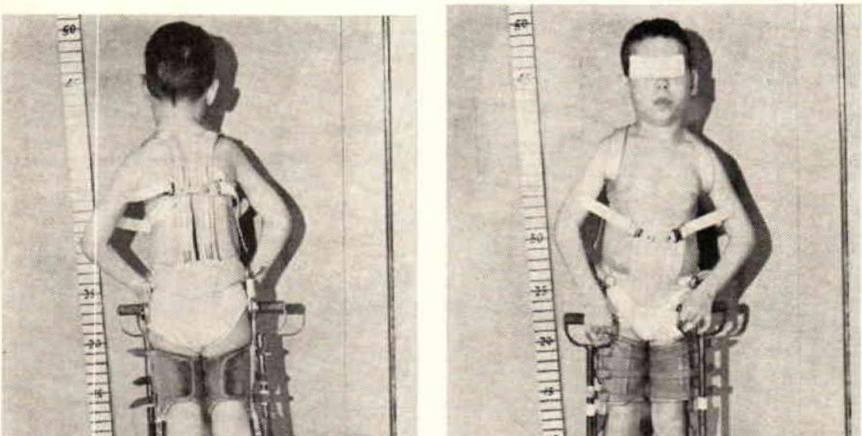

Fig. 21—This boy is able to walk slowly with extensive bracing and quadriped canes. So much energy is needed to walk short distances that he is somewhat reluctant to walk.

major problem, an antiscissoring device may be applied to the long brace with a pelvic band. One such device is the trolley (Fig. 19) manufactured by the Hickerson Company of Little Rock, Arkansas, as the result of work done by Dr. S. B. Thompson. Unfortunately there is considerable friction in this particular joint. A small child of four or five years of age would have some difficulty with bilateral long braces with a pelvic band and the trolley.

Another antiscissoring device consists of two metal rods with movable joints at the middle and at both ends (Figs. 20-A and 20-B). If long braces are sufficient, but there is some rotational deformity as a result of medial femoral torsion, a trochanteric extension may be added to the brace with a leather strap around the buttocks to help control internal rotation. An anterior strap can be used to control external rotation. The trochanteric extension and the trolley arrangement might be used to eliminate the pelvic band, but I have not tried this.

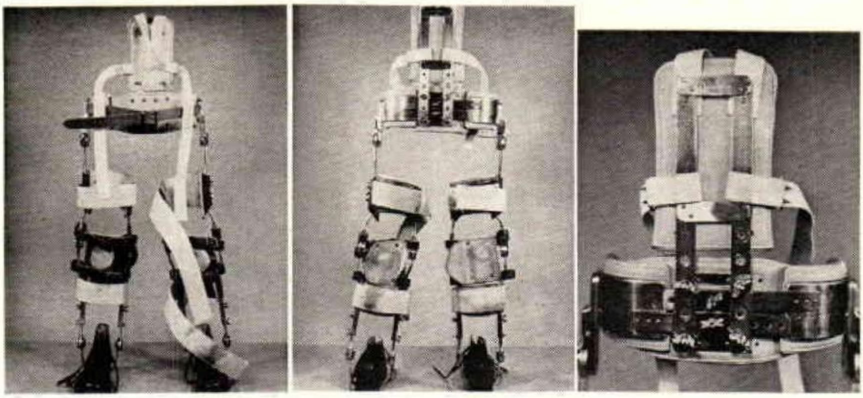

Fig. 22—Anterior view, posterior view, and close-up of training brace. It may be lengthened and the pelvic band may be widened with minimum effort. The shoes can be removed and the suitable size attached. The back support can be raised, lowered, or removed. It should be emphasized that this is a training brace and not a permanent one.

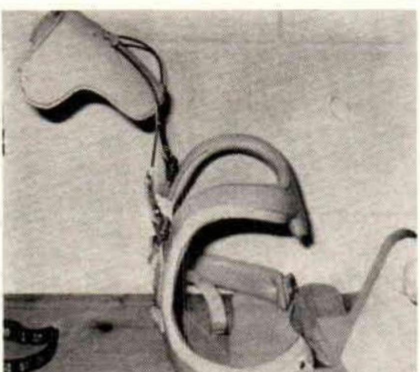

Fig. 23

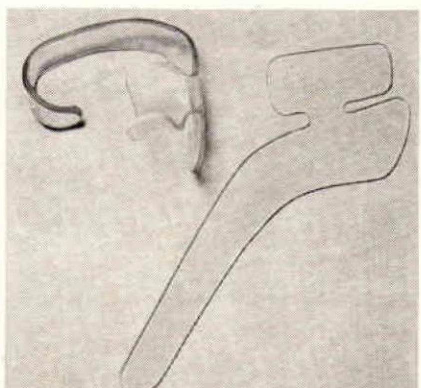

Fig. 24

Fig. 23—Head control brace used by Dr. Pearlstein.

Fig. 24—Opponens splint. With only slight modification of the C bar, this splint can control adductor contracture of the thumb. It can be made of plastic or precut metal.

Control Brace

The full control brace includes a back support added to the pelvic band and long braces (Fig. 21). Occasionally it is necessary to resort to such heavy bracing to initiate standing and walking. An adjustable brace which will allow training of a child was devised by Dr. Machek, a physiatrist in St. Louis. It is being used at the Alhambra Grotto Cerebral Palsy Center (Fig. 22). If it appears that such a brace is worth while, it can be designed to the exact measurements of the patient. A brace of this type might be appropriate for a number of children, but frequently it is rejected because of the expense and the possibility that it will not be satisfactory. I believe that this device has merit, and Dr. Machek and the B & H Orthopedic Company in St. Louis are trying to correct some of the mechanical flaws in order to make the brace more effective.

The full control brace may be required for the child with athetosis, and in some cases it may also include a head control device, which either is attached to the brace or, as Pearlstein demonstrated, may be used independently. I have experimented only recently with the head control brace (Fig. 23). Thus, I can only refer you to Dr. Pearlstein or to Dr. Phelps.

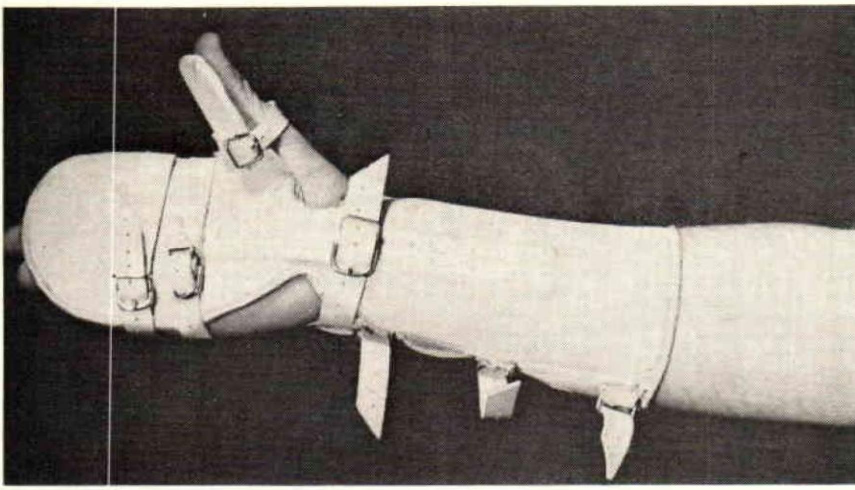

Fig. 25-A

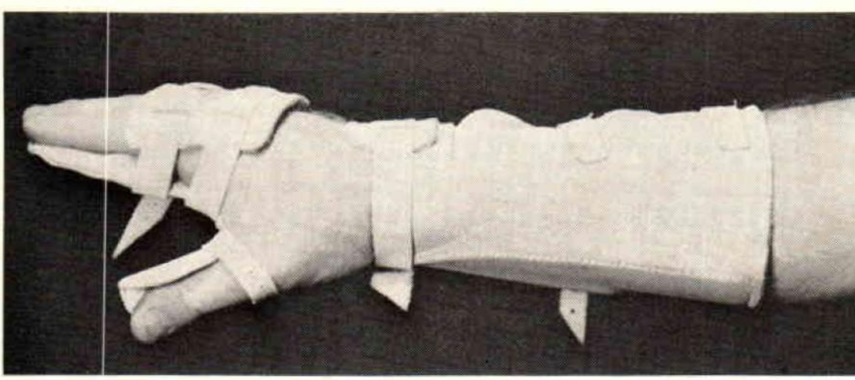

Fig. 25-B

Figs. 25-A and 25-B—Hand sandwich used on a night splint to control flexion contracture of the wrist and fingers and adductor contracture of the thumb.

The full control brace for children with athetosis has not been used at the Shriners' Hospital in St. Louis to my knowledge. I do not mean to imply that we do not prescribe braces for children with athetosis because we do. However, results are much less gratifying in athetoid patients than in spastic patients.

Bracing of the Upper Extremity

I have not braced the upper extremities to the extent that I have braced the lower extremities. I believe that we have neglected the upper extremities. Results with braces and with surgical treatment for the upper extremity have been disappointing. I think we have expected too much. If we recognize that minimum improvement may help the child a great deal, perhaps we will be more easily satisfied. Except for brachial palsy, I have not used shoulder braces for abduction or adduction deformities. The elbow brace may be of value in controlling flexion contracture of the elbow and in preventing pronation deformity of the forearm. A plaster cast can be made for this purpose and changed as the child grows. Correction may be obtained by a series of casts. The last one is used as a night splint. If the deformity cannot be controlled, the tendon of the pronator teres muscle may be sectioned and transplanted to act as a supinator, or on some occasions the entire origin of the muscle can be recessed from the medial humeral condyle distally. It is certainly wise to brace after operation in both the upper and the lower extremity until the child regains active control.

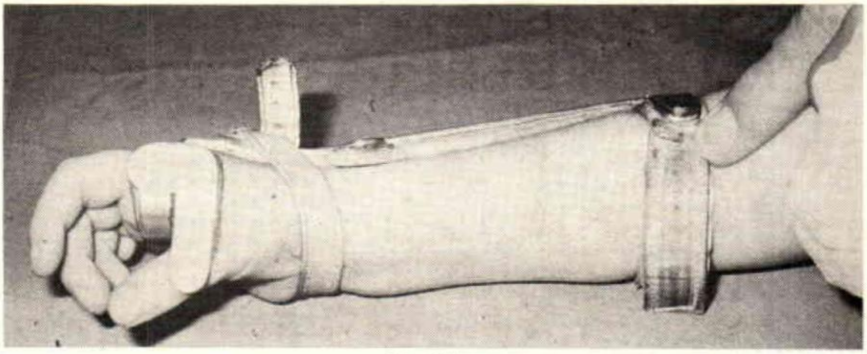

Fig. 26-A

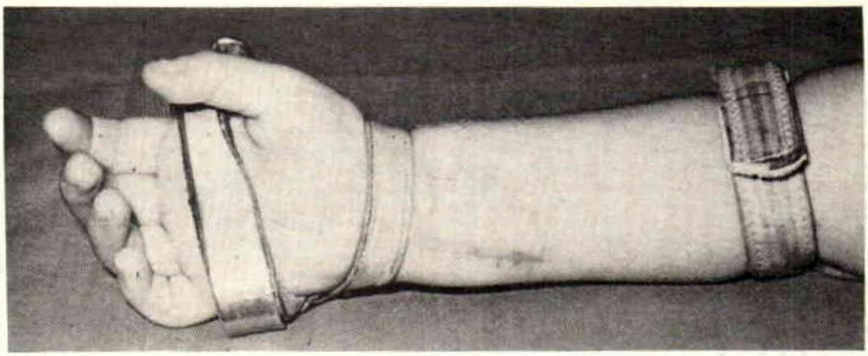

Fig. 26-B

Figs. 26-A and 26-B—Cock-up splint to control wrist flexion contracture. This child has had transplantation of the flexor carpi ulnaris to the wrist extensors. The splint is being used to protect the tendon transplant.

