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Orthoses for functional treatment of ankle fractures. A preliminary report

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Abstract

This report examines the orthotic management of patients with ankle fractures. Two functional orthoses that allow movement in the talocrural joint are described. The results of using these orthoses on ten patients are discussed.

Introduction

Immobilization of an extremity, for example after a fracture, has certain unwanted effects. Osteoporosis arises (Enneking and Horowitz, 1972; Mattsson, 1972) and cartilage changes similar to those described at an early stage of osteoarthritis take place in the joint (Enneking and Horowitz, 1972; Langenskiöld et al, 1979). Changes also occur in ligaments and joint capsule (Finsterbush and Friedman, 1973; Videman et al, 1976; Langenskiöld et al, 1979), in synovial membrane (Finsterbush and Friedman, 1973), in muscles (Mattsson, 1972; Finsterbush and Friedman, 1973) and in blood flow (Semb 1969).

So-called functional fracture treatment has been used in different types of fractures. It favours fracture healing but is also said to have beneficial effects on muscle function, joint mobility and time of rehabilitation (Sarmiento, 1967 and 1970; Sarmiento, Cooper, Sinclair, 1975; Sarmiento, Pratt, Berry, Sinclair, 1975; Mooney et al, 1970).

However, Andersson and Nilsson (1979) did not find any difference in bone mineral loss in patients with tibial shaft fracture treated with or without weight-bearing and function.

As far as we know, functional treatment has not been applied to ankle fractures which is why we started an investigation. This report only describes the orthoses used and the preliminary clinical impressions.

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Material and technique

Our purpose, in a number of operated ankle fractures with supination—outward rotation injuries stage II–IV (Lauge-Hansen, 1942), was to compare cases treated postoperatively with conventional lower leg plaster and cases treated with an orthosis allowing movements in the talocrural joint.

Classification of the fractures was made with the aid of Roentgen pictures and operative findings. Routine operative method was fixation of the fibular fracture with encircling wire/s. The fibula was secured against the tibia with Wiberg's staple/s and on the medial side pin/s or a screw have been used, or alternatively ligament suture (Cedell, 1967). Treatment of a possible posterior tibial fracture was individualized depending on size of fragment and degree of dislocation.

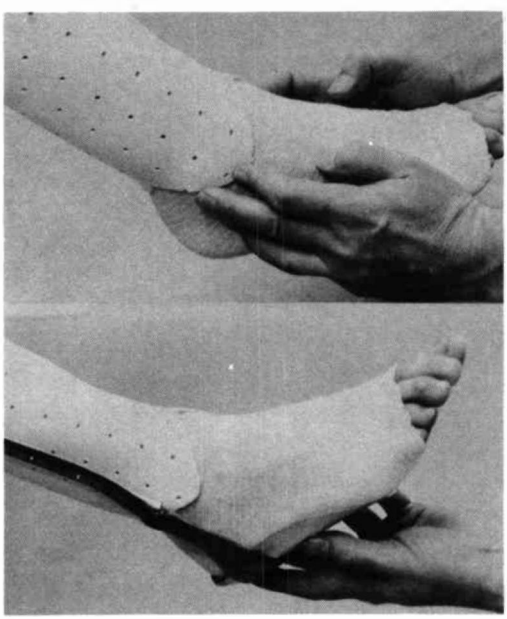

Fig. 1. Top, the Isoprene R plastic shell is carefully modelled around the malleoli. Bottom, metal hinges and footplate are attached.

Postoperatively the patient has been supplied with a split lower leg plaster. After a fortnight the plaster was removed and replaced with an irremovable orthosis permitting full dorsal and plantar flexion in the talocrural joint and full mobility in the knee and the toes including metatarsophalangeal joints.

Pronation and supination of the foot was almost impossible.

Two orthoses with the same functional principle have been tried out. For stability purposes the orthosis was originally made of plastic (Isoprene R. Johnson and Johnson) with metal hinges and foot plate, the foot plate being a semi-manufactured arch support. First of all a lower leg plastic shell was made and carefully modelled around the malleoli (Fig. 1, top). After the foot plate had been fixed to the metal hinges (Fig. 1, bottom) it was then fastened to the plastic shell and the foot with plastic slabs (Fig. 2).

The other type of orthosis was made from plaster using a prefabricated plastic hinge with a foot plate (Fig. 3). The manufacturing process is essentially the same as the first orthosis described. The mobility of the ankle can be seen in Figure 4.

