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The orthotic management of arthrogryphosis

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The arthrogryphotic child poses many problems for the orthotist who will need to be consulted for corrective splinting as early as a few weeks after birth.

These children are frequently born with gross flexion deformities and severe equinovarus club feet. The physiotherapist will give stretching exercises and strapping is applied to gain as much correction as possible.

Simple Denis Browne derotation splints can be applied first with strapping and, when the feet are large enough, open-toe bootees can be used. As the child grows it may be necessary to use the Denis Browne calcaneal splint. Lower-limb orthoses may be required for walking as early in life as one year as most of these children have a vast amount of energy and the will to progress.

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It is usual to provide the severely handicapped child with bilateral hip-knee-ankle-foot orthoses which may require a single pelvic band or both pelvic and thoracic bands with locking mechanisms at the hips. Corrective and accommodating footwear will also be necessary.

The orthoses will need to be reviewed constantly as most of these children progress fairly quickly when good physiotherapy is available. Aids for daily living will be a constant demand on the ingenuity of the occupational therapist and the orthotist.

The vastly differing needs of each individual case have to be considered in the light of limited movements in all anatomical joints.

Some patients will be completely independent and require nothing more than special footwear. Others will need specially constructed living accommodation with full accessories for even the simplest everyday tasks.

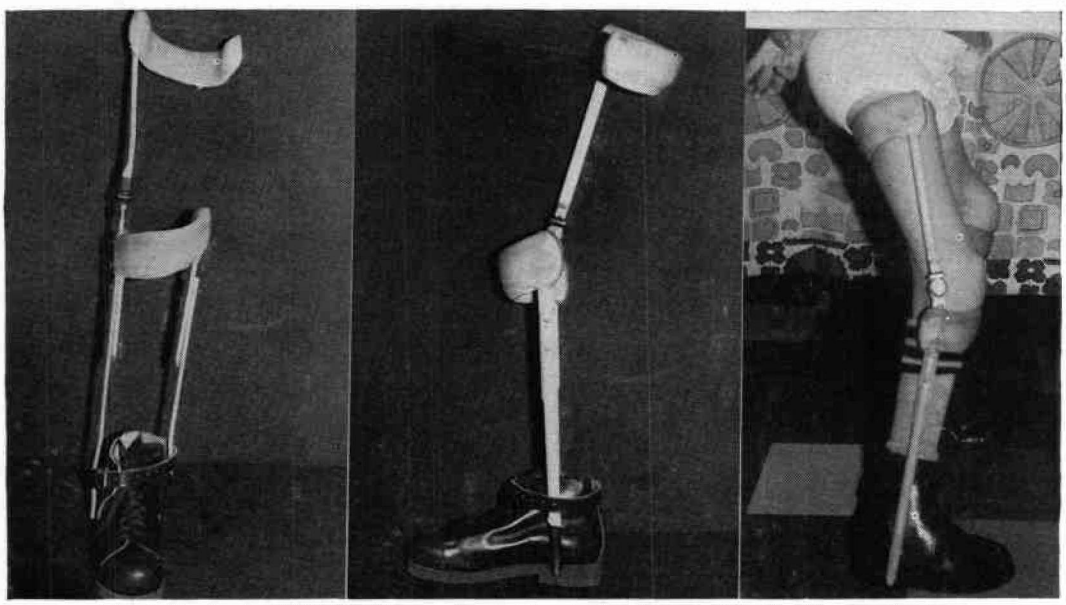

Fig. 1. Single steel KAFO with anterior patellar-tendon bar and knee locking mechanism.

Frames can be provided with adaptions for washing, hair brushing, cleaning teeth and dressing.

These children do not tolerate discomfort and no matter how good the intention of the medical staff may be regarding corrective splinting, most will find a loophole in the design to adapt to the most comfortable position of the limb.

Two examples of this can be clearly shown. First, in footwear there is frequently a desire to hold the foot in equinus and varus with the big toe completely flexed. Even though boots are provided with heel straps, varus "T" straps and varus tarsus straps, the child will always find a sympathetic member of the nursing staff to loosen the corrective straps, thus allowing the feet to become increasingly deformed.

