Treatment for acute tears of the lateral ligaments of the ankle. Operation, cast, or early controlled mobilization

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Treatment for Acute Tears of the Lateral Ligaments of the Ankle

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It has been estimated that there is about one inversion injury of the ankle per 10,000 people each day9,55-66, or approximately 5,000 injuries in the United Kingdom and 23,000 injuries in the United States each day. Patients who have a sprain of the ankle constitute 7 to 10 per cent of those who are examined at the emergency departments of the hospitals in Scandinavia27, Jackson et al.39 found this to be the most common injury at the United States Military Academy, West Point, with one-third of the cadets spraining an ankle during their four years there.

A sprained ankle is the most common injury in sports27,30,50-55. In a prospective study in Gothenburg, Sweden, Axelsson et al.4 found that 18 per cent of the patients who were treated at the emergency ward of a central hospital for a sports-related injury had an acute sprain of the ankle. In similar studies in Finland69 and Norway57, acute sprains of the ankle represented 21 and 16 per cent, respectively, of all sports-related injuries.

Sprains of the ankle occur in many sports. Garrick27 noted that injuries to the ankle accounted for 45 per cent of injuries occurring during basketball and for 31 per cent of those occurring during soccer. Sandelin69 observed that 29 per cent of all injuries of the lower extremities in soccer were in the ankle, and that, of these, 75 per cent involved the lateral ligamentous structures.

The lateral ligament complex of the ankle comprises three major ligaments: the anterior talofibular, the calcaneofibular, and the posterior talofibular. The anterior talofibular ligament runs almost parallel to the axis of the foot when the foot is in the neutral position, but when the foot is in plantar flexion, this ligament assumes a course parallel to the axis of the leg, thereby functioning as a collateral ligament5,6. As most sprains occur with the foot in plantar flexion, this ligament is the one that is injured most frequently in inversion sprains.

According to studies by Broström10 and Linstrand53, approximately two-thirds of sprains of the ankle are isolated injuries to the anterior talofibular ligament. If the inversion trauma is more severe, the calcaneofibular ligament is also involved. Broström observed that combined rupture of the talofibular and calcaneofibular ligaments occurred in 20 per cent of his patients and that the calcaneofibular ligament was never ruptured alone.

Traditionally, in clinical practice, sprains of the ankle have been classified as grade I (mild), II (moderate), or III (severe)5,6,14,20,50. A grade-I injury involves stretch of the ligament without macroscopic tearing, little swelling or tenderness, slight or no functional loss, and no mechanical instability of the joint. A grade-II injury is a partial macroscopic tear of the ligament with moderate pain, swelling, and tenderness over the involved structures. There is some loss of motion and mild or moderate instability of the joint. In a grade-III injury, there is complete rupture of the ligament with severe swelling, hemorrhage, and tenderness. There is loss of function and considerably abnormal motion and instability of the joint.

Once the diagnosis has been made clinically and confirmed by stress radiographs or arthrography, or both, a treatment regimen must be decided on. Almost all authors have agreed that patients who have a grade-I or grade-II injury recover quickly with non-operative management2,6,14,20,50 and that the prognosis is, almost without exception, excellent or good5,6,9,19,20,34,39,50,55,61,70. The treatment program, usually called functional treatment, includes three phases. Immediately after the injury, rest, ice (cold), compression, and elevation (RICE) are used. Then a short period of immobilization and protection with supportive bandaging, taping, or bracing is utilized to control pain and swelling. Finally, early active range-of-motion exercises are started, followed by weight-bearing, proprioceptive training with a tilt-board, and strengthening exercises for the peroneus muscle. Jackson et al.29 found that in cadets who followed this type of regimen, the duration of disability was eight days for a grade-I injury and fifteen days for a grade-II injury.

The treatment of grade-II sprains of the lateral ligament complex is more controversial. Many uncontrolled, non-randomized studies have suggested that primary repair is the method of choice, since most patients who had operative
treatment seemed to have a mechanically stable ankle and satisfactory subjective results. However, similar results have been reported after conservative treatment.

The cost of operative treatment is far more than that of conservative treatment. For example, in 1980, the average cost of one acute sports-related injury in Finland was $350 (United States dollars) if the patient was treated at the casualty department but was thirteen times more ($4,500 [United States dollars]) if a patient who had the same injury was treated as an in-patient.

The importance of randomized clinical trials has been emphasized in the recent orthopaedic literature. In this review, we examined twelve prospective randomized studies of the treatment of acute grade-III ruptures of the lateral ligaments of the ankle.