The second orthosis is easier to make and is also much cheaper. The cost of the plastic orthosis is about 1600 Swedish crowns while the alternative costs only 300.

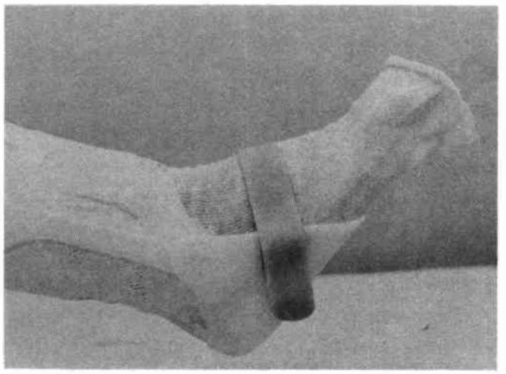

Fig. 3. Plaster shell orthosis with prefabricated plastic ankle with hinges for the talocrural joint.

The patients have been instructed and encouraged to move the ankle as much as possible. Clinical and Roentgenological checks have been made comparatively often and if required the orthosis has been adjusted or exchanged. After 6 (stage II–III) or 8 (stage IV) weeks, depending on the type of fracture, the orthosis was removed and the patient allowed

Fig. 2. Footplate and hinges are fixed around the foot with plastic slabs.

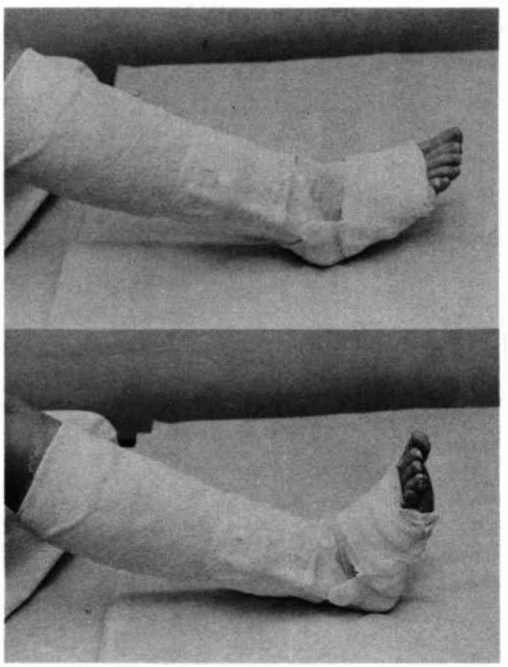

Fig. 4. The completed plaster shell orthosis showing the mobility of the talocrural joint.

full weight-bearing. The clinical and Roentgenological checks continued until at least 10 or 12 weeks, respectively, after the operation.

Results

So far 10 patients, 5 men and 5 women, have been treated. All patients have expressed their satisfaction. They have been easily taught to practise mobility and supervision by a physiotherapist has not been necessary. The mobility training has caused no or slight pain.

Owing to discomfort, mostly from dorsum pedis, the orthosis was in some cases exchanged or adjusted. In no case pressure sores appeared.

The wound healing has been uncomplicated and dislocation of the fractures has not occurred. Clinical results and Roentgen examinations have not given any reason to suspect pseudarthrosis. Based on long experience of the results of fixation using conventional lower leg plaster we have the firm clinical impression that patients using an orthosis have a faster course of rehabilitation.

Discussion

It appears comparatively safe to conclude that with the above mentioned operative method and orthoses certain ankle fractures can be allowed early mobility training of the talocrural joint without disadvantages in position and healing of the fracture/s. Presumably this treatment is advantageous.

It is quite likely that the same or similar treatment can be applied to other types of ankle fractures. However, it should probably not be used in elderly people where osteoporosis may diminish stability of the osteosynthesis. In these cases another operative technique can of course be used.

The orthoses described are relatively expensive and probably unnecessary stable. The reasons for the present constructions are firstly a wish to avoid a setback in the beginning of an investigation and secondly that the next planned step in the investigation is to be weight-bearing in the orthosis.

When further experience has been gained, treatment can probably be more individualized, for example by having a simpler orthosis, applying the orthosis immediately after operation or abandoning external fixation completely. The role which open reduction and osteosynthesis should play in the treatment of ankle fractures is not yet settled.

The investigation will continue and comparisons between the possible effects of different methods of treatment will be made with clinical, Roentgenological and clinical-physiological methods.

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