Three braces should be mentioned specifically:

1. *The opponens splint to prevent adduction contracture of the thumb (Fig. 24):* This splint should be applied very early since it is difficult to tell which children will be candidates for operation and which will not. Perhaps, if adduction contracture could be prevented, tendon surgery would be indicated when the child is four or five years of age. The result would be better functioning hands. In general operation has been withheld until the children were older than four or five years. The plastic opponens splint is easily made by the orthotist and may be changed as indicated.

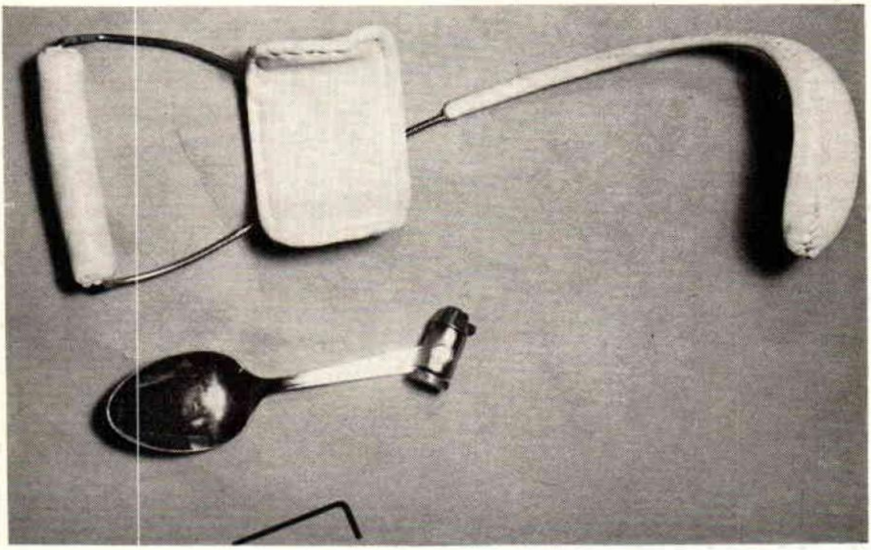

Fig. 27-A

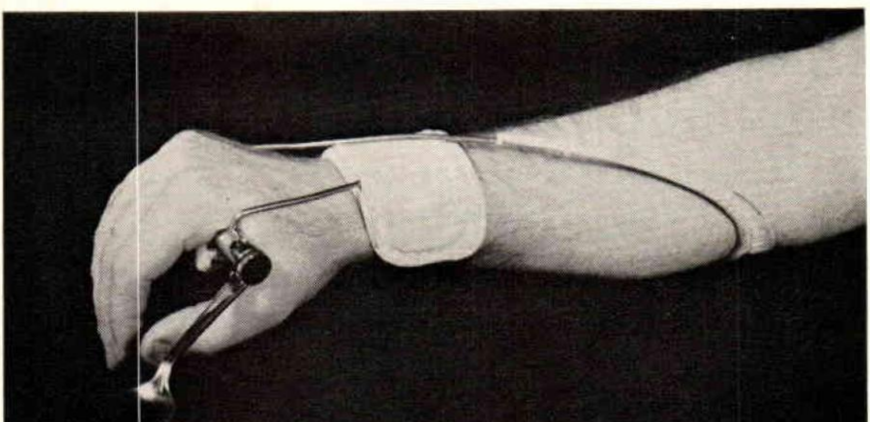

Fig. 27-B

Figs. 27-A and 27-B—Front and dorsal applied views of the Australian splint—a simple cock-up which requires no straps to hold it in place. The amount of wrist extension can be controlled by bending the dorsal wire. In larger children, it may be necessary to run additional wire to control wrist flexion. The spoon can be removed and the hole will accommodate a wooden lead pencil.

2. *The hand sandwich (Figs. 25-A and 25-B):* This is used as a night splint. I regret that we have not used this splint as much as we might have. Swanson states that it is used very frequently in the Cerebral Palsy Center at the Mary Free Bed Hospital, Grand Rapids, Michigan. The hand sandwich can correct as well as prevent deformity since it limits flexion contractures of the wrist and fingers. Thus, when operation is indicated it should be more successful. Instead, we have used the cock-up splint with an opponens bar for many of our children (Figs. 26-A and 26-B). We may not have paid as much attention as we should have to flexion deformities of the fingers.

3. *The Australian splint (Figs. 27-A and 27-B):* This splint was made for me by Mr. Jouett of Dreher-Jouett Brace Shop in Chicago. I believe that Dr. Pearlstein saw it when he was on his trip to Australia a year or two ago. It is merely a single rod which has no hooks or straps. Thus it leaves the flexor surface of the forearm free, an important consideration in all upper-extremity braces. This principle is true for children with poliomyelitis as well as with cerebral palsy. One can add the opponens bar or fork and spoon adapter which also will accommodate a pencil. Some flexibility in the brace is a definite advantage. As the flexion contracture is corrected, the splint can be bent to allow for this correction.

At present, we are experimenting with different types of hinge splints such as those used at Rancho Los Amigos in Los Angeles, Warm Springs in Georgia, and the splints manufactured by the Pope Foundation. However, I have no idea how much one can train a spastic muscle. Individual aluminum splints can be taped to the fingers, as suggested by Swanson, to get some idea of the benefit of the operation in swan-neck deformity of fingers.

Conclusion

Bracing is a very important adjunct in the care of the child with cerebral palsy. Contractures can be prevented in many instances by the judicious use of physical therapy combined with adequate bracing and night splinting. I do not mean to imply that we try to keep all of our children in cumbersome, clanking braces. We attempt to rid them of their braces by specific surgical procedures when these are feasible. Recurrent deformities have frequently resulted from inadequate bracing or splinting in the post-operative period.

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ADDENDUM

by WARREN G. STAMP, M.D.

EDITOR'S NOTE: *In reply to the* JOURNAL'S *request, the author has supplied the following additional information and illustrations.*

The twister shown in Figure 14 does not have a hip or ankle joint. We had been experimenting with this type of twister and originally thought we could increase the efficiency of the twister by eliminating the joints. If any advantage was gained it was soon lost because the children objected to the cable twisting up around the knee.

A very simple and inexpensive type of ankle joint can be made by cutting the extension off of the Klenzak ankle joint, (Illustration 28a). The posterior edge can be filed down and a hole for the set screw is drilled at a right angle to the original hole for the spring. The former spring hole serves as the site of insertion for the cable.

The completed twister that we are now using is shown in illustration 28b. In selected cases we can provide added stability by inserting a one-eighth inch steel rod into the alemite tubing, (suggested by Dr. Phelps). The distal and proximal ends of the steel rod are silver soldered to keep it from migrating. The rod is inserted at either end so that the knee portion is free.

In addition to the opponens splint shown in Figure 24, we have used an adduction splint. It is fastened with either a velcro or a simple buckle attachment, (Illustration 29a and b). We have had difficulty with the velcro because dirt gets into the fine mesh and loses its ability to hold. This splint was suggested to us by Dr. Lenox Baker when he visited in St. Louis. The portion in the web space of the thumb must be reinforced with aluminum or stainless steel or the adduction contracture will cause the splint to collapse.

The control brace in Figure 22 utilizes thigh and calf cuffs so that if the child does not require the bilateral up-rights he may have the brace converted to a single up-right brace with a pelvic band.

Acknowledgements

A special thanks to Mr. Leo Tippy for his interest in attempting to improve as well as improvise braces for children with Cerebral Palsy. Miss Glasscock, director, George Scheer, M.D., Chief Surgeon of the St. Louis Unit of the Shrine Hospital for Crippled Children, and Miss Sharon Mahon, Chief Therapist, also have supported me in this endeavor.

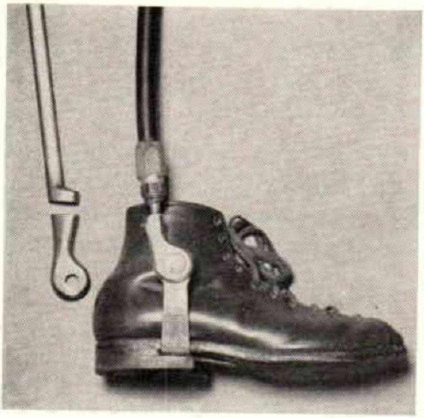


Fig. 28-A

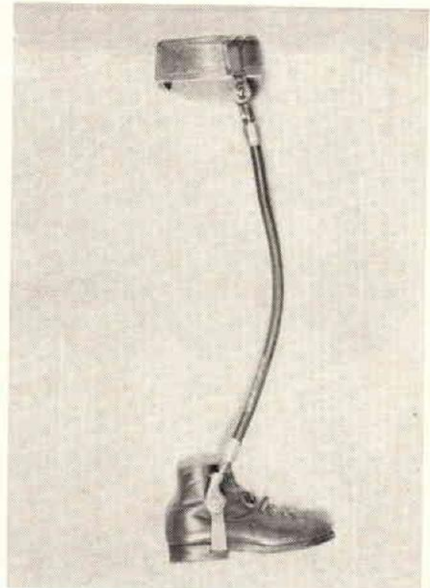


Fig. 28-B

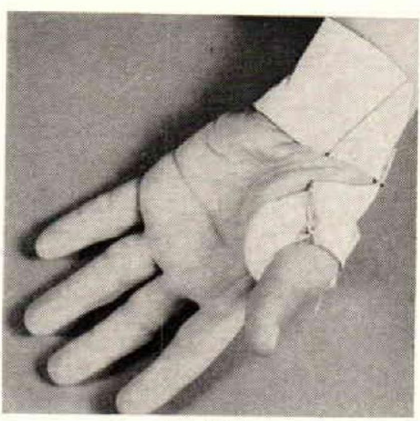


Fig. 29-A

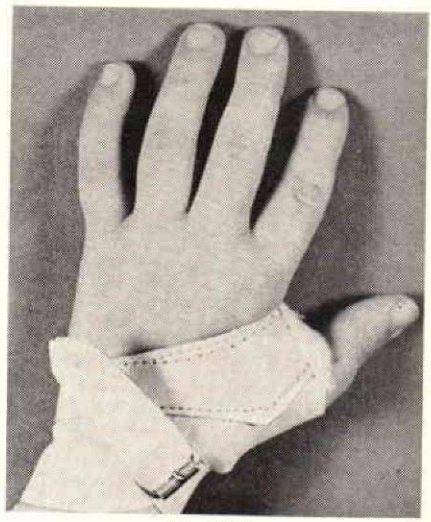


Fig. 29-B

The Adjustable Crutch Forearm Support Shelf

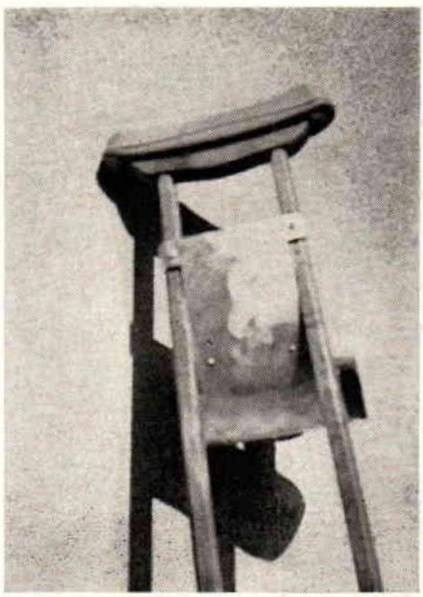
For the Patient With Both Arm and Leg Injury

