

## Comparison of three different treatments for ruptured lateral ankle ligaments

Flemming Møller-Larsen<sup>1</sup>, Jon Odd Wethelund<sup>1</sup>, Anne Grethe Jurik<sup>2</sup>, Anselmo de Carvalho<sup>2</sup> and Ulf Lucht<sup>1</sup>

Two hundred consecutive patients with arthrographically verified rupture of one or both of the lateral ankle ligaments were allocated to treatment with either an operation and a walking cast, walking cast alone, or strapping with an inelastic tape – all for 5 weeks.

Eighty-seven percent of the patients attended follow-up after 1 year. Only 5 percent in each treatment group were unsatisfied with the result. There were no differences between the treatment groups in ankle stability or symptoms during different activities, regardless of rupture of the anterior talofibular ligament alone or combined with rupture of the calcaneofibular ligament.

However, the patients treated with tape had fewer symptoms, fewer complaints when running, and more ankles recovered to the preinjury state. Therefore, in lateral ankle ligament rupture, tape bandages seem preferable.

The best method for treating ruptured lateral ankle ligaments is still a matter of debate. The following three methods are widely used: 1) suture and plaster immobilization, 2) plaster immobilization only, and 3) mobilization with elastic or inelastic support.

We have compared these methods prospectively.

### Patients and methods

During the period November 1983 to August 1985, 200 consecutive patients with arthrographically verified rupture of at least one of the lateral ankle ligaments gave their informed consent to be randomly allocated to Group 1 (operations followed by plaster cast), Group 2 (plaster cast), and Group 3 (tape bandage).

The 200 patients were selected among all the patients who attended the emergency unit with an acute ankle sprain. If the clinical examination

showed signs of instability, a stress radiograph (talar tilt) was performed without anesthesia. If the instability was confirmed (talar tilt difference  $3 = 3$  millimeters or talar tilt  $3 = 6$  degrees), an arthrography (Percy 1969) was carried out. In all, 276 arthrographies were performed, and 268 of them showed rupture of the lateral ankle ligaments.

Patients with open epiphyses and patients above 50 years of age were excluded from the study, as were patients with fractures and ligament injuries other than the lateral ligaments. However, patients with avulsion fractures as part of the ligament injury were included. Sixty-eight patients refused to participate in the study and were offered the ordinary treatment of the department, i.e., operation and plaster cast. Twenty-five patients failed to attend the 1-year follow-up.

There were 175 patients (67 females and 108 males) in the final series. The median age in the treatment groups were 25, 23, and 23 years, respectively (range 15–47 years). All had rupture of the anterior talofibular ligament, isolated in 72 patients and combined with rupture of the calcaneofibular ligament in 103 patients. The distribution according to type of ligament injury was uniform in the treatment groups. None of the patients had a rupture of the posterior talofibular

Departments of Orthopedics<sup>1</sup> and Diagnostic Radiology<sup>2</sup>, Århus Municipal Hospital, Denmark

Correspondence: Flemming Møller-Larsen, Vardøgade 9, DK-8200 Århus N, Denmark

ligament or an isolated rupture of the calcaneofibular ligament.

Group 1: The operation was carried out on the same or on the following day in a bloodless field under general or epidural anesthesia. The ligaments and the capsule were sutured with Dexon 0. The knots were tied with the foot in the neutral position. A below-knee plaster cast was applied, and the patient was discharged from the hospital the next day, weight bearing not being allowed. After 10 days, the cast and the stitches were removed, and a below-knee weight-bearing plaster cast was applied for another 5 weeks.

Groups 2 and 3: The patients were sent home with instructions to rest with the leg elevated for 5 days. Then, a below-the-knee plaster cast or a tape bandage was applied, and weight bearing was allowed. The tape was a 1.5 inch wide inelastic adhesive tape (Curity®) applied as three strips on the leg around the heel pad interdigitating with three strips on the foot around the heel.

In all the groups the plaster cast and the tapes were removed 5 weeks after the injury.

The patients were interviewed according to a questionnaire both at the time of injury and at the 1-year follow-up, when the mechanical stability of the ankle was evaluated both clinically and radiographically (talar tilt). The patients were asked to categorize the result of the treatment as good, satisfactory, or unsatisfactory, and possible symptoms during different activities were recorded.

**Statistical analysis.** The Kruskal-Wallis test was used for evaluating analogue data, i.e., age and talar tilt; and the chi-square test was used for binomial distributed data, i.e., symptoms. The significance level was chosen at 5 percent.

## Results

In Group 1, it was seen at operation that arthrography detected the combined rupture of the anterior talofibular ligament, and the calcaneofibular ligament better than the isolated rupture of the anterior talofibular ligament (Table 1).

Of the 105 patients who were active in sports before the injury, 93 had returned to sports. Although there was a tendency that patients treated with tape started to work earlier than patients in the other two treatment groups, the difference was not significant. In all three groups the treatment resulted in reduction of talar tilt, with no difference between the groups (Table 2).

Table 1. Number of ruptured ankle ligaments detected by arthrography and by operation in the operated on group

|              | Ligaments ruptured   |  |
|--------------|----------------------|--|
|              | Anterior talofibular | Anterior talofibular + calcaneofibular |
| Arthrography | 21                   | 34                                     |
| Operation    | 16 <sup>a</sup>      | 39 <sup>b</sup>                        |

<sup>a</sup> Including 1 who by arthrography had ruptures of both ligaments.  
<sup>b</sup> Including 5 with partial rupture of the calcaneofibular ligament, but who according to arthrography had rupture of only the anterior talofibular ligament.

