

## Technical note

# A multipurpose orthosis for paralysed children

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### Abstract

A severely paralysed child whose trunk as well as both lower limbs is affected needs an aid for the basic needs of sitting, standing and other activities of daily living. Often a number of aids such as standing table, adapted chairs, commode etc., is required to meet basic needs. Special equipment has been designed for this multipurpose use, which does not occupy much space in a house and is portable. This equipment enables the parents to manage the handicapped child at home.

### Introduction

The child who has both lower limbs paralysed undergoes intensive rehabilitation training for his potential sitting, standing, ambulation and other activities. Children with spinal cord injuries, progressive conditions such as myopathy etc. are being given rehabilitation training and treatment in specialized centres, where equipment such as standing tables, special chairs, walkers, inclined tables etc. are available. As soon as the child leaves the rehabilitation centre, the parents often find it very difficult to have this equipment at home to continue the management of their child.

Often either the parents are not able to continue the rehabilitation training of their child in the specialized centre due to socio-economic factors, or the rehabilitation centres may not be able to keep the patient for long due to the demand for places.

Whatever the situation, the rehabilitation process should be completed. In such circumstances the multipurpose orthosis described here provides an answer.

### Salient features

The device can be easily operated by a family member. One can make the child comfortable in

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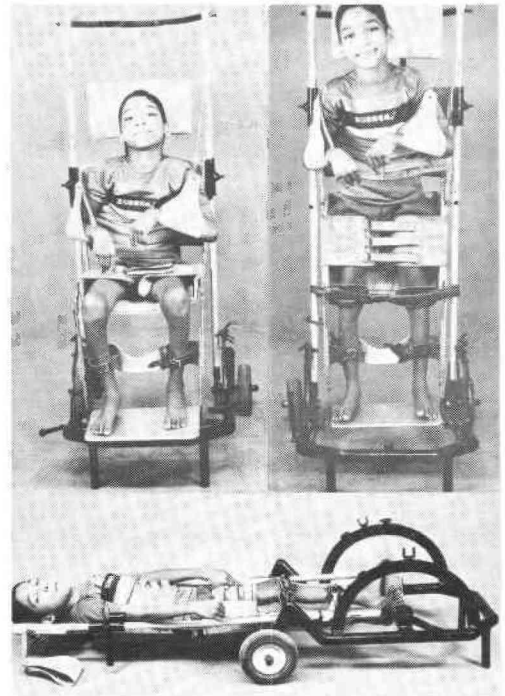


Fig. 1. The multipurpose orthosis is easily adjusted for any desired position.

the desired position such as sitting (Fig. 1, top left), standing (Fig. 1, top right), or lying supine (Fig. 1, bottom), without shifting or lifting the child. Provision has also been made for toilet activities.

### The multipurpose orthosis

The device has two wheels, so that the attendant can easily move the equipment with the patient. The over-head sling is provided to support the paralysed deltoid, to facilitate upper arm exercises and activities. The lap board (detachable) can be fixed to undertake writing, reading or any other work which has to be done at the level of the chest (Fig. 2, left).

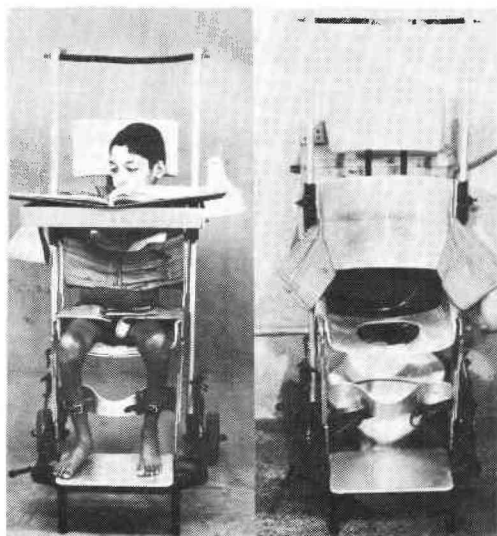


Fig. 2. Left, the detachable lap board. Right, fitted commode.

Appropriate straps are provided to support the trunk and lower extremities, and an adjustable head support is also provided at the back. If one needs to have graded, inclined sitting/standing positions in the early stages of bringing the patient to the standing position, this can be done without extra effort.

#### Design details

The base which is "U" shaped is made of 45 mm diameter G.I. tube and has two 150 mm diameter castor wheels at the back. The centre width of the base can accommodate a pedestal type commode (Fig. 2, right).

A moveable 20 mm diameter G. I. tube frame (length 1500 mm, width 380 mm) is fitted on the middle arm of the "U" base. Two semicircular 40 mm width 6 mm thick mild steel plates are welded either side of the base to guide the frame. Locking clamps are also welded on the semicircular flat.

Adjustable monobar orthoses made of high strength aluminium alloy with joint units at ankle, knee and hip are inter connected by 12 mm width 3 mm thick mild steel flat bars; 3 mm thick aluminium sheet is placed to serve as a backrest and a seat. The seat is perforated with an oval shaped hole at the centre for toilet activities.

The frame is fitted with two 25 mm diameter, 125 mm G. I. tubes having handles at both sides which are moveable in both upward and downward directions to the stopper provided at the sitting position. These are inserted on both sides of the frame. Locking stoppers for stability are provided to lock the frame in the standing position so that the child with involuntary body movements can also safely use it. A single piece curved calf band and resting stirrups are provided at the foot region of the frame, along with a leg shifting lever.

Appropriately positioned straps are provided to support the trunk and the lower extremities. For the weight and height of the patients for which this multipurpose orthosis is designed the centre of gravity will fall within the base for all possible positions of the patient. For patients of greater weight and height the base can be modified by providing a telescopic arrangement in the base tubes.

#### Durability and maintenance

The frame has been designed to withstand static and dynamic loads of 80 kg. The frame has to be painted once a year to resist corrosion. Periodic lubrication must be applied to the moveable parts. This frame is in use in the National Institute of Rehabilitation Training and Research. The doctors, engineers, prosthetists, physiotherapists and occupational therapists of the Institution consider this equipment to be an excellent indigenous adapted device for the handicapped. The frame is an improved design based on an earlier version designed and described by Balakrishnan (1978).

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#### REFERENCE

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