

Technical note

New walking aid for primary mobilization of an infant with deficiency of all four limbs

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Abstract

The authors report on a new device for the primary mobilization of a boy with severe deficiencies of all four limbs. This device allows independent mobility.

Introduction

The supply with technical aids in the case of loss of all four limbs is always difficult, especially in respect of primary mobilization. Studying the available literature, the authors found references published mainly in the thalidomide era. On first provision sockets were usually fixed to platforms on casters as by Aitken (1972) and Tippy *et al.* (1979) or to three wheeled carts, (Motloch and Elliot, 1966). Trunk swing, especially if the upper limbs are not deficient, may provide the means for a slow advancement. The children, as seen from photographs in the publication of the results, did not appear happy with the movement achieved since the motion needed great effort. The other form of provision was a socket fixed on platforms and bars (Marquardt and Martini, 1979; Radford and Steensma, 1957) to achieve an upright position but without mobility. Swivel walkers requiring rocking motions (Motloch and Elliot, 1966) on the other hand are usually not the first aids provided for mobilization. The aim of the authors was the supply to the child of

a device which would permit active communication.

Case history

Szabolcs K., male, was born with serious deficiencies of his four limbs. His upper limbs end between the upper and middle third of the humerus, the right side being somewhat longer. He has free shoulder joint movements. The left

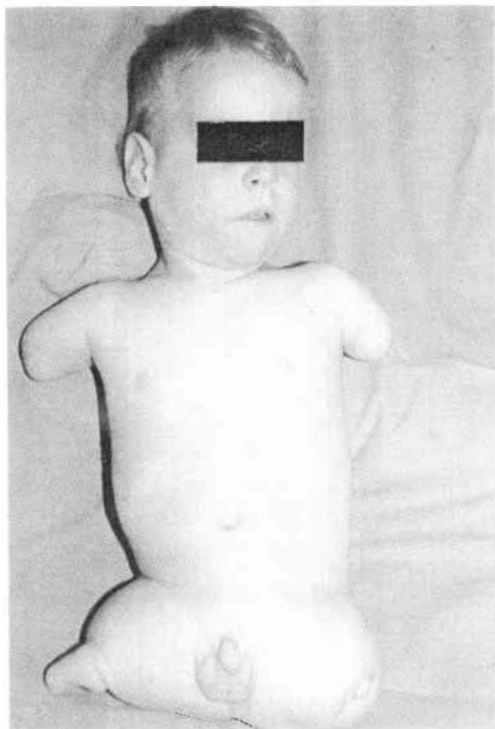


Fig. 1. Szabolcs K. with deficiency of four limbs.

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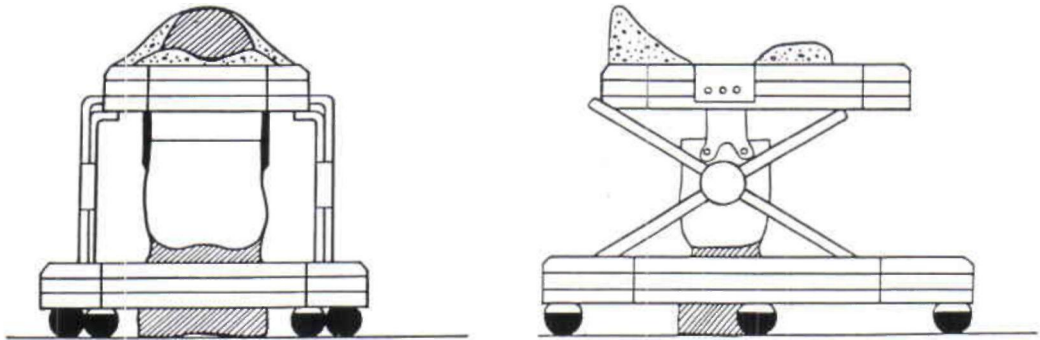


Fig. 2. Anterior and lateral views of the device.

lower limb is completely missing. There is a toe-like residual limb on the right side (Fig. 1). No calcified bones are visible in his right lower limb on the X-ray pictures at the age of one year. His mental development is normal. The development of movement is retarded due to the deficiencies. He can change prone and supine positions but cannot climb or crawl and cannot sit up. He was institutionalised in a health care children's home. His problem was studied with the aim of mobilisation. The aim of the fitting was the production of an aid which could be controlled by the child i.e. the device could be steered and stopped. A pelvic socket was laminated with varying stiffness to permit entry. This was fixed to a semi-rigid foam (plastazote) sole coated with rubber. This socket was suspended elastically on a commercial infant's go-cart, the centre of gravity of the child being below the centre of rotation (Fig. 2). This suspension permits the child to interact with the device and also permits full control. During the manufacturing process the child learned to adapt to the upright position, to losing and recovering balance and his deep back muscles and abdominal muscles were thus strengthened, since good active movements of the lumbar

spine are necessary to control the device. This was followed by gradual training with the aid. First the child got into the socket, held in the upright position. On the next day he got into the complete device and was tilted from balance and helped to recover. These exercises were further developed into periodic movements copying the phases of gait. By tilting his pelvis he produces the "toe off" phase. He lifts his weight on his arms or on both his arms and chin while he swings his socket forward, lands on the edge of the sole and then regains balance by achieving complete support by the sole (Fig. 3). Steering is achieved with his arms, facilitated by the planet-wheels of the walker, and by swinging the socket in the desired direction. He became independently mobile within one week.

Discussion

The aid described in this publication is basically different from those published in previous references. The socket ends in a rubber sole and is elastically suspended in the frame. The principle of the aid is similar to a person supplied with prostheses and a rolling walker. It is important, that there is the possibility of rapid movement and the coverage of large distances



Fig. 3. Phases of "walking" with the device.

with relatively little muscle work. The danger of accidents is very small. Finally it was possible to teach the use of the aid very quickly. Szabolcs was able to move around indoors safely, without hitting furniture, and became mobile outdoors too. This increased mobility had a remarkable effect on his mental development.

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