**Prospective Randomized Studies**

A review of the English-language literature revealed twelve prospective randomized studies that had been carried out for the purpose of identification of the proper treatment of acute grade-III (complete) tears of the lateral ligaments of the ankle.

**Age and Activity**

The mean or median age of the patients was reported in eight of the twelve studies, and it ranged from twenty-three to thirty-two years. In the two earliest studies, from 1965, the ages of the patients were not given, and in two studies only the range of the patients' ages (fifteen to fifty years and twelve to fifty years) was given. In ten studies, high-performance athletes were included, and in two studies, they were excluded.

**Sex Distribution**

In eleven studies, an average of 71 per cent of the patients were men and 29 per cent were women. Korkala et al. did not report the sex distribution.

**Previous Injuries**

In six studies, patients who had had a previous sprain of the ankle were excluded. In the studies by Broström, Prins, and Niedermann et al., 32, 26, and 21 per cent of the patients had had one or more previous sprains of the ankle. In the other three studies, this information was not given.

**Diagnostic Methods**

To be included in any of the studies, patients had to have a typical history of injury and positive clinical findings (talar tilt and an anterior drawer test indicative of a grade-III sprain of the ankle). In addition, in every study at least one radiographic method was used to confirm the clinical diagnosis. In five studies, stress radiography was used, and in two studies, arthrography was used for confirmation. Both stress radiography and arthrography were used in the other five studies.
Operative Technique

In all twelve studies, a very similar operative technique was used: primary suture of the ruptured ligaments. Broström\textsuperscript{11} used continuous sutures; in the other studies, the repair was performed with interrupted stitches and absorbable sutures. A detailed description of the operative technique was given by Prins\textsuperscript{61} and by van Moppens and van den Hoogenband\textsuperscript{76}.

Physiotherapy

In six studies\textsuperscript{11,17,24,25,33,58}, specific physiotherapy was prescribed after the period of immobilization. It included various modes of treatment involving supervised mobilization of the ankle; peroneal-muscle, toe-raise, and toe-jump exercises; proprioceptive training; massage; and ultra-short wave therapy. In each study, the rehabilitation program was the same for each group. Two studies\textsuperscript{46,72} reported that no organized physical therapy was given, and in the other four\textsuperscript{25,58,59,61} it was not mentioned.

Duration of Follow-up and Number of Patients Followed

In all of the studies, follow-up consisted of normal office visits at regular intervals after the injury. The latest follow-up examination was six months after the injury in three studies\textsuperscript{17,46,61}; one year in five studies\textsuperscript{25,58,59,72,76}, one and one-half years in one study\textsuperscript{33}, two years in two studies\textsuperscript{24,48}, and 3.8 years in one study\textsuperscript{11}. The average duration of follow-up was 1.2 years, which we believe is long enough to identify persistent mechanical instability but too short to recognize late osteoarthrotic changes\textsuperscript{59}.

The number of patients who were able to attend the latest examination (the follow-up percentage) is critical when the quality of a clinical orthopaedic trial is evaluated. This value ranged from 63 to 100 per cent (average, 89 per cent). In seven of the twelve studies, it exceeded 90 per cent.

Follow-up Methods

All but three of the studies had subjective (questionnaire), clinical (physical examination), and radiographic (stress radiographs) components of the follow-up protocol. In the work by Grönmark et al.\textsuperscript{33}, only results from mailed questionnaires were presented. In the studies reported by Broström\textsuperscript{11} and Niedermann et al.\textsuperscript{59}, stress radiographs were not made.

Radiographic follow-up evaluation of talar tilt and anterior drawer is of great importance when primary repair is compared with conservative treatment, since the most important advantage of operative repair has been reported to be improved mechanical stability of the ankle. This may, in turn, lead to a decrease in late symptoms, such as giving-way, pain, swelling, and stiffness.

When the foot is in the neutral position, the anterior drawer test determines the integrity of the anterior tibiofibular ligament primarily. Talar tilt primarily tests the calcaneo-ribular ligament when the foot is in that position, but also the anterior tibiofibular ligament if the foot is in plantar flexion\textsuperscript{53,64}. The exact techniques used for testing anterior drawer and talar tilt on stress radiographs varied among the twelve studies, but within each study the same technique was used for every patient.

Opinions vary regarding the value of the radiographic talar-tilt test compared with the anterior drawer test. Traditionally, many have favored the talar tilt test\textsuperscript{18,49,50,65}, while recently the anterior drawer test has been suggested to be more reliable\textsuperscript{49}. Some authors have concluded that the two tests are complementary and that they should be used in combination\textsuperscript{32,42,61}.

Statistical Analysis

Statistical analysis was adequately performed in eight studies. In the other four\textsuperscript{17,24,25,33}, no statistical calculations were given to support the conclusions.