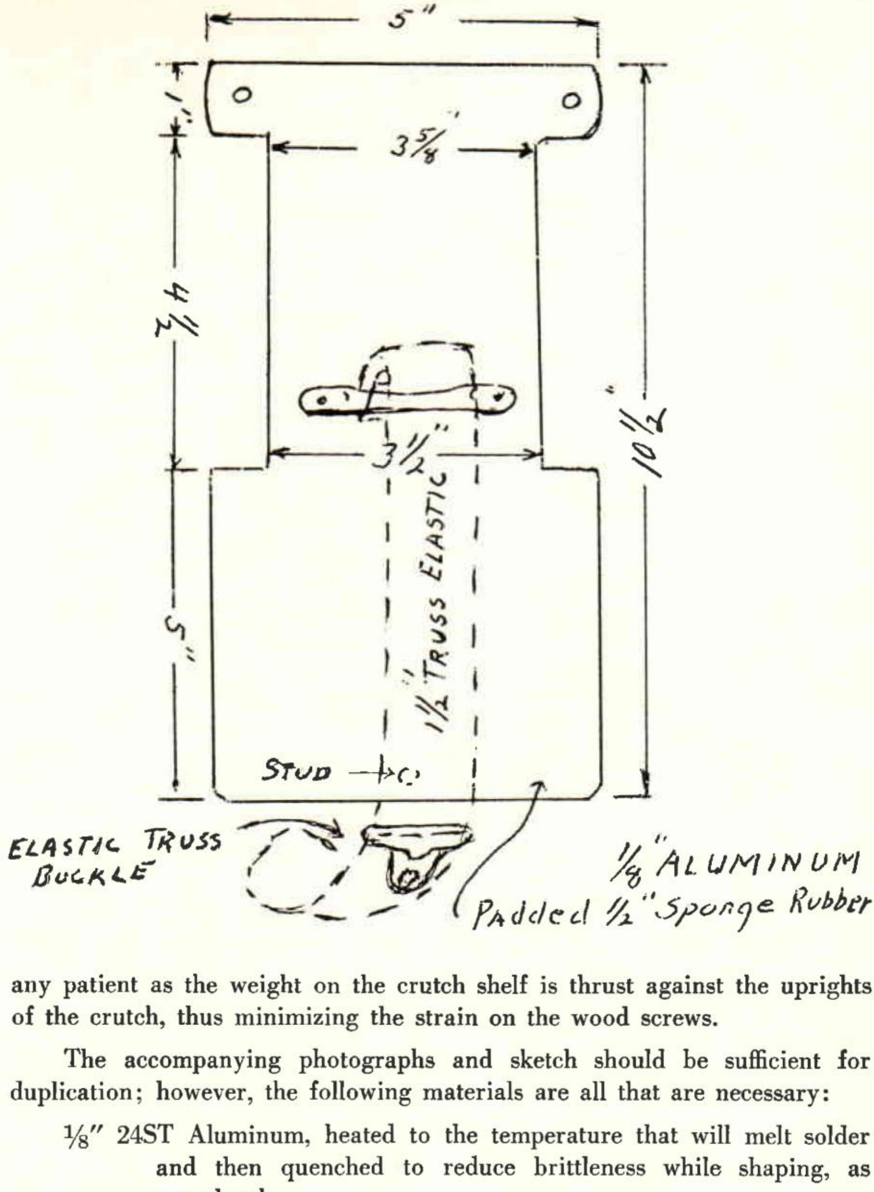
By JACK R. PAVA, C.O.

J. R. Pava Orthopedic Laboratory — Santa Barbara, Calif.

In my 36 years' experience as an Orthotist, it was only recently that I had an inquiry for a forearm support for a crutch. Yet at this writing, I have made three. It seems the medical profession just did not imagine it possible to get their patients with arm and leg involvement out of bed, using crutches. My first inquiry was for a below-elbow amputee with a leg injury. The next case was for a patient with one arm in a cast who had just had part of his foot amputated, due to an accident. The third request was for a patient with just a sprained wrist and a sprained ankle. None of these cases could bear weight on one hand to be able to use crutches. My design enabled these people to become ambulatory much sooner, thereby improving their morale, as well as allowing their earlier release from the hospital.

To eliminate the problem of exact measurements between the axilla and elbow-forearm weight-bearing surface, this support shelf is attached to a wood, adjustable crutch by two small wood screws. Extra holes were drilled into the crutch upright 3/8″ apart for the finer adjustment at the time of delivery. Because of its design, it will securely support the weight of





any patient as the weight on the crutch shelf is thrust against the uprights of the crutch, thus minimizing the strain on the wood screws.

The accompanying photographs and sketch should be sufficient for duplication; however, the following materials are all that are necessary:

$\frac{1}{8}$" 24ST Aluminum, heated to the temperature that will melt solder and then quenched to reduce brittleness while shaping, as per sketch

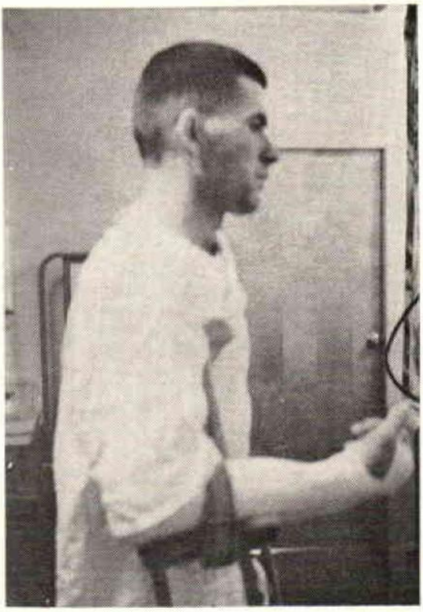
$\frac{1}{2}$" sponge rubber for padding where the arm rests

$1\frac{1}{2}$" truss elastic strap sewed to a metal bar on the inside of the shelf

Truss buckle, together with a stud, for holding the forearm in place on the shelf

2 wood screws to secure shelf to crutch uprights

This simple device was enthusiastically received by both the referring doctors and the patients. Upon mentioning it to other orthopedic specialists, they reported they had often had cases with the similar involvement but just did not realize there was any appliance that could be made to solve the problem of earlier ambulation for these cases.



In Memoriam

Benjamin Starek, C.P.

Benjamin Starek, C.P., of the J. F. Rowley Company of Chicago, died suddenly of a heart attack on September 27, at the age of 64. Mr. Starek had been with the Rowley Company for 46 years.

Mr. Starek was one of the early Certifees in Prosthetics. He was Certified in 1948, and held Certification Number 111. His work in prosthetics has been distinguished, and he will be greatly missed by associates and friends.

Raymond A. Beales, C.P.

Raymond A. Beales, C.P., of J. E. Hanger, Inc., Washington, D. C., died on Sunday, December 8, at the age of 58. He had been ill since May of this year. Mr. Beales had been with Hanger since 1923, and received his Certification in February, 1949.

Mr. M. P. Cestaro, writing of the death of Mr. Beales, described him as a long-time employee and valued associate whose passing he announced with sorrow and regret.

A Cosmetic Duplication Method

By LAURENCE PORTEN, C.P.O.

Union Artificial Limb and Brace Co.
Pittsburgh, Pennsylvania

For some time, I have wanted to write about my method of duplicating missing or deformed parts of the body, legs or arms to achieve a nearly perfect form and copy for any type of prostheses. Particularly in view of the increasing use of plastic material in the orthopedic field my method should be of great help to my fellow colleagues, because, after first taking a mould of the normal part of the body, and then by turning the shell inside out, we obtain a perfectly matched form to cover the deformed part and make both sides look alike.

It is much simpler than it sounds and one does not need a sculptor or expensive apparatus and materials to make a nearly perfect duplication. At the end of this article, I will list all the necessary tools and materials which are found in almost all of our orthopedic shops.

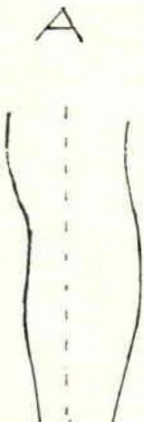
For simplicity let us assume we have a B.K. lady amputee whom we have to fit with a plastic cosmetic prosthesis that will match the normal leg, calf and ankle. The following process will do that and also applies to any deformity of the body which can be covered and reproduced by this method.

The first step is to secure all necessary measurements and castings in the usual routine manner. However, I advise right here to use only elastic plaster of paris bandages which will stretch and conform to the contours of the object without leaving wrinkles, and so produce a faultless negative.

Before applying the plaster of paris bandages, the stump (or other body parts) must be covered generously with a good separator like vaseline, silicone, wax, soap, paraffin or other chemicals to avoid the cast sticking to the object of duplication. Under no circumstances should a stockinette or other fabric be used as a separator.

In the case of the B.K. leg, the patient should stand on a podium, box or table supported by hand rails or crutches to be secure and comfortable, and must face in the opposite direction from the prosthetist. Next, a separator will be applied to the bare normal limb and a strip of brass, aluminum or plastic, approximately $\frac{3}{4}''$ wide and the full length of the leg, should be placed posterior running down from above the knee over the calf and heel into the arch and wrapped up with the plaster of paris bandages. This underlaid strip is used to cut the negative safely after the cast is hardened. It should be noted that the negative shell must be made with great care, without wrinkles, and of a fairly thin wall to allow easy removal from the leg.

After the negative has been removed, the cutting edges should be brought together, wrinkles smoothed over and the inside shell generously covered with the separator before the cut and foot opening are closed with plaster of paris bandage or tape. When this is done, a piece of water or gas pipe about 6" to 10" longer than the shell should be inserted, which later will be used to clamp the cast in a vice, and then filled with a well mixed good brand of plaster of paris that has no lumps or air bubbles in it. After allowing about one hour time for setting and hardening, the plaster negative should be removed with great care to avoid nicks and damage to the positive form. Its surface must be smoothed over and any rough spots or air holes filled in. Then we proceed without drying the cast to cut out a paper pattern like sketch C over the positive and use it to cut a piece of celastic about 1/16" thick from a roll or sheet, making sure the cutting edges are posterior. While the celastic piece is soaking in a pan of softener, we cover the positive with a separator. Aceton should not be used, because it dries too fast and takes the elasticity out of the celastic.



Sketch A shows tracing of normal leg.

Sketch B shows contour of artificial leg.

The positive is clamped into a vice with the posterior side up. Next, the soaking wet celastic sheet is removed from the pan and quickly draped and moulded around the cast from top to bottom, bringing the cutting edges together. Any overlap must be cut away and only a straight and close cutting line should remain.

To protect the hands against the chemicals, rubber gloves should be used which also serve to smooth the surface after the moulding is completed. If necessary, some softener fluid should be rubbed into the celastic during the procedure to keep it soft and pliable.

When the outside of the celastic shell begins to dry in the air, it should be removed very gently from the cast by inserting a flexible thin strip of pliable round-cornered plastic about 10" long, 1½" wide and 1/16" thick between the celastic and cast. As soon as the shell is off it must be turned inside out until the cutting edges meet and the reversion process is completed. This is only possible because the moist plaster cast keeps the inner side of the shell soft and pliable while the outside already has started drying in the air and retains its shape. All that has to be done now is to straighten out dents, bring the cutting edges together and make sure the reversed shell matches the positive.

The whole trick in this reversion process centers in the fact that the plaster cast must be moist to prevent the celastic inside wall from drying out too soon so it will not stick to the plaster. Therefore, everything must be done in an almost continuous motion to guarantee success.

