Management of Posttraumatic Swelling in Association with Conservative Treatment of Talo-Crural and Talo-Calcanear fractures

The relationship between fracture haematoma and closed functional stabilisation

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Abstract:

From June to August 2000, we studied the effect of closed functional stabilisation treatment on the development of posttraumatic swelling. 129 patients with non-displaced talo-crural and talo-calcanear fractures, selected for closed treatment, were randomised into three groups. The first group was treated by traditional Plaster of Paris immobilisation (PoP). In the second group the patients were treated with a similar PoP for the first five days, immediately followed by Soft Cast (3M Healthcare ™) /Combicast application (hereafter Combicast) for the rest of the treatment time. In the third group the Combicast technique was applied immediately on admission.

The effects of the three different treatment strategies on the posttraumatic swelling were measured following the modified method from Whitesides (13).

The tissue pressure was measured on admission, 72 hours after initial immobilisation and on days 7, 14 and 21. Tissue pressure measuring was expressed in mmHg. An increase of tissue pressure in the fractured area was recorded after 72 hours in groups one and two with the traditional PoP. In group one a decrease of the
tissue pressure could only be recorded after 14 days, which was remarkably later than we expected. In group two the tissue pressure started to decrease after application of Combicast on day 5. Instead of an increase we recorded a remarkable decrease of the posttraumatic swelling after 72 hours in group three following the application of Combicast at the start of the fracture treatment. Where in the other groups a relatively high tissue pressure was still measured after 7 days, in group three tissue pressure was back to normal again.

Introduction

As a result of violent forces, the posttraumatic swelling, following damage of bone and soft tissues, in addition to a disturbance of the arterial and venous circulation, lead to severe pain for the patient. It is obvious that an increase of the posttraumatic swelling during the first days, can cause a risk of further constriction of the circulation. With prolonged posttraumatic swelling in the fracture area, pain for the patient will also be prolonged, which results in involuntary immobilisation, eg. non-function with all its consequences. These complications are especially expressed in the conservative treatment with a traditional immobilisation.

In case of a prolonged swelling period the high tissue pressure and disturbance of the arterial and venous circulation can be a reason for delayed biological fracture healing, including other effects like complications with ischaemic disturbances and all its consequences.

As both closed and open repair of fractures are of equal importance, both are worthy of further development. Closed management of fractures and ligament lesions with Combicast techniques resulting in good patient outcome has been described in several papers. (2, 3, 4, 5, 6) The aim of our study was to examine the effects on the development of posttraumatic swelling of Combicast compared with traditional plaster cast
applications.

**Materials and Methods**

We observed the development of posttraumatic swelling in fractures in the talo-crural and talo-calcaneal area. Over a period of three months a total of 129 patients with non-displaced thalo-crural and thalo-calcaneal fractures were selected for closed treatment and for enrolment in this study. The study subjects were seen in the Ambulatory Trauma department of the Surgical Clinic, Clinical hospital Split, Croatia. The patients, aged from 30–40 years, were randomised into three groups with 43 patients each. All patients received their primary cast within three hours after the time of their injury.

The first group (A) was treated with a PoP cast on admission.

The second group (B) was treated primarily with PoP and secondary after five days by a Combicast application.

The third group (C) was treated with Combicast from the beginning.

The Combicast method consist of an unpadded circular flexible casting material, with a small rigid Scotchcast splint built in. This rigid splint is applied in such a way, that stability is applied to the site of the fracture only and with controlled motion in the surrounding areas. The circular Soft Cast is flexible but does not have any stretch. This type of cast adapts itself to the changing profile of the extremity during muscle movements resulting in dynamic pressure to the soft tissue. The patients were examined in the ambulatory department after 72 hours, and on days 7, 14 and 21. All patients received the same instructions, which are normally given with a cast immobilisation. Tissue pressure was measured according the technique of Whitesides et al (13). Values were expressed in mmHg. According to Whitesides the tissue pressure was compared with the diastole pressure. With this interpretation each
increase of pressure observed is a reflex of tissue pressure increase.

The measurements were done on the ventral part of the talo-crural and talo-naviculare region without penetration of articular space. We performed the measurements for each patient on the same hour of the day (about 01.00 PM) and only one measurement per time: 72h, 7, 14, and 21 days after initial immobilisation. A small window was made in the cast as a point of entry for the measurement.

The statistical analysis was done by Student T test.

**Results**

An increase in tissue pressure with an average of 7 mmHg was recorded in group A, 72 hours after the immobilisation had been applied. This pressure value remained the same after 7 and 14 days. In this group a decrease of 2,5 mmHg was measured on day 21. A similar increase of 7 mmHg after 72 hours was recorded in group B. However, when Combicast was applied on day 5, a decrease of the tissue pressure to 2,0 mmHg on day 7 and to 1,0 mmHg on day 14 and 0 mmHg day 21 was recorded.

72 hours after the immobilisation the average decrease of the tissue pressure of group C was 2 mmHg and during all following examination days only normal tissue pressure was recorded. The results are shown in chart 1.

The remarkable increase in tissue pressure of groups A and B followed by the change in group B and finally the remarkable drop in tissue pressure in group C were all confirmed by the Student T test. The difference in tissue pressure between group A and C (p<0.0001) was statistically significant.

**Discussion**

Numerous papers have already reported the positive outcome of closed fracture treatment with an early functional stabilisation method using Combicast. (4,7,8,9,10,11).
The authors reported advantages with regard to biological fracture healing, a reduced risk for re-dislocation, prevention of ischaemia, and less rehabilitation.

Several authors however hesitate to use the circular Combicast technique in the primary phase, fearing an increase in swelling and the risk of ischaemia with the circular flexible cast. This study showed the opposite: increase of swelling in a traditional plaster cast and a fast reduction of swelling in the Softcast/Combicast method. The clinical experiences indicate that a fast reduction of swelling leads to a reduction in pain and thus to the possibility of early function.

We expect that with this improved swelling management, the risk of complications in the closed fracture treatment can be further reduced.

Although clinical experience already showed positive results, further research is necessary to confirm the influences of this method on the final outcome for the patients.

References:


Chart 1

Results tissue pressure measurements