Evaluation of Results

In general, according to the twelve studies, the results after treatment of an acute grade-III sprain of the lateral ligaments of the ankle were excellent. In most patients (75 to 100 per cent), irrespective of the therapy (repair and cast, cast alone, or early controlled mobilization), the one-year prognosis was excellent or good and fully acceptable, and only a few patients had residual symptoms. Interestingly, these over-all results were better than those reported in the earlier studies\textsuperscript{7,35,52,73,74}.

Furthermore, the twelve studies did not identify any difference between the patients who had an isolated rupture of the anterior tibiofibular ligament and those who had a combined injury of the anterior tibiofibular and calcaneo-fibular ligaments. These findings may partially explain why, in all retrospective, uncontrolled studies, the treatment that is presented has led to fine results, and why such a controversy about proper treatment can persist for years.

We selected nine outcomes by which to evaluate the results of the studies: return to work or physical activity; functional instability; pain, swelling, or stiffness with activity; mobility of the ankle; atrophy of the muscles; return to preinjury level of activity; reinjury; objective mechanical stability of the ankle; and complications. For each outcome, the five studies\textsuperscript{17,24,46,59,61} that had two treatment groups (repair and cast and cast alone) were compared separately from the six studies\textsuperscript{11,25,33,48,58,76} that had three groups (repair and cast, cast alone, and functional treatment). The twelfth study\textsuperscript{72}, comparing repair and immobilization in a cast with functional treatment, was included in the latter comparison.

Return to Work or Physical Activity

Return to work or physical activity is an important variable because of economic reasons. In addition, athletes and other physically active people appreciate a quick return to training and competition.

Of the five studies that had two treatment groups, two showed that treatment in a cast alone was better in this respect, with the time to return to activities averaging one to two\textsuperscript{26} and four\textsuperscript{27} weeks earlier than after operative repair.
Klein et al. found no difference, and Niedermann et al. did not report on this outcome. Prins used different durations of immobilization (three weeks after operation, but six weeks when a cast was the only treatment), so his results were not used for comparison.

Of the seven studies that included patients who had functional treatment, four reported the time between injury and return to work or physical activity. The conclusion in each of the four studies was that functional treatment was superior to the other two modalities in this respect; return to activity was two to four times faster after functional treatment than after operation or immobilization in a cast. Treatment with a plaster cast alone was also found to be slightly better than operative treatment and a cast.

Functional Instability (Feeling of Giving-Way)

The term functional instability of the ankle was first used by Freeman et al. to designate the disability to which patients refer when they say that the foot tends to "give away". This phenomenon has been reported to occur after 15 to 60 per cent of injuries to the lateral ligaments of the ankle, and it seems to be independent of the grade of the initial injury.

The exact pathomechanics of this symptom are not clear. It has been shown repeatedly that, after an acute injury of the ankle, there is no correlation between proved mechanical instability (radiographic talar tilt and anterior drawer tests) and patients' complaints of functional instability (giving-way, pain, and swelling). Freeman et al. suggested that functional instability of the ankle is usually due to motor incoordination secondary to a disorder of proprioception. In their prospective, randomized trial, they demonstrated that the incidence of this problem can be reduced substantially by a treatment protocol involving coordination exercises done on an ankle tilt-board. Recently, this finding was confirmed by Tropp and by Gauflin et al.

Other factors, such as formation of adhesions leading to decreased mobility of the ankle (especially dorsiflexion), weakness of the peroneal muscles, and chronic sprain of the tibiofibular ligament, may also cause functional instability. However, the specific role of each of these factors is, as yet, poorly defined.

Of the five studies that had two treatment groups, the frequency of persistent functional instability was reported in four. In two studies, no difference was found between the groups, with an average of 93 and 75 per cent of asymptomatic patients. Evans et al. found that treatment in a cast alone was better: 8 per cent of the patients who had only a cast had functional instability, compared with 26 per cent of the patients who had repair and a cast. However, Prins found that, six months after the injury, 92 per cent of the patients who had been treated with a cast only had a fear of giving-way of the ankle; in patients who had operative repair, only 22 per cent had functional instability.

Of the seven studies that also included a functional treatment group, the frequency of late functional instability was reported in five. In two studies, operative treatment gave the best results (fewer than 10 per cent of the patients had giving-way, compared with 18 to 50 per cent in the other groups). In two other studies, functional treatment produced the best results (14 to 22 per cent of the patients had functional instability, compared with 24 to 42 per cent in the other groups). In the fifth study, by Freeman, no difference could be identified among the groups.

