Diagnostic guidelines for chronic ankle pain. From loose bodies to joint venture
Verhagen, R.A.W.

Citation for published version (APA):

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Chapter 2

Long-term follow-up of inversion trauma of the ankle

R.A.W. Verhagen, G. de Keizer, C.N. van Dijk

Arch Orthop Trauma Surg 1995;114(2):92-6
Abstract
In our institution lateral ankle ligament injuries are classified into three grades according to the extent of instability found on physical examination and/or stress X-rays. Grade I and II lesions are taped, while treatment of grade III lesions consists of operative reconstruction of the ruptured ligaments. In 1989 we published the results of 1012 patients after 9 months' follow-up. About 30% had residual symptoms. The nature and frequency of these symptoms were equally divided among the three groups. To examine the long-term follow-up results, we conducted a retrospective study on the same group of patients after 6.5 years. Although ankle ligament injuries are still considered rather innocent lesions, we conclude that even after 6.5 years patients can still have residual complaints (pain, fear of giving-way, actual instability, swelling), which interfere with daily living and/or sport activities. The results deteriorated over time. This was especially noticeable in the grade II group, where the percentage of poor and fair results doubled. The overall percentage of residual complaints was 39%. We concluded that there is no such thing as “a simple sprain”.
Introduction
Lesions of the lateral ligaments of the ankle joint are among the most common diagnostic findings in trauma surgery and represent the most common sports injury. It is known that about 20% of the patients who are treated at the emergency department for a sports-related injury have an acute sprain of the ankle.¹ For the Netherlands this means that about 300,000 patients each year suffer a sports-related ankle sprain. In soccer 30% of all injuries of the lower extremities are of the ankle, and of these, 75% involve the lateral ligaments.² The aim of treatment is complete recovery with no residual complaints. Possible methods of treatment include plaster immobilization, operative treatment or functional management. In a recent survey concerning treatment of acute tears of the lateral ligament complex of the ankle, Kannus and Renstrom compared 12 prospective studies.¹ They concluded that functional treatment should be considered the method of choice, as it provides the quickest recovery of the full range of motion and facilitates return to work and physical activity. Furthermore, functional treatment of lateral ankle ligament injury can mean economic savings when compared with operative treatment. In their opinion, surgery can sometimes be appropriate if the injury is severe and recurrent. No conclusions could be drawn with regard to the later development of osteoarthritis of the ankle joint, due to lack of subsequent follow-up studies. When treatment results of isolated ruptures and multiple ligament lesions were compared, no significant difference could be found.³
In 1989 in this journal we presented the results of our 9 months’ follow-up study on the treatment of acute lateral ankle ligament lesions.⁴ At that time we could not demonstrate any difference between grade I, II and III lesions in 817 patients (Table 3). To examine the long-term follow-up results of inversion trauma of the ankle, we conducted a retrospective study with the same group of patients with a mean follow-up of 6.5 years.

Materials and Methods
All patients with a sprained ankle were diagnosed and treated according to the protocol in our hospital. The diagnosis ‘sprained ankle’ was made on the basis of history (pain following inversion trauma) and physical examination (swelling, haematoma and/or anterolateral instability). Fractures were excluded by plain X-rays. The sprained ankles were classified into the traditional three grades, depending on the extent of instability found on physical examination and/or stress X-ray.⁴ In cases where there was some doubt about the grade, stress X-rays were taken under local infiltration anaesthesia. The classification was as follows: ankle sprain grade I – no demonstrable sign of instability at physical examination (treatment consisted of compression with bandage); grade II – incomplete instability present at physical examination and/or talar tilt < 15° and/or anterior drawer < 5
Long-term follow-up of inversion trauma of the ankle

mm on stress X-ray investigation (treatment consisted of partial immobilization by means of tape and physiotherapy); and sprain grade III – joint completely unstable at physical examination and/or talar tilt > 15° and/or anterior drawer > 5 mm on stress X-ray investigation (treatment consisted of primary surgical repair of the ruptured ligaments).

