Orthotics and Prosthetics, Vol. 30, No. 3, pp. 13–16, September 1976

CLINICAL EXPERIENCE WITH THE "SOLID-ANKLE" ORTHOSIS[1]

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The conventional method of bracing the child with myelodysplasia at the L3-4 level seems to be by use of metal and leather in the form of hip-knee-ankle-foot orthoses (HKAFO) as illustrated in Figure 1, in spite of the availability of polypropylene "solid-ankle" orthoses described by Glancy in the March 1972 issue of *Orthotics and Prosthetics* (*2*).

Fig. 1. Conventional hip-knee-ankle-foot orthoses provided for children with myelodysplasia at the L3-4 level.

The intent of this paper is to describe the experiences gained in utilizing Glancy's technique at the Krusen Center for Research and Engineering.

Patients with paraplegia at the L3-4 level have intact hip flexors and knee extensors, but the muscles below the knee are flaccid. When HKAFO's are used the unaffected musculature is not permitted to control function when the mechanical knee and hip joints are kept in the locked position. Functional activity while wearing the conventional orthosis is reduced, not only because of the rigidity of the total system, but also because of the additional burden caused by the weight of the orthosis.

Another problem seen in the myelodysplastic child is deformity of the bones of the lower limb. All children seen in the myelodysplasia clinic during the past year had worn conventional orthoses, and had deformities varying between slight and extreme (Fig. 2 & 3). It seems to be self evident that conventional orthoses do little to prevent deformity, and that alternate means of bracing, such as the molded plastic techniques need to be investigated with respect to their potential ability to control and prevent deformity.

In his paper Glancy (*1*) discusses the rationale for the "solid-ankle" orthosis, and goes on to describe completely the procedures necessary for fabrication and fitting.

The only change made at this center, except to ignore the need for shoe modification, was to use vacuum-forming techniques, rather than hand layups.

FABRICATION AND FITTING

The casts were taken and positive models made according to Glancy (*1*). Polyethylene foam was

[1]This work was carried out with partial support of the Rehabilitation Services Administration, Department of Health, Education and Welfare under Grant #23P-55518

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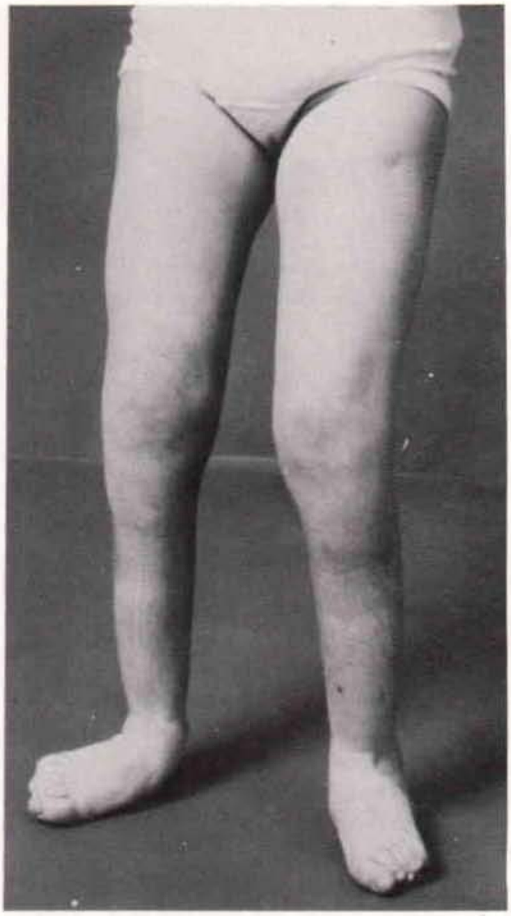

Fig. 2. Typical condition of patient with myelodysplasia at the L3-4 level.

Fig. 3. Severe foot deformity seen in patient with myelodysplasia at the L3-4 level.

formed over the anterior section of each positive model, and both models then were placed on the platen of the vacuum-forming machine so that the orthoses can be molded simultaneously (Fig. 4)

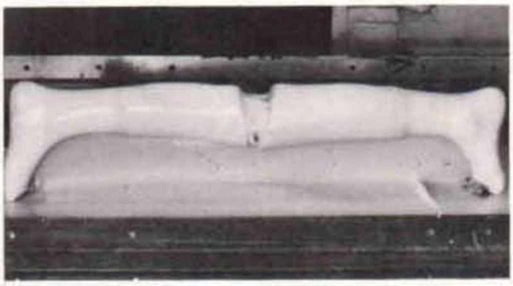

Fig. 4. Right and left orthoses molded simultaneously.

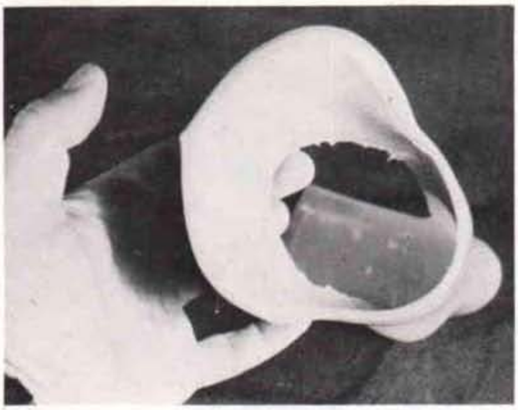

Fig. 5. Top view of "solid-ankle" orthosis.