In summary, three studies found no differences among the treatment groups, three found that there was less functional instability after operative repair than after other treatments, and three found that conservative treatment (cast or functional treatment) was better than operative repair. We concluded that no one treatment method seemed to reliably minimize the chances of late functional instability.

Pain, Swelling, or Stiffness with Activity

Pain, swelling, and stiffness correlate closely with functional instability, and quite often the two outcomes occur together.

In four of the five studies that had two treatment groups, there was no difference in this outcome between the group that had operative repair and a cast and the group that had treatment with a cast alone. The incidence of these symptoms ranged from 10 to 27 per cent. Prins, again, found completely different results. Pain occurred in only 7 per cent of the patients who had an operation but in 63 per cent of the patients who had only a cast. Swelling persisted in 2 per cent of the patients who were operated on and in 29 per cent of those who were treated with only a cast.

Information regarding pain, swelling, and stiffness was available in four of the seven studies that had a functional treatment group. Freeman and Møller-Larsen et al. found that functional treatment was better than a cast alone, and the worst results were after operative treatment. Van Moppens and van den Hoogenband reported no differences, and Grønmark et al. found that operative repair was better than the other forms of treatment.

In summary, these studies failed to demonstrate any differences among the treatment groups regarding long-term pain, swelling, and stiffness, and recommendations cannot be made regarding the optimum treatment to minimize these problems.

Mobility of the Ankle

Restricted mobility of the ankle, especially in dorsiflexion, has been cited as one reason for persistent complaints by patients. Mobility of the ankle was measured at the follow-up examination in three of the five studies that had two treatment groups. Evans et al. noted that mobility of the ankle was normal in 80 per cent of patients who had conservative treatment but in only 48 per cent of patients who had operative treatment. Niedermann et al. and Prins found no differences between the two groups.

Mobility of the ankle was measured in three of the seven studies that included three therapy groups. In all of these studies, functional treatment was superior to the...
other two methods for achievement of a full range of motion earlier after the injury. However, after one year, there were no differences.

Atrophy of the Muscles

Atrophy of the muscles in the calf was evaluated in only two studies\textsuperscript{59,76}. In both, the circumferences of the uninjured and injured sides were compared. Niedermann et al.\textsuperscript{59} found no difference in this outcome, one year after the injury, between patients who had operative treatment and those who had only a cast. Van Moppen and van den Hoogenband\textsuperscript{76} observed that, after nine weeks, patients who were operated on or had immobilization in a cast had a substantially higher rate of atrophy of the muscles of the calf than did patients who had functional treatment (22 and 18 per cent compared with 4 per cent). After six months, however, this difference did not persist.

Return to Preinjury Level of Activity

This criterion has been used very frequently in studies of sprains of the ankle. Generally, at the final follow-up examination, the researcher combines the subjective, functional, and clinical data to determine an over-all result. It is a very subjective parameter and, therefore, is sensitive to bias. Additionally, one researcher may emphasize some part of the evaluation more than others.

All five studies comparing two treatment methods gave information on patients who returned to preinjury status. In three studies\textsuperscript{24,46,59} no difference was found between the groups, and 62 to 81 per cent of the patients had recovered completely. Evans et al.\textsuperscript{24} concluded that a cast alone was better than operation (59 compared with 37 per cent). Prins\textsuperscript{61} found no difference between the groups if return to everyday activities was the criterion (98 per cent for both groups), but operative repair had a considerable advantage if return to sports was the criterion (77 compared with 29 per cent).

In the seven studies comparing three treatment groups, all reported the number of patients who had returned to preinjury status by the time of the latest follow-up examination. In three of the studies\textsuperscript{25,58,76}, functional treatment was found to be superior to operation or immobilization in a cast. In the study by Möller-Larsen et al.\textsuperscript{59}, complete recovery occurred in 82 per cent of the patients in the functional-treatment group, 65 per cent in the cast group, and 56 per cent in the operative-repair group. In the study by van Moppen and van den Hoogenband\textsuperscript{76}, the same percentages of return to preinjury status were 100, 98, and 95 per cent, and in the study by Freeman\textsuperscript{39}, the rates were 58, 53, and 25 per cent. In the study by Broström\textsuperscript{11}, function was fully restored in 92 per cent of the patients who were operated on, in 82 per cent of those who had functional treatment, and in 79 per cent of those who had immobilization in a cast. Grenmark et al.\textsuperscript{33} reported similar results of 97, 77, and 67 per cent. In two studies\textsuperscript{46,72}, no difference was found among the groups.