After-care consisted of 3 weeks in a walking plaster followed by 3 weeks of partial immobilization, tape, and physiotherapy.

As had been done in the first study after 9 months, data on the residual symptoms and degree of handicap were obtained by means of a questionnaire. For various reasons 67 patients could not be traced.

Results

Of the 750 questionnaires sent out, 577 were returned and were found to be suitable for analysis (Table 1). The overall response rate was 77%. There were 251 female and 326 male patients. The age distribution in relation to the grade of sprain is listed in Table 2.

Table 1  Distribution of questionnaires returned

<table>
<thead>
<tr>
<th>Follow-up</th>
<th>0 months n (%)</th>
<th>9 months n (%)</th>
<th>6.5 years n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>617 (61%)</td>
<td>491 (60%)</td>
<td>398 (69%)</td>
</tr>
<tr>
<td>Grade II</td>
<td>319 (32%)</td>
<td>263 (32%)</td>
<td>128 (22%)</td>
</tr>
<tr>
<td>Grade III</td>
<td>76 (7%)</td>
<td>63 (8%)</td>
<td>51 (9%)</td>
</tr>
<tr>
<td>Total</td>
<td>1012 (100%)</td>
<td>817 (100%)</td>
<td>577 (100%)</td>
</tr>
</tbody>
</table>

Table 2  Age distribution in relationship to grade of sprain (6.5-year follow-up)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>n &lt; 20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>&gt; 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>398</td>
<td>140</td>
<td>96</td>
<td>76</td>
<td>55</td>
<td>16</td>
</tr>
<tr>
<td>Grade II</td>
<td>128</td>
<td>41</td>
<td>43</td>
<td>30</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Grade III</td>
<td>51</td>
<td>27</td>
<td>13</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3  Residual symptoms 9 months and 6.5 years post-injury

<table>
<thead>
<tr>
<th></th>
<th>Pain</th>
<th>Fear of instability</th>
<th>Swelling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9 months n (%)</td>
<td>6.5 years n (%)</td>
<td>9 months n (%)</td>
</tr>
<tr>
<td>Follow-up:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade I</td>
<td>137 (28%)</td>
<td>67 (17%)</td>
<td>157 (32%)</td>
</tr>
<tr>
<td>Grade II</td>
<td>71 (27%)</td>
<td>28 (22%)</td>
<td>74 (28%)</td>
</tr>
<tr>
<td>Grade III</td>
<td>22 (35%)</td>
<td>9 (18%)</td>
<td>17 (27%)</td>
</tr>
</tbody>
</table>
Stress X-rays under local infiltration anaesthesia were done in 113 patients. They were performed only if there was doubt if the sprain was grade II or grade III. Of the 113 patients, 38 were diagnosed with grade III lesions, 44 with grade II lesions and 26 with grade I lesions. At the 6.5-year follow-up there was a decrease in pain level throughout all groups. This was most noticeable in grade III lesions. There was a slight increase in “fear of giving-way”. This increase was most prominent in the grade II group, where an increase was seen from 28% after 9 months to 48% (Table 3).

At 6.5 years, due to residual symptoms, 6% of respondents were not still not able to carry out their occupational activities at all, while 15% could only continue their original occupation with some degree of handicap, for example, with the help of an elastic bandage or other support.

In our group, 424 of the 577 respondents played sports. Because of residual problems in the injured ankle, 23 patients (5%) had to change their sporting activity and 16 patients (4%) had to stop altogether.

We also included a question on recurrent injuries as an indication of actual instability. The numbers are lower than those for functional instability. The highest percentage of patients with recurrent injury was seen in the grade II group (Table 4). In 10 patients the instability was such that a secondary stabilizing procedure had to be performed.

The overall subjective judgement is shown in Table 5. The overall percentage of residual symptoms was 39%.