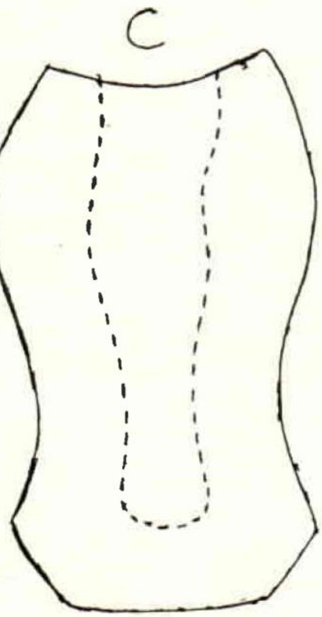
Following is a list of materials and tools:

Elastic plaster of paris bandages—plaster of paris (good grade)—knife and scissor—rubber gloves—water bucket—glass or metal pan for softening celastic—sheet or roll of celastic about 2/16" thick—celastic softener—separators like vaseline, soap, silicone, wax, paraffin or other chemicals—wrapping paper—gas or water pipe—a strip of aluminum, brass or plastic approximately 1" wide and 1/16" thick for cutting the cast lengthwise, and a strip of plastic or soft metal with round corners about 10" long, 1½" wide and 1/16" thick to help remove the shell from the cast.

Sketch A shows tracing of normal leg.

Sketch B shows contour of artificial leg.

Sketch C shows cutting pattern for celastic shell.



Sketch C shows cutting pattern for celastic shell.

Self-Adjustable and Inflatable Air Stump Socket

By LAURENCE PORTEN, C.P.O.

Union Artificial Limb and Brace Co.
Pittsburgh, Pennsylvania

AUTHOR'S PREFACE

This is an article about a new technic to fit artificial limbs and prostheses. It is, in fact, not a new idea at all because pneumatic and liquid filled sockets have been patented before, but they have never worked out to satisfaction and soon were forgotten.

I have analyzed the faults and shortcomings of the first sockets and by using entirely different materials and methods, I do feel the adjustable pneumatic stump sockets should and could be of great benefit to the amputees and the prosthetists.

I do not expect that my idea will be accepted 100 per cent without pro and con, but, in all fairness to progress, I hope it will stir up enough interest to discuss it and give it a chance to be approved or disapproved.

My motto always has been to try any new idea first before condemning it and help progress along. Therefore, I beg your indulgence in judging this matter because I am of the opinion that amputees and limb fitters would gain immensely if this method could be adopted in general and the known difficulties in fitting of artificial prostheses could be lessened and avoided.

In more than 50 years of professional limb and brace fitting, I have worked and tried all known technics, but at the same time I have kept my eyes open for new items and progress and therefore took great interest in all the V.A. and Government inspired and sponsored new developments in the orthopedic field. I myself and my eager young men in the shop have attended and followed most of the University Programs and we all are proud to belong to the respected and progressive shops in the U.S.A.

Looking back to 1937 when my family and I came to the U.S.A., I was ready to demonstrate the suction sockets because I had made and fitted a number of them. However, America was not ready for it until the U.S.A. Occupation Army reported the progress in Germany. This development has been one of the biggest boons in the history for all amputees. Here also was a pro and con suspicion and animosity prevailed until it succeeded.

I am merely mentioning these facts to recall the resistance and unwillingness to accept the suction socket which seems impossible today to have ever happened. It should remind us also that we should approach and judge a new idea and development with open eyes and willingness to try before turning our back to it.

It is up to our clear and logical thinking colleagues, patients, scientists and sponsors to help this idea along, and I hope the self adjustable pneumatic stump socket will eventually find its place in the orthopedic field like the suction socket and other newly developed and accepted items.

THE INFLATABLE SOCKET

For a long time it has been on my mind to simplify the method of fitting artificial limbs to amputee stumps by means of a new and different approach.

In the past, the limb fitter who was not a trained or certified orthopedic man used only primitive measurements to carve out the wooden socket which is a container for the stump. Later a more accurate fitting was obtained by using a plaster of paris negative and positive as model. However, even the best fitting artificial prostheses can be very uncomfortable because of certain conditions such as changes in the stump, shrinkage, or weather conditions. Increasing age also tends to have its influence on the amputee, and all these factors combined can sometimes make the use of an artificial leg unbearable.

Ordinarily wool stump socks will act as cushioning shock absorbers between stump and limb socket. But very often the stump and its bony parts are so tender and sore that not even wool socks or other liners will help to relieve the discomfort. Since I had been familiar with these problems for many years, I came to the conclusion that better techniques and materials must be found to make the patient comfortable and also to give him a chance to adjust the socket to his own liking at any time.

My idea, which I experimented with in my home shop for several years, has to do with an air inflated and adjustable stump socket which will let the stump practically float on air and thus avoid direct contact between the bony and tender parts of the stump and the hard walls of the artificial leg.

Since the idea of using inflated pads or sockets was not new and patents on it had been issued, I had to find out why they had failed and find the answer to problems which mostly concerned the right kind of materials. I must point out that my socket is not just a double wall tubing affair with a certain air pressure that surrounds the stump in the socket. It is not a fluid-lined socket either. Ordinary pneumatic sockets with only air as filler do not feel comfortable and alive, and the same goes for the fluid-filled sockets.

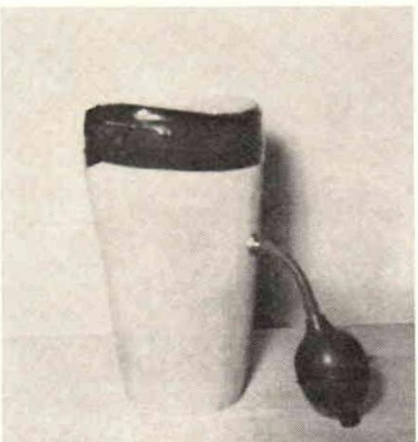


Fig. 1. Single wood socket with pneumatic inner socket installed. The hand pump is attached to the valve to inflate the stump socket from the front of the leg.

Fig. 2. Same wooden socket shown with a leather inner socket with ball pump attached to hose which is installed in the adjustable socket at the brim so that inflation is easier in some cases.

Both elements, when under load pressure, create a somewhat unreal, bumpy and uncomfortable feeling because they shift and move too much, and the stump loses contact and security. In order to avoid this feeling, I arranged as the most important factor in the socket a full size layer of porous plastic foam (Polyurethane) between the two walls which acts as a liner or pressure and shock absorber. The thickness of this foam liner varies according to the fleshy or bony nature of the stump and how much room is available between the stump and the inner wall of the prosthesis. Of equal importance is the one-sided adhesion of the foam liner to the wall of the socket next to the stump. Thus, when air is pumped into the socket, the foam liner will firmly surround and protect the stump like an ordinary liner, while the air between simply acts as an adjusting factor to regulate shrinkage or expansion of the stump. This problem can be solved with the help of a small ball hand pump and is easily handled by the patient himself. It is particularly helpful for new amputations which tend to shrink very fast sometimes, and in diabetic cases when too much pressure causes dangerous skin ulcers and infections. In such cases the amputee has only two alternatives: First, wear more stump socks to fill in the empty space in the socket; or Second, have the limb shop install leather felt or plastic liners and re-fit the stump again and again until the prosthesis is comfortable. This process, however, may have to be repeated several times during the process of shrinking and is always time-consuming and costly. To avoid all this the inflatable air socket can be fitted right into the new artificial limb when it is constructed or can be added later. It is also possible to make and install smaller air pads wherever they are needed to protect bony parts like ends of stumps, tibia and fibula, condyles, Choparts, and Pyrogoffs, ischium and disarticulation cases. Above-knee amputations and upper extremity cases could also be served; and with bottoms closed and sealed, A.K. and B.K. legs could be fitted as suction legs.

In designing this socket, I joined and air-sealed two layers of a special plastic sheet material from which I made a bag, attached a valve, filled and pressurized it with air, and submerged it in a bucket of water where I kept it under weight for over a year. The material I use is the only one that stood up among dozens of other sheet materials. Therefore I favor it until something better can be found.

Inside, between the two layers, is a sheet of porous air foam (Polyurethane) which is glued to the layer next to the prosthesis and expands when air is pumped into the socket. The porous plastic foam allows the air to circulate freely in an even flow so there will be pressure all around the stump and, at the same time, an additional cushion. A piece of plastic tubing is welded between the two layers of plastic sheeting and the open end of the tubing contains the air valve which is operated by the small air pump. Or a different valve with a short stem can be installed directly into the adjustable socket, protruding through a hole to the outside of the limb shank to allow easy access to the ball pump. The simplicity of operating the inflatable air socket is quite obvious and almost any amputee should be able to inflate or deflate the socket after being shown how by the limb maker. The small ball hand pump can be carried in a coat pocket, a woman's purse, or in the hollow space on the prosthesis below the stump end. It attaches easily to the valve.

It is my firm belief that these adjustable air stump sockets can be made in standard sizes and carried by the artificial limb shops for installation at any time. They can be made in closed tubing shapes, with or without closed bottoms, or in open fashion with one or two inches of overlap for easy fitting into the sockets of the legs. Another possibility is to cover one side with some adhesive, like band-aid's, which would allow the leg maker to install the socket without fuss and then cut away the overlap margin. There would be no objection to the patient wearing wool or cotton stump socks if he so desires. Furthermore, the adjustable socket could be used as a stump shrinker in new amputation cases and to replace elastic bandages which have a tendency to loosen and slide off the stump if not properly applied. The circular air pressure is easy to control and can be handled by the patient himself, while the wrapping process with the elastic bandage would require another person's help.

VA Office in Rome Serves 21 Countries

Approximately 16,000 VA beneficiaries in 21 European countries now are being served by the newly opened Veterans Administration Office in Rome, Italy. Manager of the office is Mr. Gordon Elliott, former Manager of the Philadelphia Regional Office of the VA.

The office was officially opened April 1, 1963, and is manned by four Americans and five Italian nationals. The Americans, in addition to Mr. Elliott, are Elizabeth Sommer, formerly of the Central Office of VA; Benefits Specialist Peter Basone; and Administrative Officer Robert Heathman.

The Department of Data Management has provided the Rome Office with a breakdown of every Europe-residenced service-connected veteran, pensioner and other beneficiary by name, claim number, and other data necessary to authorize immediate service.

Expenditures of some $17 million are being paid annually with 60% of the outlay presently being distributed in Italy and Greece.

The VA Office for Europe is authorized by Public Law 87-815. Prior to enactment of this law in October 1962, veterans living in Europe were not eligible for VA medical benefits if they were permanently residing abroad. The new law, however, requires only that the veteran be a citizen of the United States and that the condition for which he requires hospitalization or outpatient treatment be related (service-connected) to his military service.

History of Braces and Prostheses in Lebanon

By GEORGE MIKAEL
Beirut, Lebanon

Till the beginning of the twentieth century prostheses and braces in Lebanon were made by carpenters and shoe makers.

In 1910 my father, Jabra Mikael, made the first prosthesis in the Middle East. He was encouraged by a physician who gave him the catalog of A. A. Marks of New York, who was quite famous at that time. This catalog was his chief help until about 1914.

During the first World War the government of our country, still under Ottoman dominion and co-allied with Germany, sent my father to Berlin for further professional training.

The manufacture of prostheses remained rather an artisan type of work, because there were few amputees, and most of them had a poor morale toward prostheses. This condition existed for a long time, and "Jabra Mikael and Son" was the only orthopedic and prosthetic establishment at that time in Lebanon.