A second example can be seen where there is increasing knee flexion deformity. A great deal of thought and time has been spent endeavouring to provide comfortable but corrective orthoses for knee flexion. Moulded Plastazote knee-caps can be used, or well shaped, soft leather knee-caps lined with lambs' wool, but, as mentioned earlier, there will always be someone around to loosen corrective straps and allow increasing deformities. This can be very serious and, if not checked, can lead to epiphyseal damage of a lasting nature.

A simple fairly foolproof method of making sure the knee is held in place is to use a single steel or double steel knee-ankle-foot orthosis with an anterior patellar-tendon bar and knee-locking mechanism. This will only lock in one position and will eliminate the loosening of straps as can be seen in Figure 1.

In spite of all our efforts it may be necessary for a number of serial plasters to be applied during growth.

When bone growth is complete, surgery may be performed to place the limbs in the best possible position for walking. The orthotist can then design effective and cosmetically acceptable orthoses which the young adults can assume themselves. Here, advanced techniques using good thermoplastics and laminates can be of enormous advantage.

It is possible to accommodate short, fixed equinus feet in ordinary shoes by extending foot pieces and adding false foreparts as toe fillers (Figures 2 and 3).

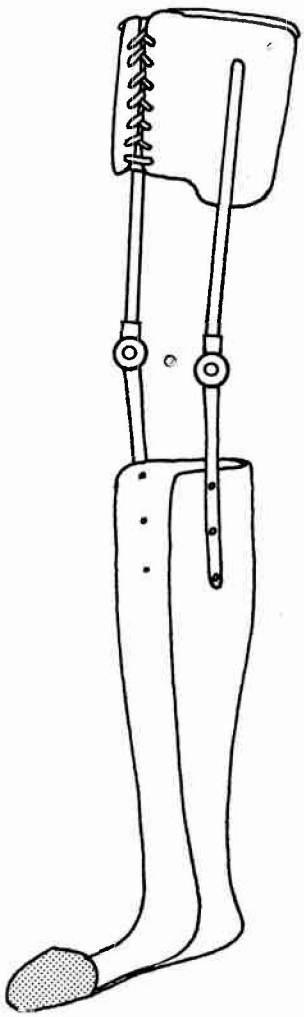

Fig. 2. KAFO with high density plastic below-knee leaf spring type shoe piece.

Good use can also be made of the extension prosthesis technique, combining the skills of both prosthetist and orthotist. Figure 4 shows how this can be applied, not only concealing the deformities of fixed equinovarus feet, but also bringing a child of diminutive height to normal stature.

There may be cases where severe limitation of joints will make it impossible for the subject to fasten any type of footwear. Unless something can be designed without fastenings, independence can never be achieved.

Figure 5 shows an extension prosthesis with patellar-tendon-bearing orthosis and automatic bilateral knee-locking joints. The foot enters the apparatus with the orthosis in a flexed position. When the foot is placed in the foot piece the knee joints can be locked by extending the knee. As the knee is fixed in flexion, no other fastenings are necessary.

In conclusion it would appear that the orthotic management of this very severe condition is primarily one of corrective splinting during growth with the object of enabling the arthrogryphotic patient to achieve a degree of independence.

Fig. 3. Cut-away section showing toe-piece to accommodate short equinus foot in normal size shoe.

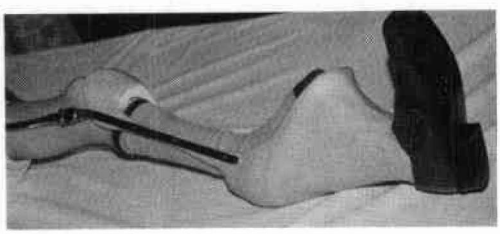

Fig. 4. Extension prosthesis technique applied to KAFO.

Fig. 5. Extension prosthesis with patellar-tendon-bearing orthosis and bilateral automatic knee locking joints.