<table>
<thead>
<tr>
<th>Table 4 Recurrent injury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>n</th>
<th>Regularly</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
</tr>
<tr>
<td>Grade I</td>
<td>398</td>
<td>183 (46%)</td>
<td>215 (54%)</td>
</tr>
<tr>
<td>Grade II</td>
<td>128</td>
<td>69 (54%)</td>
<td>59 (46%)</td>
</tr>
<tr>
<td>Grade III</td>
<td>51</td>
<td>20 (39%)</td>
<td>31 (61%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5 The overall subjective judgement of the treatment results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Follow-up:</th>
<th>Good (%)</th>
<th>Fair (%)</th>
<th>Poor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9 months</td>
<td>6.5 years</td>
<td>9 months</td>
</tr>
<tr>
<td>Grade I</td>
<td>85%</td>
<td>75%</td>
<td>12%</td>
</tr>
<tr>
<td>Grade II</td>
<td>85%</td>
<td>62%</td>
<td>13%</td>
</tr>
<tr>
<td>Grade III</td>
<td>81%</td>
<td>72%</td>
<td>16%</td>
</tr>
</tbody>
</table>
Discussion

The most striking result of our previously published study (9 months post-injury), was that where the frequency and nature of the residual symptoms and the extent of the handicap are concerned, no differences emerged between the three groups. For this reason we concluded that the prognosis following a simple inversion injury without visible signs of instability was the same as that for a completely unstable ankle which had been treated by primary ligament suture.4

In this 6.5 years post-injury study it has become clear that there actually are some differences. Although after 9 months the residual symptoms of pain and functional instability were the same in each grade, after 6.5 years, pain had diminished in all groups, while functional instability had increased. The latter was most prominent in the grade II group. This was also the case for actual instability with recurrent injury. The overall judgement of the results given by the patients themselves shifted with time to a lower appreciation level, irrespective of the grade.

In the literature an enormous variation in the percentage of residual complaints is encountered (Tables 6-8). The highest frequency of residual complaints occurs after plaster treatment of 6 weeks or more. The average percentage is 40% - 50% (Table 6).

Table 6  Residual complaints after lateral ankle ligament rupture (plaster treatment > 5 weeks)

<table>
<thead>
<tr>
<th>Study</th>
<th>Yr of publication</th>
<th>Prospective (P)</th>
<th>Retrospective (R)</th>
<th>Number of patients</th>
<th>Follow-up (years)</th>
<th>Residual complaints (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prins⁶</td>
<td>1978</td>
<td>P</td>
<td>59</td>
<td>0.5</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Klein⁷</td>
<td>1988</td>
<td>P</td>
<td>30</td>
<td>0.5</td>
<td>30</td>
<td></td>
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<tr>
<td>Linhart⁸</td>
<td>1990</td>
<td>P</td>
<td>28</td>
<td>0.5</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Hedges⁹</td>
<td>1980</td>
<td>P</td>
<td>14</td>
<td>0.8</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>van den Hoogenband¹⁰</td>
<td>1987</td>
<td>P</td>
<td>50</td>
<td>1.0</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Möller-Larsen¹¹</td>
<td>1988</td>
<td>P</td>
<td>55</td>
<td>1.0</td>
<td>78</td>
<td></td>
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<tr>
<td>Niedermann¹²</td>
<td>1981</td>
<td>P</td>
<td>62</td>
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<td>34</td>
<td></td>
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<tr>
<td>Speeckaert¹³</td>
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<td>101</td>
<td>1.0</td>
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<td></td>
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<tr>
<td>Freeman⁵</td>
<td>1965</td>
<td>P</td>
<td>18</td>
<td>1.0</td>
<td>44</td>
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</tr>
<tr>
<td>Grönmark¹⁴</td>
<td>1980</td>
<td>P</td>
<td>22</td>
<td>1.5</td>
<td>33</td>
<td></td>
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<tr>
<td>Tonino¹⁵</td>
<td>1973</td>
<td>R</td>
<td>22</td>
<td>1.5</td>
<td>32</td>
<td></td>
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<tr>
<td>Ruth¹⁶</td>
<td>1961</td>
<td>R</td>
<td>72</td>
<td>2.0</td>
<td>58</td>
<td></td>
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<tr>
<td>Zwipp¹⁷</td>
<td>1991</td>
<td>P</td>
<td>48</td>
<td>2.0</td>
<td>24</td>
<td></td>
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<tr>
<td>Homminga¹⁸</td>
<td>1986</td>
<td>R</td>
<td>52</td>
<td>3.1</td>
<td>44</td>
<td></td>
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<tr>
<td>van Beek¹⁹</td>
<td>1985</td>
<td>P</td>
<td>38</td>
<td>3.2</td>
<td>89</td>
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<tr>
<td>Niethard²⁰</td>
<td>1974</td>
<td>R</td>
<td>20</td>
<td>3.5</td>
<td>55</td>
<td></td>
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<tr>
<td>Hansen²¹</td>
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<td>R</td>
<td>144</td>
<td>4.2</td>
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<tr>
<td>Staples²²</td>
<td>1972</td>
<td>R</td>
<td>68</td>
<td>10.0</td>
<td>41</td>
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</tbody>
</table>