I had obtained my school diploma in 1945, and then had started working with my father. There were no doctors to prescribe the type of braces, corsets, or prostheses. I had to be the doctor, the manufacturer, and subsequently the fitter.

There were no set-ups nor accessories. The lower extremity prostheses were made of willow wood and leather, the latter usually being advised to new amputees. Both kinds had lateral and medial steel bars with movable

JABRA MIKAEL (1887-1946)

GEORGE MIKAEL

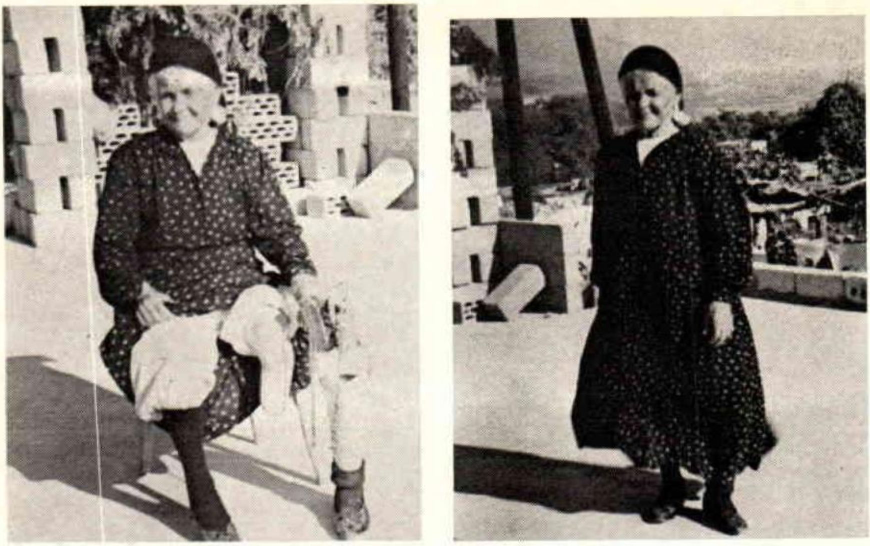
knee joints. The feet were made of wood with movable steel ankle axis. Upper extremity prostheses were very few in number, as the amputees found any type of artificial arm very complicated. As for the braces, mostly for poliomelytic cases, the conventional type of braces were applied with only steel bars. Because of the lack of good aluminum, poor results were obtained with aluminum-made braces. All the parts of artificial limbs and braces were made in our facility. The average number manufactured per year was ten to fifteen prostheses, mostly lower extremity, and fifteen to twenty polio braces.

I must mention that at that time there was no government aid nor public assistance. Amputees and polio patients paid for their own appliances. Late in 1958 the government decided to grant a budget for war amputees and poor people. Since the amount of the budget was very low, only a few people were furnished with prostheses made in the so-called Welfare Education Center, with very high prices (much higher than the prices in Europe and the U.S.A.). It was the same in the next year.

During 1959-60 I did not make any prostheses in my facility. This was also the case with my competitors. (By now there were three facilities in Lebanon). Foreseeing this crisis, I took the opportunity to travel to Europe for further professional training. I went to Germany, Belgium, and England, where I became a Fellow of the Artificial Limbfitters of Great Britain.

I was amazed to see the rapid technique of manufacturing artificial limbs by means of ready-made set-ups, excellent aligning machines, and the jigs. After three months' training in different countries, I returned to Lebanon where I mounted a workshop which, though relatively small, was the best and was equipped with the most recent equipment. Parts, accessories, and set-ups were ordered from the U.S.A., Germany, and England. I became a member of AOPA, and received educational books from the U.S.A. and manuals from the VAPC.

My oldest male B.K. amputee: he is 79. His first leather prosthesis was made in our facility in 1937; the second wooden one in 1955, and the third with the government subvention in 1962. This is an excellent P.T.B. case, but the government urges us to mount knee joints on the plastic shank. He is a farmer and doing all right, wears the prosthesis 16 hours a day, and he says, "I sleep with it when I am in the field full season."



This is my oldest female B.K. amputee and is 82 years old. She was amputated some 35 years ago and had her first prosthesis only in 1962 paid by the government. It was hard to keep up her morale during the first four weeks; but now she is doing very fine and tries to compete with the young ones.

I must mention here, with thanks, the valuable help of Mr. Anthony Staros of the VAPC for the manuals which he sent me; the *Artificial Limbs* periodical sent by Mr. A. Bennett Wilson; and the *Orthopedic and Prosthetic Appliance Journal* and the monthly AOPA *Almanac* sent to me regularly with other educational materials by the good offices of Mr. Lester Smith.

At the end of 1961 the public health department granted an important budget for an adjudication of prostheses for war and poor amputees for the following year.

In Lebanon all the amputees take advantage of the subvention of the government for the supply of prostheses, except the rich class (very few in number) who can afford and prefer to go to Europe.

The main condition for having the adjudication was to offer the lowest prices. I was determined to have it, and I did, because of the very low prices I gave, even though they are still higher than the prices in Europe and the U.S.A.

My main purpose in having the contract was to accumulate experience with my new machines and set-ups, as well as to train the three people working with me. In 1962 the following prostheses were made:

50 B.K. (40 government, 10 private)
10 A.K. (8 government, 2 private)
9 B.E. (7 government, 2 private)
5 A.E. (4 government, 1 private)

This can be considered a record number that a prosthetic facility has ever done in Lebanon or in the Middle East during one year. To this can be added about 20 long and 25 short leg braces with 3 scoliosis braces of our design and 3 Milwaukee braces.

I am convinced that the more you meet new cases the more experienced you become. I say new cases because nine out of ten amputees were operated on by surgeons who were not orthopedic surgeons, so they have very irregular and unshaped stumps. An amputee would draw his gun on you, however, if you advised him the operating room.

Now things have changed and I have great faith in the future. We have about twelve orthopedic surgeons, all of whom have specialized either at Northwestern University in Chicago, New York University, or in France or England. A cooperation between the orthopedic surgeon or physician and the prosthetist or orthotist has started. But there is still a lot to be organized in Lebanon both in private and in government hospitals.

I think everything must be done to prevent any patient from going away or refusing help, and we should insist on giving reasonably cheap prices in order to get acquainted with numerous new cases. I may be harming my competitors with my low prices, but, as I mentioned, we are only three in Lebanon, and the two others are working at very good salaries in hospitals.

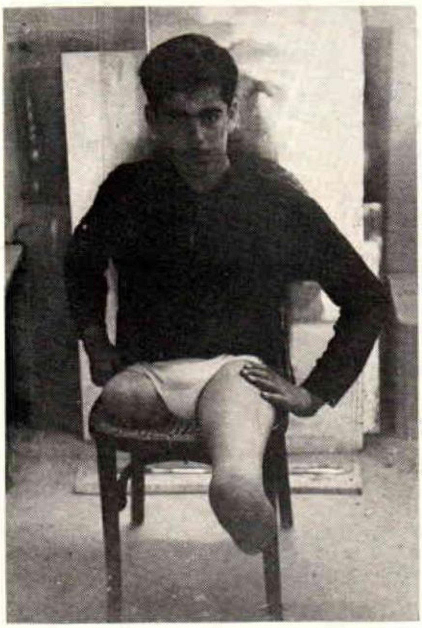
I beg all my colleagues who read these lines to send me their new ideas, books, inventions, or manuals in the orthopedic and prosthetic line, which will be most helpful to the disabled and crippled of our country.

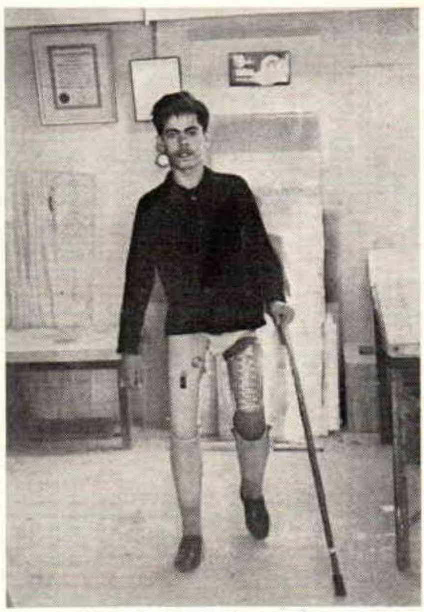
It has been found and asserted that:

1) To attribute help for under-developed countries is our biggest actual need.

2) The lack of qualified technicians constitutes a big problem. Insufficient staff and material and scarcity of research teams, training possibilities, and especially the need of good organization constitute other difficulties which prevent adequate orthotic and prosthetic services.

3) Many attempts already have been made by the United Nations and other organizations to establish prosthetic and orthopedic services. The

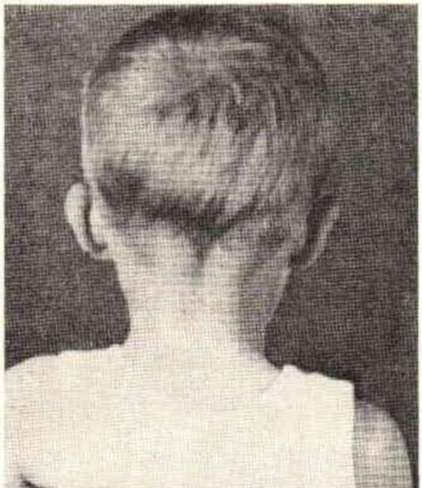




My youngest bilateral 15-year-old amputee. He lost his legs when he was 3 and was fitted only last year by the government subvention, 12 years after his accident. He is doing fine, goes to school and sells (walking in the streets) lottery tickets during the summer vacation.

actual situation of these attempts must be examined by qualified people to determine the strong and weak sides of the services, so that remedy is available in case of failure. This is the true and particular case in Lebanon.

4) The financial problem of such an undertaking must be solicited to the administrations of the Technical Assistance of the United Nations, the World's Veterans Administration, the International Society for the Welfare of Cripples, and to other interested foundations.



This is a combination of Barr-Buschenfeldt and our design. The result is good but not as quick as the Milwaukee brace; the latter being hardly accepted by the parents because of the bulky shape: but excellent improvements have been noticed with the few Milwaukee braces I have made.

A Programme For The Establishment and Training of Orthopaedic/Prosthetic Appliance Technicians in Hong Kong*

By J. A. E. GLEAVE

Harcourt Health Centre
Hong Kong

Until 1959, the making of orthopaedic appliances and artificial limbs in Hong Kong had been limited to attempts by local untrained artisans to produce such articles. To meet the pressing need of the many disabled in the colony the Government Medical Department decided to set up an orthopaedic workshop and fitting department to provide limbs and appliances. In most cases it provided them free or at a nominal charge where circumstances indicated this.

The workshop was set up in 1960 and at the same time plans were made to build an Orthopaedic Medical Rehabilitation Unit, which would include the initial Orthopaedic workshop, a Physiotherapy section and an Occupational Therapy section. This unit was to be sited at a central government hospital where some 300 beds would be reserved for patients requiring orthopaedic treatment. The unit would provide the various stages of rehabilitation to the point when the patient could be referred elsewhere for vocational training.

To implement this plan it was necessary to appoint and train staff and to develop an effective scheme of co-operation between the medical and paramedical personnel involved.

The choice of staff for the orthopaedic/prosthetic unit presented particular difficulties since there were no trained personnel available. The issue was complicated by the pressing need to begin production as rapidly as possible. It appeared impracticable to adopt a formal apprenticeship scheme since this would take too long. Equally it seemed unsatisfactory to send men abroad for a short intensive course because of their complete lack of initial experience. Yet at the same time any training should be such that the ultimate knowledge and status of the technicians would be equivalent to that of technicians elsewhere. Preferably their qualifications should be recognized by a professional body or society.