Table 2. Talar tilt after ruptured ankle ligaments

| Treatment | Number | At injury <sup>a</sup> | At follow-up <sup>a</sup> |
|-----------|--------|------------------------|---------------------------|
| Operation | 55     | 15 (5-38)              | 5 (0-18)                  |
| Plaster   | 55     | 13 (0-36)              | 5 (0-18)                  |
| Tape      | 65     | 17 (0-33)              | 5 (0-18)                  |

<sup>a</sup> Degrees talar tilt, median (range).

Table 3. Patients with symptoms during different activities in relation to ankle ligaments ruptured

| Treatment | Ligaments ruptured | Number | Number of patients with symptoms |   |   |   |    |    |
|-----------|--------------------|--------|----------------------------------|---|---|---|----|----|
|           |                    |        | A                                | B | C | D | E  | F  |
| Operation | a                  | 21     | 0                                | 2 | 4 | 4 | 5  | 7  |
|           | a+c                | 34     | 1                                | 2 | 2 | 4 | 5  | 11 |
| Plaster   | a                  | 26     | 0                                | 4 | 4 | 6 | 5  | 3  |
|           | a+c                | 29     | 0                                | 4 | 6 | 4 | 10 | 7  |
| Tape      | a                  | 25     | 1                                | 3 | 2 | 4 | 4  | 3  |
|           | a+c                | 40     | 0                                | 1 | 3 | 5 | 2  | 2  |

<sup>a</sup> a anterior talofibular; c calcaneofibular.  
A Walking on even ground.  
B Walking on rough ground.  
C Running on even ground.  
D Swelling during activity.  
E Running on rough ground  $P < 0.05$ .  
F Stiffness during activity  $P < 0.025$ .

Table 4. Ankle state at follow-up and patients' assessment

| Treatment | Ligaments ruptured <sup>a</sup> | n  | Outcome |    |   |    |   |   |  |
|-----------|---------------------------------|----|---------|----|---|----|---|---|--|
|           |                                 |    | A       | B  | C | D  |   |   |  |
|           |                                 |    |         |    |   | g  | f | p |  |
| Operation | a                               | 21 | 10      | 7  | 6 | 17 | 2 | 2 |  |
|           | a+c                             | 34 | 21      | 10 | 8 | 30 | 4 | 0 |  |
| Plaster   | a                               | 26 | 16      | 14 | 6 | 20 | 5 | 1 |  |
|           | a+c                             | 29 | 20      | 13 | 7 | 24 | 4 | 1 |  |
| Tape      | a                               | 25 | 19      | 18 | 4 | 22 | 1 | 2 |  |
|           | a+c                             | 40 | 34      | 32 | 5 | 33 | 5 | 2 |  |

<sup>a</sup> a anterior talofibular; c calcaneofibular.  
A Restored to preinjury state  $P < 0.05$ .  
B A symptomatic ankles  $P < 0.0005$ .  
C Subjective instability.  
D Patients' assessment: g good; s satisfactory; p unsatisfactory.

Patients treated with tape had fewer complaints on running and reported less stiffness during activity (Table 3). In addition, more patients treated with tape found their ankles asymptomatic and restored to the preinjury state than did patients who were treated with an operation or a plaster cast (Table 4). A mean of 83 percent of the patients scored the result as good in each treatment group and only 5 percent as unsatisfactory. In this respect, there were no differences between the groups.

## Discussion

In our study the frequency of patients with rupture of both the ATFL and the CFL was nearly twice of that seen in most other studies (Broström 1966, Prins 1978, Niederman et al. 1981, van Moppes and van den Hoogenband 1982). This may be due to our selection of patients for arthrography—only those with clinically unstable ankles; many patients with isolated ligament rupture were thus excluded from the study.

The intention of using the simple tape bandage was not to immobilize the ankle as with the Coumann bandage (van Moppes and van den Hoogenband 1982), but to stimulate the cutaneous reflexes. According to Freeman and Wyke (1967), these contribute to the postural reflexes that originate in the ankle joint and mediate an active stabilization of the joint through the leg muscles.

Freeman (1965) suggested in a study with a rather few patients that mobilization and strapping was the best treatment. Broström (1966) found fewer complaints of instability in the op-

erated on group, but recommended strapping as a routine method because of good results in 80 percent. Moreover, he found it possible to explore and suture the ligaments after several years if instability persisted. Prins (1978) advocated operation if both ligaments were ruptured. In contrast, Niederman et al. (1981) found no difference between the results of operation and plaster cast or plaster cast alone, regardless of rupture of isolated or combined ruptures. Unfortunately, Prins (1978) only used strapping for the group with rupture of the anterior ligament, whereas Niederman et al. (1981) used strapping for the patients who clinically had no rupture of the lateral ankle ligaments. Our results confirm van Moppes and van den Hoogenband (1982), who examined all three treatments in a study comparable to ours and found the results excellent regardless of treatment and the type of lateral ligament rupture.

We are not able to give any clear explanation of the difference between our results and those obtained by Broström (1966) and Prins (1978), but it may be caused by slight differences in treatment and observation period. Thus, Broström (1966) used plaster cast or strapping for 3 weeks, and elastic support for the strapped group. Our patients were treated for 5 weeks, and we used an inelastic support in the strapped group. Three weeks are presumably too short for the cutaneous proprioceptive reflexes to be sufficiently established to mediate an active stabilization of the ankle joint. On the other hand, 5 weeks of immobilization may produce atrophy of the connective tissue. Prins (1978) made the follow-up after half a year, whereas we made it after 1 year.

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