Operative treatment followed by functional after-treatment gives an average percentage of residual symptoms of 30% (Table 7). Functional treatment gives rise to a comparable number of residual complaints (Table 8).

In athletes, the percentage of residual complaints is higher than in patients who indulge in
Table 7  Residual complaints after lateral ankle ligament rupture (operative treatment + functional aftercare or plaster 2–5 weeks)

<table>
<thead>
<tr>
<th>Study</th>
<th>Yr of publication</th>
<th>Prospective (P)</th>
<th>Retrospective (R)</th>
<th>Number of patients</th>
<th>Follow-up (years)</th>
<th>Residual complaints (%)</th>
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</thead>
<tbody>
<tr>
<td>Prins</td>
<td>1978</td>
<td>P</td>
<td></td>
<td>45</td>
<td>0.5</td>
<td>7</td>
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<tr>
<td>Schaap</td>
<td>1989</td>
<td>R</td>
<td></td>
<td>63</td>
<td>0.8</td>
<td>35</td>
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<tr>
<td>Holzach</td>
<td>1984</td>
<td>R</td>
<td></td>
<td>37</td>
<td>1.0</td>
<td>35</td>
</tr>
<tr>
<td>Brand</td>
<td>1977</td>
<td>R</td>
<td></td>
<td>52</td>
<td>0.9</td>
<td>15</td>
</tr>
<tr>
<td>van der Ent</td>
<td>1984</td>
<td>P</td>
<td></td>
<td>157</td>
<td>1.0</td>
<td>9</td>
</tr>
<tr>
<td>Evans</td>
<td>1984</td>
<td>P</td>
<td></td>
<td>50</td>
<td>2.0</td>
<td>58</td>
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<tr>
<td>Korkala</td>
<td>1986</td>
<td>P</td>
<td></td>
<td>34</td>
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<td>12</td>
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<tr>
<td>Lohrer</td>
<td>1990</td>
<td>R</td>
<td></td>
<td>90</td>
<td>2.5</td>
<td>45</td>
</tr>
<tr>
<td>van Beek</td>
<td>1985</td>
<td>P</td>
<td></td>
<td>31</td>
<td>3.2</td>
<td>50</td>
</tr>
<tr>
<td>Broström</td>
<td>1966</td>
<td>P</td>
<td></td>
<td>86</td>
<td>4.0</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 8  Residual complaints after lateral ankle ligament rupture (functional treatment)