The ultimate numbers of staff, both technicians and artisans, which would be required was assessed and the following plan chosen for their training. Initially two technicians were to be appointed, who would be given intensive training until, as their ability progressed, a gradually increasing number of technicians and artisan staff would be appointed.

Selection

It was necessary to select men whose education was sufficient for them to follow lectures in Anatomy, Pathology, and Physiology yet who had sufficient ability and manual skill to follow and execute the various stages of production and fitting of appliances and prostheses. Since many of the problems associated with orthopaedic and prosthetic manufacture are of an engineering nature, it was decided to select young men between 18 and 30 years of age, of suitable character and education, who had completed a five year apprenticeship in mechanical engineering (or its equivalent). Accordingly the short listed candidates were given character, practical, and aptitude tests and a careful selection made.

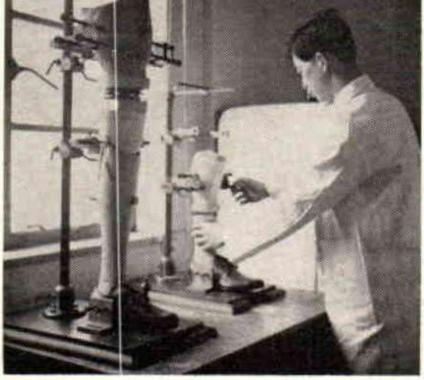
The training programme was devised so that the ultimate knowledge of the technicians would include engineering (including simple electronics) biomechanics, the practical techniques of production, materials use and selection, a knowledge of the structural or kinesiological functions of parts of the body, as well as the intimate knowledge of the design, fitting and essential criteria for all types of brace or prosthesis.

The background Medical knowledge is provided at the school for Physiotherapy. Here the student technicians attend on average five hours weekly over a period of one year. They hear formal lectures in Anatomy, Physiotherapy and Pathology, apart from gaining detailed knowledge which is essential to their work, this enables them to grasp some of the problems of the other members of the rehabilitation team and to observe and discuss the anatomical and physiological problems caused by disease or trauma.

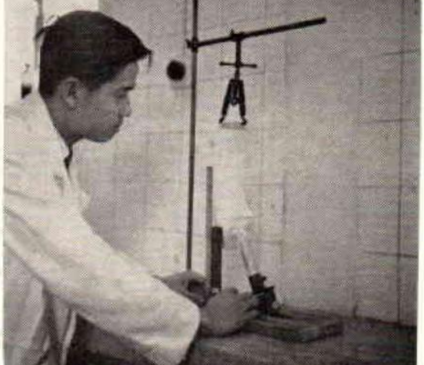
Concurrent with the lectures is the practical study of limbs and appliances. As work started, specific instructions and demonstrations were given in cast taking, measuring, construction, fitting and the interpretation of prescriptions. The relationship of the technician with other medical and paramedical personnel is explained and stressed. General instructions are given in the use of plastics, leather, wood and other materials, and the nature, properties and chemistry of these materials explained.

With these principles in mind the technicians began under supervision to deal with patients, each taking casts, measurements etc., making and fitting the appliance; when it was complete to the satisfaction of the supervisor the technician attended the orthopaedic clinic with the patient for the surgeon's assessment.

In the interests of efficiency exact procedures were devised which would compensate for the students' lack of experience; and a research and development programme runs concurrently with the production schedule, in which new procedures and mechanisms for dealing with given conditions are evolved, i.e. alignment jigs for upper and lower extremity prostheses, devices



1. Using vertical alignment jigs for lower extremity prostheses.



2. Setting up a BE socket in the upper extremity alignment jig.

for taking pre-shaped and aligned casts, apparatus for the forming of plastic materials. The plan of any experiment is explained to the group and each technician is given specific tasks to perform, thus the students fully understand the principles of any device and foresee its ultimate use.

Specific Training

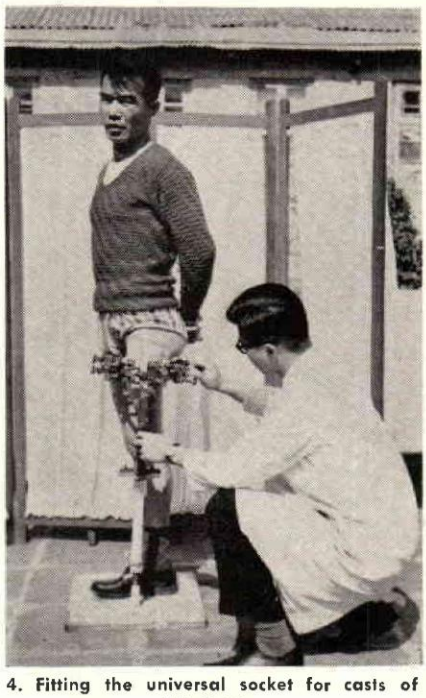
However, problems of the production schedule do not present themselves in a logical or scientific order for discussion, and so although certain basic techniques are described at this stage and much valuable knowledge and experience is gained it is supplemented by a parallel intensive training scheme which treats the whole subject from the scientific, rather than the objective viewpoint.

This training scheme consists of formal workshop lectures and demonstrations, in which appliances and prostheses for various parts of the body are described, the basic principles of their design and purpose stressed, and the already studied Anatomy, Physiology and Pathology are applied. The biomechanical problems are stated. Finally the measuring and fitting procedures and criteria, which have probably been stated at an earlier date in the production schedule, are re-iterated, discussed and assessed.

In this way the students build-up a background of practical experience and at the same time they develop an increasing scientific knowledge of the problems of their work, so that at the end of their training period, they are capable of making and supervising the making of all known types of artificial limbs or orthopaedic appliances; as well as being able to modify or design for individual needs; or to initiate research projects as appears necessary.

The patients here, as in most of Southeast Asia, present many problems;

3. Fitting a pair of leg braces with moulded ischial seats.



4. Fitting the universal socket for casts of AK stumps.

some are of neglect; in others disability may have occurred years previously with consequent muscle atrophy or deformity; others more recently disabled are unable to attend for pre or post prosthetic training; and social, economic, educational and religious factors also present problems. The majority of patients live in crowded unhygienic conditions under which what might be considered "standard" prostheses deteriorate rapidly. A fisherman would find difficulty in rowing his boat using a hook terminal device. A leg amputee would not wear his prosthesis for fear of spirits associated with it. SACH feet deteriorate rapidly in paddy fields. How can a man with deformed hands use a plough, the origin of its design lost in antiquity? These are some of the problems, answers have been found for many, and many more await investigation, and it is the continuous work of the department to find materials, components, and designs to meet the demands of S.E. Asia.

The concept of team work is well fostered since the technicians co-operate with the physiotherapists in class instruction. The technicians co-operate with the Occupational therapists too, when an arm amputee has been fitted the technician attends at the initial arm training sessions to ensure all controls are properly adjusted. Equally they co-operate with the medical social worker in assessing social background in indicated cases. The surgeons too take part in the programme; orthopaedic registrars spend one month in the department during which time they observe the various procedures of measuring fitting and construction, assessment procedures, prescription and the functional possibilities and limitations of the various types of prostheses and appliances. At the same time the technicians benefit from their presence in the department, for they can receive immediate information of the possibilities and limitations of surgery in individual instances.

* ACKNOWLEDGEMENT:—

Dr. The Hon. D. J. M. Mackenzie,
Hon. Director of Medical & Health Services.
For permission to publish

Selected Listing of Films Pertaining to Prosthetics and Orthotics

Compiled by Steven L. Purka, Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001

A Day in the Life of an Amputee

(Color-Silent-26 Minutes—35mm) Depicts the daily activities of a bilateral arm amputee, featuring driving a car, at work, fishing, bowling, playing billiards, etc. *Source:* International Society for the Rehabilitation of the Disabled, 701 First Avenue, New York 17, New York.

Above-Knee Prosthetics: Stump Casting with the Use of a Casting Stand

(Color-Silent-17 Minutes—16mm) Illustrates the use of the VAPC Casting Stand, a device using three separate and adjustable components to form the cast of a thigh stump under weight-bearing conditions. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Amputation for Congenital Anomalies of the Lower Extremities

(Color-Silent-27 Minutes—16mm) Shows series of congenital deformities with description of procedures undertaken and end results with prostheses. *Source:* Alton Ochsner Medical Foundation, 3503 Prytania Street, New Orleans, Louisiana.

Amputations for Occlusive Arterial Disease

(Color-Silent-22 Minutes—16mm) Illustrates amputation under freezing anesthesia. *Source:* Surgical Products Division, American Cyanamid Company, Danbury, Connecticut.

Amputations, Part 1, Guillotine Operation of the Lower Extremity

(Color-Sound-16 Minutes—16mm) Demonstrates in detail the technique of amputation employed in the field. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Amputations, Part 2, Revision and Reamputation of the Lower Extremity

(Color-Sound-27 Minutes—16mm) Demonstrates the procedure of Syme's amputation; lower leg reamputation at the site of fracture; a Gritti-Stokes amputation; and a revision and secondary closure are also demonstrated. Covers reamputation techniques, dressings, traction, postoperative care, shrinking of the stump, use of pylon, and exercise. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Amputations, Part 3, The Upper Extremity

(Color-Sound-15 Minutes—16mm) Indicates suitable amputations at the site of election and the technique of the forearm cineplasty operation. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Assistive Devices for the Physically Handicapped

(Color-Sound-12 Minutes—16mm) Demonstrates various assistive devices used to increase the functional capacity of the physically disabled, from such simple equipment as a mouth stick to an electric wheelchair. *Source:* National Foundation—March of Dimes Professional Film Library, C/O Association Films, Inc., 799 Stevenson Street, San Francisco, California, Broad at Elm, Ridgefield, New Jersey, 561 Hill Grove Avenue, LaGrange, Illinois, 1621 Dragon Street, Dallas, Texas.

Back to Normal

(Black and White-Sound-16 Minutes—16mm) Indicates how the loss of a limb no longer prevents amputees from leading normal lives. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Below-Knee Amputation

(Color-Sound-16 Minutes—16mm) Demonstrates a method of amputation immediately following injury and in secondary repair of stump. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Below-Knee Prosthetics: Stump Casting with the Use of a Casting Stand

(Color-Silent-13 Minutes—16mm) Illustrates the experimental below-knee casting procedure using below-knee forms. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Biceps Cineplastic Technique

(Color-Sound-10 Minutes—16mm) Discusses the advantages of biceps cineplastic technique over older methods in supplying motive power to a prosthesis. *Source:* Audio Visual Training Section, Bureau of Medicine and Surgery, U. S. Navy Department, Washington 25, D. C.

Canadian Hip Disarticulation Prosthesis

(Color-Silent-1 Hour and 30 Minutes—16mm) Embraces the entire process from the first examination of the amputee to the final fitting. It utilizes the inventor's principles (Colin A. McLaurin), but with certain fabrication procedures developed by the University of California, Berkeley group. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Cerebral Palsy: Methods of Ambulation

(Color-Sound-20 Minutes—16mm) Shows the methods and equipment used at Lenox Hill pre-school cerebral palsy clinic in teaching patients to roll, crawl, sit, kneel, stand, and walk. *Source:* National Society for Crippled Children and Adults, Inc., 11 South LaSalle Street, Chicago 3, Illinois.

Cineplastic Operation

(Color-Sound-20 Minutes—16mm) Shows a cineplastic operation. Cords are attached to muscle and then to a prosthetic appliance so that the patient can operate the prosthetic appliance by contracting his own muscles in the amputation stub. *Source:* Director, Armed Forces Institute of Pathology, Walter Reed Army Medical Center, 6825 16th Street, Washington 25, D. C.

