

A Foot Drop Spring*

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INTRODUCTION

Active splints have long been accepted as a basic therapeutic measure for the prevention of deformity due to paralysis and in the treatment of paresis. However, in leprosy their use has frequently been neglected. The fitting of an active splint to the hand is difficult, compared with the ease of fitting an efficient active splint that will provide a functional support to allow normal walking in a foot with paralysis of the anterior and/or lateral leg muscles (foot drop). Many types of splint have been devised over the years and have proved effective, but some may not be acceptable for the treatment of large groups of persons in poor financial conditions.

The requirements of an efficient active splint for foot drop are that it should be: (1) effective, (2) comfortable, (3) adaptable for making with local materials by patients themselves, (4) cheap, (5) easy to apply, even with deformed hands, and (6) that it can be used with socially acceptable clothes and shoes and can conform to local customs. Over the years the staff at Hay Ling Chau have evolved a foot drop spring that we consider fulfils these conditions in Hong Kong.

DESCRIPTION

A simple cuff is made to encircle the leg immediately below the knee and to fasten in front of the leg. Attached to this by 2 arms is a "Y" piece, to the lower end of which is fastened a metal spring which is hooked on to the shoe; the degree of lift required is adjusted by the length of the "Y" piece, which is provided with a number of holes for use with a pair of buckles on the upper cuff, thus providing a choice of length.

MATERIAL

(a) Any locally available material can be used. Leather is readily usable, but webbing, canvas, or any similar strong material is equally satisfactory.

(b) The upper cuff, if made of leather, is padded with sponge rubber to assist grip on the leg and reduce localized pressure. A cuff made of other material may not need padding.

(c) Buckles are used for fastening, but eyelets and laces could be used, or "Velcro Magic tape" for patients with bad hands, or "Gripper", fasteners or other patent fastenings as available.

(d) Metal springs are reliable and wear well, but strong elastic may be used or strips of heavy rubber from the inner tubes of lorry tyres will provide adequate stretch.

(e) A dressmaker's hook stitched to the shoe (or sock) will provide the point of attachment, or the spring can be hooked through shoe laces or on to a loop or ring stitched to the shoe.

In countries where shoes are usually removed at the door and left outside, it is possible to attach the spring to firm socks, or to provide a cuff to go round the forefoot at the level of the metatarsal-phalangeal joint so that the spring can be worn in the house. As the paralysed foot is usually associated with an anaesthetic sole it is best to advise these patients to wear some type of footwear at all times so as to prevent trauma.

PATTERN

The Hay Ling Chau design is as follows:

(1) A leather cuff with a sponge-rubber inner lining and furnished with a tongue and a strap to pass through the buckle in front of the leg carries 2 further buckles, one on each lateral aspect, angled forward to provide attachment

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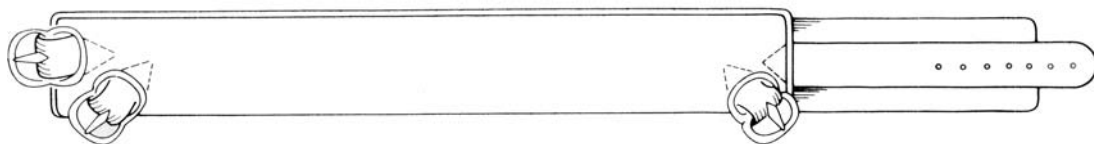


FIG. 1
Upper leg cuff showing tongue lining and placement of buckles.

for the “Y” piece (see Figs 1 and 3). *Note:* All buckles should be on the front of the leg to prevent them damaging the anaesthetic skin of the popliteal fossa when patients sit or squat. The cuff must, of course, be tight enough to hold up above the calf. Cuffs may be pre-made, but should allow for different calf sizes (lengths of 10 and 12 in. (25 and 30 cm) are commonest for adults in Hong Kong).

(2) In acute paralysis, where the lateral popliteal nerve is tender, it may not be possible to tighten this type of cuff adequately without causing pain in the nerve; also, in patients with marked wasting of the calf there will not be enough muscle bulk to hold up this cuff. In such case a double cuff is desirable. The upper cuff can be fastened firmly while the lower cuff is left looser. The latter is essential as it provides the correct site for the pull of the spring. If the spring is attached above the knee its tension will be lost when the knee is flexed; hence to be effective the spring must be attached below the knee. The side bars joining the 2 cuffs should be directly mid-lateral to prevent rubbing during movement of the knee (Fig. 3).

(3) The “Y” piece is also lined with leather for strength and has 4 to 6 punch holes on each upper end to allow adjustment of the length; it has also a metal bracket at the lower end for attachment of the spring (Fig. 2).

(4) The spring is about 5 in. (12.5 cm) in length, 6 or 7 mm in diam. and the 5 in. length should stretch to 6 or 7 in. (15 to 17 cm) when strong pull is applied. Weak springs will rapidly be distorted by the power of the gastrocnemius and soleus muscles. The lower end of the spring is easily bent out to form a ring for use on the hook, or to pass through a ring or lace on the shoe.

(5) The hook on the shoe should be situated

over the head of the fourth metatarsal to provide adequate lateral lift in a full foot drop. This site may need to be adjusted if there is paresis in order to obtain a suitable balance and prevent inversion or eversion of the foot. The shoe need not be an expensive or orthopaedic one, provided it fits well and firmly so that it will not be pulled off by the spring (i.e. has a heel counter); it should also have a good sole to protect the anaesthetic foot that usually accompanies foot drop. The final appearance of a completed spring with double upper cuff is shown in Fig. 3. *Note:* For night use a cuff to encircle the foot at the level of the metatarsal-phalangeal joint can be made to attach to the spring and so minimize the chances of contracted Achilles tendon.

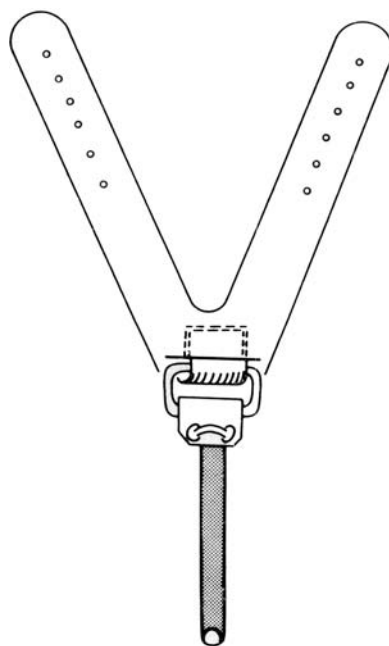


FIG. 2
The “Y” section showing metal attachment and spring.



FIG. 3
Complete spring with double upper cuff, showing shoe attachment.

These springs can easily be adjusted to ensure adequate lift of the foot to prevent a flapping gait during walking. Many patients appreciate the relative comfort of walking with one of these springs after years of "flapping feet".

SUMMARY

A description is given of a simple form of foot drop spring that is cheap and easy to make and has proved effective in controlling the paralyzed foot and preventing further deformity.

ACKNOWLEDGEMENTS

The design of this spring has gradually evolved over many years of co-operation by staff and patients. We merely present the version we are using today to help others to help themselves. Our thanks go to Miss K. Collett for the illustrations and to the Hong Kong Government physiotherapists for their encouragement and assistance in improving the design.

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