<table>
<thead>
<tr>
<th>Study</th>
<th>Yr of publication</th>
<th>Prospective (P)</th>
<th>Retrospective (R)</th>
<th>Number of patients</th>
<th>Follow-up (years)</th>
<th>Residual complaints (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prins</td>
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<td>P</td>
<td></td>
<td>41</td>
<td>0.5</td>
<td>32</td>
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<tr>
<td>Hedges</td>
<td>1980</td>
<td>P</td>
<td></td>
<td>17</td>
<td>0.8</td>
<td>53</td>
</tr>
<tr>
<td>Schaap</td>
<td>1989</td>
<td>R</td>
<td></td>
<td>263</td>
<td>0.8</td>
<td>30</td>
</tr>
<tr>
<td>Linde</td>
<td>1986</td>
<td>P</td>
<td></td>
<td>137</td>
<td>1.0</td>
<td>18</td>
</tr>
<tr>
<td>Freeman</td>
<td>1965</td>
<td>P</td>
<td></td>
<td>12</td>
<td>1.0</td>
<td>42</td>
</tr>
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<td>Möller-Larsen</td>
<td>1988</td>
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<td></td>
<td>50</td>
<td>1.0</td>
<td>22</td>
</tr>
<tr>
<td>Grönmark</td>
<td>1980</td>
<td>P</td>
<td></td>
<td>23</td>
<td>1.5</td>
<td>23</td>
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<tr>
<td>Cetti</td>
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<td>51</td>
<td>1.5</td>
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<td>Korkala</td>
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<td>36</td>
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<tr>
<td>Zwipp</td>
<td>1991</td>
<td>P</td>
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<td>50</td>
<td>2.0</td>
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<tr>
<td>Bosien</td>
<td>1955</td>
<td>R</td>
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<td>133</td>
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<tr>
<td>Brink</td>
<td>1985</td>
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<td>176</td>
<td>2.5</td>
<td>17</td>
</tr>
<tr>
<td>Andersen</td>
<td>1987</td>
<td>P</td>
<td></td>
<td>100</td>
<td>3.4</td>
<td>35</td>
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<tr>
<td>Bröstrom</td>
<td>1966</td>
<td>P</td>
<td></td>
<td>87</td>
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</tr>
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</table>

less strenuous activities. Apart from mechanical instability, residual signs and symptoms in most cases consisted of functional instability, intermittent swelling, stiffness and/or pain. The term ‘functional instability’ was introduced by Freeman. He suggested that the initial trauma caused a defect in the proprioceptive mechanism.5 Many other authors mention functional instability as a cause of residual complaints. Apart from a defect in the proprioceptive system, a satisfactory explanation of this has yet to be given. Intermittent swelling is often mentioned as a cause of residual complaints. An explanation for this swelling – apart from recurrent sprains – cannot be found in the literature. Pain is an important residual symptom. The location of pain is usually not given: most authors speak of ‘a painful ankle’.

In our own experience, the pain is often located on the medial side of the ankle joint. When a thorough physical examination of the ankle joint is performed, many patients complain of pain on palpation of the anterior aspect of the medial malleolar region in the acute situation as well as in the chronic situation. Ankle ligament injuries are still considered rather innocent
lesions, and it is thought that patients can return to their pre-injury level of activity without lasting handicap. The results of this study show that a sprained ankle, irrespective of grade, interfered with the physical activities of 9% of the patients, and 6% were not able to carry out their previous occupation at the same level of activity.

The aim of this study was not to compare the results of conservative treatment and operative treatment in a well-defined group of patients, but to determine the residual complaints in the long-term.

Our results indicate that an operatively treated grade III lesion has about the same prognosis as a conservatively treated grade I lesion, while a conservatively treated grade II lesion is associated with a higher percentage of residual complaints.

Our results indicate that there is no such thing as “a simple sprain”. Future research should focus on the cause of prevention and treatment of these residual complaints.
References


Long-term follow-up of inversion trauma of the ankle