Cineradiography Movement of Joints

(Black and White-Silent-18 Minutes—16mm) X-ray motion pictures of all joint movements. Excellent training film for therapists, prosthetists, and orthotists. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Complicated Amputations, Case Reports, Parts 1 and 2

(Black and White-Sound-52 Minutes—16mm) Depicts in detail techniques for triple amputations with hemiplegia, skull perforation and cranioplasty operation. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Diary of a Sergeant

(Black and White-Sound-21 Minutes—16mm) Designed primarily for patients who have lost their arms. Illustrates how one soldier, Harold Russell, in a serious situation, was able to regain his place in society. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Dynamic Exercises for Lower Extremity Amputees

(Color-Sound-10 Minutes—16mm) Starting with a demonstration of normal walking, broken down into all of its components, with special emphasis on the relationship of body segments during the transfer of body weight, the patient is taken through his entire exercise routine under the supervision and direction of the physical therapist. Patient is given orientation and demonstration in utilization of his prosthesis in walking and in meeting his daily functional demands. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Elective Supracondylar Amputation of the Thigh

(Color-Silent-15 Minutes—16mm) *Source:* Clarence E. Rees, M.D., 2001 Fourth Avenue, San Diego 1, California.

Fabrication Technique for Medial Opening, Polyester Nylon, Syme Prosthesis

(Color-Silent-30 Minutes—16mm) Illustrates, step-by-step, the VAPC method of fabricating the medial opening, polyester nylon, Syme prosthesis. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Gait Analysis

(Color-Sound-27 Minutes—16mm) Illustrates and defines the various gait deviations as shown by a unilateral above-knee amputee. A physician, a prosthetist, and a physical therapist analyze the deviations and suggest possible causes and corrective measures. *Source:* American Academy of Orthopaedic Surgeons, 29 West Madison Street, Chicago 2, Illinois.

Gait and Musculoskeletal Disorders

(Color-Sound-34 Minutes—16mm) Stance and swing phases of normal gait are covered along with associated arm movements. Abnormal gait due to pain, structural defect and muscular disorders are considered. Polio patients illustrate gluteus medius and gluteus maximus limp, drop foot, quadriceps weakness. Scissors gait of cerebral palsy, muscular dystrophy and dystonia musculorum also shown. Hip considered last with congenital dislocation, degenerative disease of hip and slipped femoral epiphysis. *Source:* Audio-Visual Utilization Center, Wayne State University, Detroit 2, Michigan.

Half A Chance

(Black and White-Sound-11 Minutes—16mm) Shows how one amputee, through use of an artificial leg, was able to participate in various sports, including professional baseball. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Hemipelvectomy, Interillioabdominal Amputation

(Color-Sound-23 Minutes—16mm) *Source:* Sturgia-Grant Productions, 322 East 44th Street, New York 17, New York.

Hydra-Cadence, Reel 1

(Color-Sound-15 Minutes—16mm) Deals with the aspects of human locomotion and compares the characteristics of the Hydra-Cadence unit to the non-amputee and the amputee using the conventional prosthesis. *Source:* Hydra-Cadence, Inc., 623 South Central Avenue, Post Office Box 110, Glendale 4, California.

Hydra-Cadence, Reel 2

(Color-Sound-30 Minutes—16mm) Deals with the fabrication, production and avenues of sales the prosthetist may use. When these two reels are used together they give a complete explanation of both the advantages to the amputee and the advantages to the prosthetist using the device. *Source:* Hydra-Cadence, Inc., 623 South Central Avenue, Post Office Box 110, Glendale 4, California.

Land Mine Injury to Both Legs: Bilateral Amputation Simultaneously with Two Teams

(Color-Silent-10 Minutes—16mm) Shows excessive damage to both legs due to numerous missiles, application of pneumatic tourniquets, preparation of extremities, and cleansing of amputation sites. Demonstrates circular type of incision to permit loose approxilation of edges of stumps. Shows application of skin traction to the left extremity with adhesive tape and illustrates counter-traction obtained by ladder wire splints encased in plaster bandages. *Source:* Audio Visual Training Section, Bureau of Medicine and Surgery, U. S. Navy Department, Washington 25, D. C.

Major Amputations for Arteriosclerosis, Technique and Rehabilitation

(Color-Sound-31 Minutes—16mm) Importance of simple techniques of amputation and early provision of temporary limbs in patients receiving above-knee and below-knee amputation, and methods for measuring for artificial limbs and constructing them are shown. *Source:* Surgical Products Division, American Cyanamid Company, Danbury, Connecticut.

Modified Guillotine Amputation Through Leg for Arteriosclerotic Gangrene With and Without Diabetes

(Color-Silent-15 Minutes—16mm) *Source:* Beverly C. Smith, M.D., 63 East 84th Street, New York 28, New York.

Muscular Phasic Activity in the Lower Extremity

(Black and White-Sound-45 Minutes—16mm) By electromyographic procedures, the normal activity of the muscles of the lower extremity is demonstrated by oscillographic tracings and sound. Pre- and Postoperative activity of muscle transfers are recorded and compared with the normal. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Neurophysiologic Influences in the Restoration of Function of the Upper Extremity in Adult Extremity, in Adult Hemiplegic Patients

(Black and White-Sound-35 Minutes—16mm) This is a teaching film for physicians and physical therapists. *Source:* International Society for the Rehabilitation of the Disabled, 701 First Avenue, New York, New York.

New Legs

(Color-Sound-18 Minutes—16mm) A railway plate layer amputated at the hips, makes a successful recovery, in spite of the problem of fitting prostheses. *Source:* International Society for the Rehabilitation of the Disabled, 701 First Avenue, New York 17, New York.

Physical Diagnosis: Disorders of Motility

(Color-Sound-37 Minutes—16mm) Concerns diagnosis of motility disorders caused by congenital spastic states and diseases. Patients demonstrate motility handicaps related to muscular dystrophy, multiplesclerosis, Parkinson's disease, strokes, cerebral palsy, poliomyelitis, brain tumor, and other degenerative diseases. *Source:* Audio-Visual Utilization Center, Wayne State University, Detroit 2, Michigan.

Plastic Finishing of an Above-Knee Socket

(Color-Magnetic Sound-27 minutes—16mm) Illustrates, step-by-step, the VAPC method of finishing wood prostheses with a nylon stockinet and polyester laminate. Socket, shank, and foot finishing techniques are presented. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Road to Recovery

(Black and White-Sound-40 Minutes—16mm) Describes rehabilitation programs for amputees, NP patients, and cardiac cases. *Source:* Director, Armed Forces Institute of Pathology, Walter Reed Army Medical Center, 6825 16th Street, Washington 25, D. C.

Scoliosis: Method of Correction and Fusion

(Color-Sound-30 Minutes—16mm) Shows the steps in correcting a case of idiopathic scoliosis, including the use of a turnbuckle jacket and brief demonstration of surgical technic in performing the arthrodesis. *Source:* E. R. Squibb & Sons, Motion Picture Department, 745 Fifth Avenue, New York 22, New York.

Some Biomechanical Methods for Evaluating Activity

(Color-Magnetic Sound-18 Minutes—16mm) Shows some of the biomechanical methods used in the laboratory to measure the effectiveness with which both normal and handicapped people perform various activities. Various photographic, mechanical and electrical techniques are demonstrated. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Spinal Cord Injury: The Functional Expectations as Related in Level Injury

(Color-Sound-25 Minutes—16mm) The film depicts eight levels of spinal cord injury and demonstrates the degree of independence that the average patient can attain after injury. Independence is accomplished through a program of maximum strengthening of the remaining active muscles combined with appropriate assistive devices such as short leg braces, long leg braces, overhead slings, artificial muscles, special splints, crutches, hydraulic lifts, etc., and training. *Source:* Rancho Los Amigos, Medical Education Service, 7601 East Imperial Highway, Downey, California.

Suction Socket Above-Knee Artificial Limb

(Color-Sound-25 Minutes—16mm) Provides information on the suction socket above-knee artificial limb. Principles are explained; contraindications, proper fitting and gait analysis are described. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Suction Socket Amputee Training

(Black and White-Silent-16 Minutes—16mm) Indicates some of the methods employed in teaching amputees with suction socket above-knee artificial limbs to walk properly. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Swinging Into Step

(Black and White-Sound-33 Minutes—16mm) Shows graphically how loss of limbs no longer prevents individuals from living normal lives. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

Teaching Crutch Walking

(Black and White-Sound-13 Minutes—16mm) Shows how the physical therapist teaches the bed patient reconditioning exercises; how to teach the patient to walk in a walker; how to teach the various methods of crutch walking, two-point, four-point, and swinging; how to teach the patient to sit, arise, climb stairs; and the safety factors involved in crutch walking. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Teamwork In Action

(Black and White-Sound-33 Minutes—16mm) Through the Workmen's compensation board, a patient is fitted and provided with an artificial leg and through a suitable rehabilitation program in the Board's rehabilitation center, he returns to his original factory work. *Source:* International Society for the Rehabilitation of the Disabled, 701 First Avenue, New York 17, New York.

Technical Considerations in Hemipelvectomy

(Color-Sound-26 Minutes—16mm) *Source:* Surgical Products Division, American Cyanamid Company, Danbury, Connecticut.

Technique of the Biceps Cineplasty

(Color-Sound-26 Minutes—16mm) Portrays the operative technique used at the Walter Reed Army Medical Center, Washington, D. C., to perform a biceps cineplasty. Salient teaching points cover: positioning the patient and aligning the arm; transverse and vertical incisions; hemostasis; undermining procedure; formation of a tunnel in the muscle; suturing; final skin grafting; and dressing. Shows the patient, following surgery, undergoing physical therapy and receiving prosthesis training. *Source:* Director, Armed Forces Institute of Pathology, Walter Reed Army Medical Center, 6825 16th Street, Washington, D. C.

The Heather Hand

(Color-Silent-10 Minutes—16mm) A lightweight, wrist extension, hydraulic orthesis is illustrated. This device is intended to provide a three-jaw chuck grasp for the patient with hand paralysis. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

The Sky Is the Limit

(Color-Sound-20 Minutes—16mm) A picture of the phases of rehabilitation that apply to an above-knee amputee. It portrays the proper walking technic for individuals with two normal lower extremities and for a unilateral above-knee amputee, and it emphasizes many of the capabilities which are within the reach of the patient who possesses the will to strive for them. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

The Total Contact, Soft-End, Plastic Laminate Above-Knee Socket

(Color-Silent-23 Minutes—16mm) Shows step-by-step method of casting thigh stumps using elastic plaster of Paris wrap, and a casting stand having adjustable forms representing the posterior-medial, the anterior, and the lateral walls. The fabrication of the soft-end (or foam end) total-contact above-knee plastic laminate socket is described. *Source:* Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York, New York 10001.

The Undefeated

(Black and White-Sound-35 Minutes—16mm) A young glider pilot who lost both legs and the power of speech during the war is determined to become an active and useful member of his community again. *Source:* International Society for the Rehabilitation of the Disabled, 701 First Avenue, New York 17, New York.