(*3*). Polypropylene, 1/4-in. thick, was used so that after the forming process the thickness of the anterior wall of a finished orthosis is at least 3/32-in. and the thickness of the posterior section is approximately 1/8-in. In vacuum forming, a weld is produced vertically in the anterior section as the heated material on each side is brought together. Breakage in this area has occurred when adequate thickness was not maintained. When breakage does occur, Kydex 1/16-in. thick can be used to provide reinforcement to the anterior section.

Shoe modifications have not been found to be necessary. The patients have been fitted with ordinary shoes as illustrated in Figures 7 and 8. Ankle position is maintained and a knee extension moment is provided as well.

Fig. 6. Anterior view of a pair of "solid-ankle" orthoses.

Fig. 7. Typical myelodysplastic patient with "solid-ankle" orthoses.

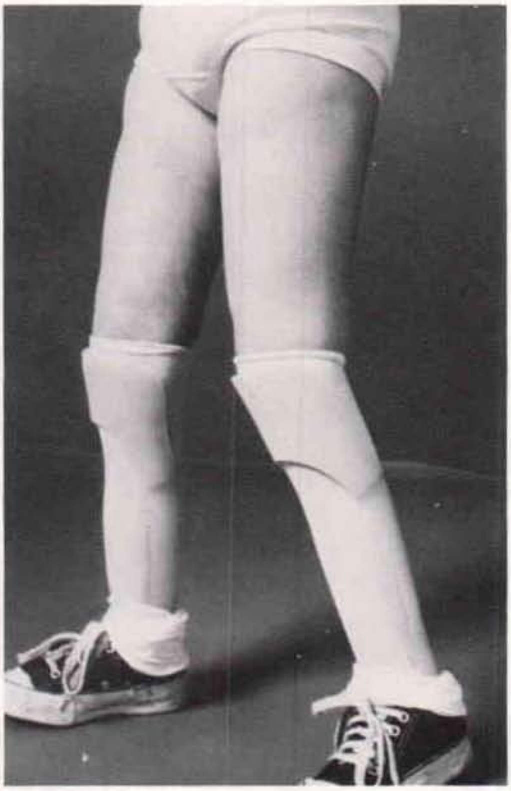

Fig. 8. Typical myelodysplastic patient with "solid-ankle" orthoses.

SUMMARY OF EXPERIENCE AND DISCUSSION

When marked knee instability was present in the medio-lateral plane, children provided with the "solid-ankle" orthosis presented a number of orthotic problems that have not been overcome completely. The techniques described by Foort in reference to the CARS-UBC knee orthosis (*1,4*) are being applied to the "solid-ankle" orthosis in an attempt to control M-L motion better without restricting knee flexion and extension.

Probably the most serious problem confronted while fitting the "solid-ankle" orthosis has been skin breakdown. In most cases of myelodysplasia there is loss of sensation, and condition of the skin must be followed closely. Careful instruction must be given to the child and to the parent to check skin condition frequently during the period immediately following initial fitting and at least three times daily as long as a molded orthosis is used.

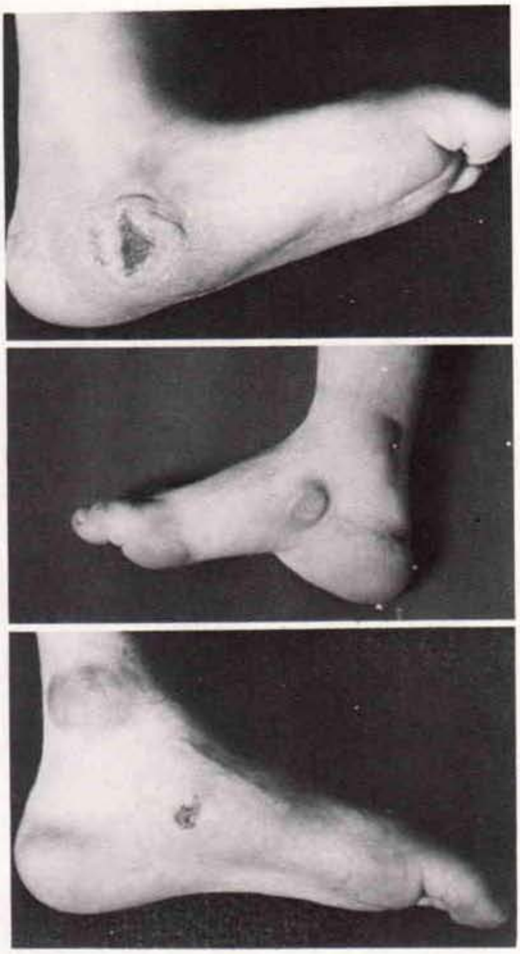

Fig. 9. Lesions caused by inadequate fit and lack of attention on the part of the patient and parents.

Skin breakdown that could have been avoided easily if simple instructions had been followed are shown in Figure 9. Fortunately, simple modification of the orthosis and good medical management permitted these pressure areas to clear up without severe complications.

To date 21 children with myelodysplasia have been fitted with "solid-ankle" orthoses, and a total of 47 "solid-ankle" orthoses as described by Glancy have been fitted to 24 children. Our experience to date has been mostly very satisfactory, failure as a result of use of the orthoses having been observed in only a small portion of the cases treated.

This work has been carried out with the assistance and cooperation of the staff of the A. I. duPont Institute, Wilmington, Delaware.

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