Total Rehabilitation of a Bilateral High Upper Extremity Amputee

(Color-Sound-30 Minutes—16mm) Shows how a bilateral double high-arm amputee can be restored to functional capacity. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Towards Independence

(Black and White-Sound-30 Minutes—16mm) Shows how modern developments in medicine have made it possible for victims of paraplegia, resulting from spinal cord injuries, to become independent, well-adjusted citizens. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Upper Extremity Prosthetics, Part I

(Color-Sound-23 Minutes—16mm) This training film presents highlights of prescription, fabrication, fitting and harnessing, including the criteria for acceptance of artificial arms. The importance of teamwork is emphasized. Pre-prosthetic and prosthetic training activities are shown. Modern devices and appliances are described. Some of the motivations and adjustments involving acceptance and use of arm prostheses are depicted. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Upper Extremity Prosthetic Principles, Part II

(Color-Sound-20 Minutes—16mm) Film shows examples of research efforts resulting in a body of prosthetic principles leading to better artificial arms. A systematic description is given of the functions lost at different levels in amputation and of the principles involved in their prosthetic restoration. An armamentarium board and other items among the latest available devices and components are described in detail. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Urban Maes Amputation for Peripheral Vascular Disease

(Color-Sound-12 Minutes—16mm) Demonstrates the advantages in the Urban Maes technique of below-the-knee amputation in diseases of compromised circulation. Shows the operative technique from initial incision to final stump closure and the healed stump with range of motion some weeks later. Shows other patients who have been handled in a similar manner, with views of their stumps, ambulatory on pylon, temporary, and final prostheses. *Source:* Central Office Film Library, Veterans Administration, Washington 25, D. C.

Use of Flexorhinge Hand

(Color-Sound-25 Minutes) Indicates the different flexor hinge hand splints with advantages and capacities of each as related to individual patient weaknesses. The CO-2 muscle in action is also shown. *Source:* Rancho Los Amigos, Medical Education Service, 7601 East Imperial Highway, Downey, California. (Reserve several months in advance. Free of charge except return postage and insurance fee for $150.00).

AOPA'S LEADERS—Left to right: Vice President David C. McGraw, Secretary-Treasurer M. P. Cestaro, Past-President Carlton E. Fillauer, President Robert C. Gruman and President-Elect Herbert J. Hart.

AOPA ASSEMBLY PASSES FIVE HUNDRED MARK

Gruman Takes Office As President Robert C. Gruman was formally installed as President of the American Orthotics and Prosthetics Association at the Assembly held in New Orleans. In turning over the presidential office, Carlton Fillauer welcomed Mr. Gruman of Minneapolis as his successor. Installed at the same time were Herbert J. Hart of Oakland, California as President-Elect, David C. McGraw of Shreveport, La., as the new Vice President and M. P. Cestaro of Washington, D. C. who was reelected as Secretary-Treasurer.

AOPA Program For 1964 The new officers, as a group, pledged their best to the members who had elected them at the Business Session November 6. The program which they had planned for the coming year includes these member services:

1. Continued support and expansion of Northwestern University's Business Course to develop benefits for members.
2. A public relations folder to explain to physician, agency and patient the services offered by our members in their training. This will be in two parts—the first one devoted to the work of the orthotist. This is the special responsibility of President-Elect Herbert Hart who is public relations chairman.
3. A new AOPA publication which will be made up of selections from past issues of our *Journal*. This carries out an idea originally suggested by Past-President Lucius Trautman that AOPA should make available to new members some of the fine articles published in past years which are now out of print.

AOPA Board of Directors AOPA's Board of Directors held two sessions during the Assembly and immediately thereafter. The eleven Regional Directors reported on plans for the Regional Meetings to be held in the spring of 1964. Regional Meetings scheduled for March include Region VIII, which will meet March 13-15 at the Granada Hotel, San Antonio, Texas; and Region X, meeting March 28-29 at the El Rancho Hotel, Sacramento. Meeting dates of the other Regions will be announced in the March *Journal*.

PROSTHETISTS AND ORTHOTISTS CERTIFIED IN 1963

The Committee on Examinations of the American Board for Certification announces that the following candidates have received Certification as a result of successfully passing the 1963 Examinations of the Board. (The four men listed as Certified Prosthetists and Orthotists had previously received Certification in one of these two fields.)

Prosthetics

1. George Anderson
2. Helmut Breuer
3. Alan R. Finnieston
4. Charles E. Hixenbaugh
5. William K. Lucas
6. Donald H. Martin
7. Jack D. Pounders
8. Forrest T. Scarlott, Jr.
9. Willi Veith

Prosthetics and Orthotics

1. Thomas R. Bidwell
2. Loren D. Jouett
3. Claude J. Lambert
4. Siegfried W. Paul

Orthotics

1. Ross L. Bremer
2. Michael Danisi
3. Willard E. Lanier
4. Harold E. Miller
5. Paul F. Parris
6. Ray W. Richmond
7. Curtis R. Sherman
8. Jerome E. Skahan
9. John G. Wilkins
10. Wilford Young
11. Joseph J. Zlatich

In Memoriam

Clyde C. Scott

It was my pleasure and privilege to be associated with Mr. Clyde C. Scott for the past eleven years. He was always very faithful in his attendance at our clinics and I am sure this meant a great sacrifice to him since he gave up working hours in his shop to attend the clinics.

His workmanship was excellent, and, in addition, he was most cooperative with the clinic team and developed excellent rapport with the patients, especially the juvenile amputees.

He always had the utmost cooperation and friendship of the other prosthetists and in turn was quite willing to give constructive comments.

He literally "died with his boots on." He came to our clinic, early as usual, to deliver a lower extremity prosthesis and to be ready for clinic. He slumped to the floor and all efforts to revive him failed.

His loss will be greatly felt by our clinic team, and the many inquiries that have come to me from his clientele show that they also will miss him very much.

CLAUDE N. LAMBERT, M.D.
Professor of Orthopaedic Surgery.
University of Illinois College of Medicine
Lecturer on Orthopaedic Surgery
Northwestern University Medical School

American Board for Certification Announces Officers

George H. Lambert, C.P.O., Baton Rouge, Louisiana was elected President of the American Board for Certification in Orthotics and Prosthetics at a meeting in New Orleans, Louisiana at the time of AOPA's National Assembly. Serving with him will be Dr. Cameron B. Hall of Los Angeles as Vice President and Mr. M. P. Cestaro of Washington, D. C. who was reelected Secretary-Treasurer.

New Directors of the American Board for Certification include Dr. Claude N. Lambert of Chicago, Illinois and Mr. Durward R. Coon, C.P.O., of Detroit, Michigan.

President Lambert after consultation with his Executive Committee has announced the appointment of the following committees of the Board:

Committee Appointments

Educational Standards

Michael P. Cestaro, Chairman
Washington 13, D. C.

Basil Peters, C.P.O.
Philadelphia 47, Pennsylvania

Richard G. Bidwell, C.P.O.
Milwaukee, Wisconsin

Edward W. Snygg, C.P.O.
San Francisco, California

Committee on Credentials

Theodore W. Smith, C.O., Chairman
Kansas City, Missouri

Roy M. Hoover, M.D.
Roanoke, Virginia

Howard V. Mooney, C.O.
Lowell, Massachusetts

Committee on Facilities

Durward R. Coon, C.P.O., Chairman
Detroit, Michigan

William E. Brownfield, C.P.O.
Boise, Idaho

Claude N. Lambert, M.D.
Chicago 3, Illinois

Committee on Examinations

George H. Lambert, C.P.O., Chairman
Baton Rouge, Louisiana

Alfred Denison, C.P.
Chicago, Illinois

Clyde Peach, C.O.
Indianapolis 24, Indiana

Cameron B. Hall, M.D.
San Francisco 25, California

Ethical Practices

Chester C. Haddan, C.P.O., Chairman
Denver, Colorado

M. J. Benjamin, C.O.
Los Angeles 14, California

Daniel A. McKeever, C.P.
Atlanta 9, Georgia

Richard H. Jones, M.D.
Minneapolis 5, Minnesota

To The Ladies

FROM A.O.P.A.'s AUXILLIARY

Mrs. Esther Pava
President

Mrs. Ted W. Smith
Vice President

Mrs. Shirley Sobbe
Secretary-Treasurer

Mrs. Elinor Bohnenkamp
Past President

DEAR AUXILIARY MEMBERS:

As your new President, I am writing my first letter for the *Journal* just a few days after our return from the wonderful meeting at the Jung Hotel in New Orleans. First of all, I wish to take this opportunity to thank every individual who had anything to do with making the meeting a tremendous success. Your past slate of Officers, I am sure, will join me in words of gratitude for the help and co-operation by members of the Auxiliary in assisting us with the many details at the registration desk. Making up the Mardi-Gras party sacks would have been almost an impossible task without the help of those of you who volunteered to help. However, I am happy to report the Auxiliary treasury was increased by $53 profit from that project.

To the members who were unable to attend this year, we do hope you will be with us next year in Hollywood, Florida. Your Auxiliary is growing—we added 18 new members in New Orleans, bringing our total membership to about 190. There were 87 ladies who registered at the Auxiliary desk in the Jung Hotel. We have set a more purposeful meaning to our organization by deciding to contribute a portion of our treasury to a philanthropic cause. It was voted at our second meeting on November 6 to donate $200.00 to the "Orthopaedic Research and Education Foundation."

Although the weather did not co-operate perfectly for the tours planned for the women, there were 56 who braved the rain to take the bus tour of the City of New Orleans. We were very happy to have quite a few men on the 2 busses. Because it was raining, some folks did cancel going on the Bayou and Swamp tour but the 20 of us who went were real happy to have the weather clear and see the sun by the time we had reached our destination to board the cruise boat.

For those of you who had to leave our luncheon meeting at the Royal Orleans Hotel, we were sorry you missed a most interesting speaker. Mrs. Kitty Rotruck of the "Bishop Method of Clothing Construction" fascinated her audience with the clever ideas of easily made accessories. Incidentally, Mrs. Rotruck is a personal friend of Dorothy (Mrs. Les) Smith.

Until the next issue of the *Journal*, I remain,

Sincerely yours,

ESTHER C. PAVA

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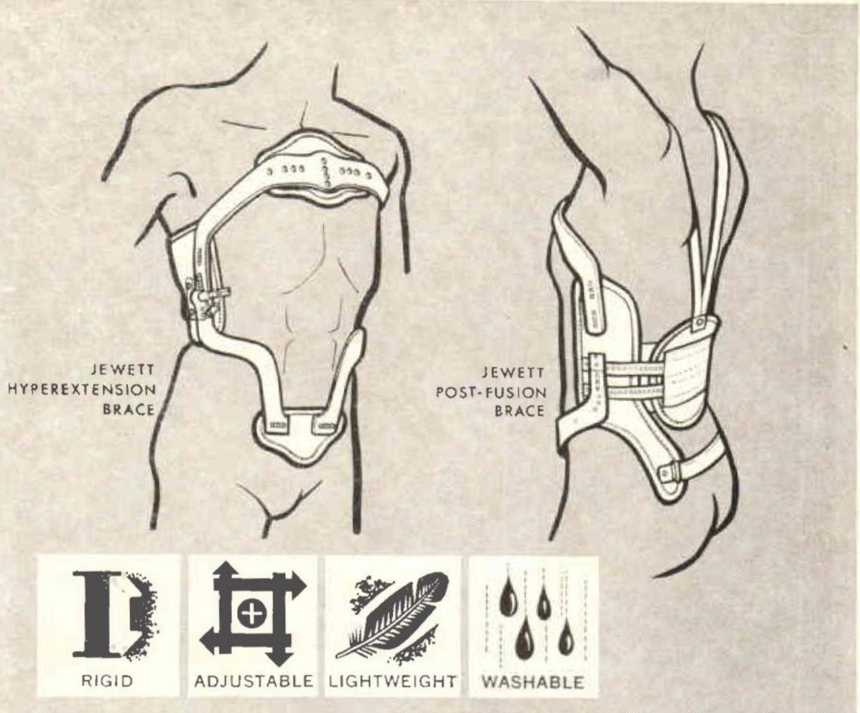
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