In summary, in five studies, no differences were identified; in four, conservative treatment was found to be better than operative repair; and in three, operative treatment produced better results. Thus, we cannot recommend one mode of treatment over the others if final restoration to the preinjury level of activity is used as the only criterion.

However, a clear advantage for treatment with strapping and early controlled mobilization (functional treatment) was present in most of these studies, if the time to the absence of symptoms was also used as a criterion. This finding was best demonstrated by van Moppen and van den Hoogenband\textsuperscript{76}, who carefully followed their patients nine, twelve, twenty-four, and fifty-two weeks after the injury. At nine weeks, 68 per cent of the patients who had functional treatment had been restored to the preinjury level, compared with 7 per cent of those who were operated on and 13 per cent of those who had only a cast. At twelve weeks, functional treatment still represented a considerable advantage (81, 36, and 7 per cent), and even at twenty-four weeks there were differences (98, 76, and 88 per cent).

Reinjury

The number of patients who had had one or more reinjuries may be a direct reflection of the mechanical instability of the ankle. Of the five studies in which operative repair and treatment with a cast were compared, four reported the rate of reinjury during the period of follow-up. In three studies\textsuperscript{24,46,59}, there was no difference between the treatment groups; the incidence ranged from 4 to 28 per cent. Again, Prins\textsuperscript{61} found that operation was superior: none of the patients who had operative repair had a reinjury, but 19 per cent of those in the group that had only a cast had a reinjury. The frequency of reinjury was evaluated in four\textsuperscript{25,48,72,76} of the seven studies that had three treatment groups. There were no differences among the groups, with the incidence of reinjury ranging from 0 to 25 per cent.

Objective Mechanical Stability of the Ankle

Objective mechanical stability of the ankle is the most important variable when the results of operative and conservative treatment are compared, since improved mechanical stability after primary repair has been the main argument for operation. Mechanical instability has been claimed to be an important factor in the development of late symptoms, such as the feeling of giving-way, recurrent sprains, swelling, tenderness, and pain. Mechanical stability of the ankle can be measured objectively only with evaluations of talar tilt and anterior drawer on stress radiographs. Therefore, only the evaluation of these examinations is reported here.

Of the five studies comparing operative treatment with immobilization in a cast, three reported the results of examination with stress radiographs at the most recent follow-up examination. Evans et al.\textsuperscript{24} and Klein et al.\textsuperscript{46} observed no difference between the two groups, but Prins\textsuperscript{61} found that operation gave better results: talar tilt was significantly less in the ankles that had been repaired operatively (mean, 3.4 degrees) than in those that had been immobilized in a cast (mean, 9.9 degrees). No difference in anterior drawer was noted between the two groups.
Talar tilt or anterior drawer, or both, was measured radiographically at follow-up in five of the seven studies evaluating three treatment groups. In four studies, no substantial differences were found among patients who had had an operation, immobilization in a cast, or functional treatment, but Sommer and Arza concluded that functional treatment was better than operation. The initial mean talar tilt was 18 degrees in the functional-treatment group, and at the one-year follow-up examination, it had decreased to 6 degrees (average improvement, 14 degrees). In the patients who were operated on, the initial mean talar tilt was 15 degrees, and at one-year follow-up examination, it was 6 degrees (average improvement, 9 degrees). The initial and follow-up values for anterior drawer were eight and six millimeters in the group that had functional treatment and seven and six millimeters in the group that had an operation.

With mechanical stability as the criterion, operation, immobilization in a cast, and functional treatment seem to give equal, mostly excellent, results. Therefore, improved mechanical stability alone does not seem to be a reason to justify operative repair of acute tears of the lateral ligament of the ankle.

Furthermore, three of the studies, as well as previous investigations, suggest strongly that pure mechanical instability of the ankle after an acute sprain of the ankle is not an appreciable independent reason for the development of late symptoms. In this respect, the theory of Freeman et al. that motor incoordination and weakness of the peroneal muscles are consequences of a disorder of proprioception seems more appropriate. Mechanical instability, a proprioceptive deficit, and weakness of the peroneal muscles may occur simultaneously in the same patient (particularly in the presence of gross mechanical instability), making it very difficult to identify the specific cause of persistent functional instability.

Complications

To justify its use as a suitable choice of treatment for injuries to the ligaments of the ankle, the optimum therapy should be free of complications.

Of the five studies that had two treatment groups, all reported the rate and type of complications. All complications but one occurred in groups that were treated operatively. Niedermann et al. reported that, in the patients who were operated on, the rate of infection of the wound was 4 per cent; the incidence of dysesthesia, 7 per cent; and the rate of "neuroma-like tenderness of the scar", 9 per cent. Of the fifty patients in the operative-repair group in the study by Evans et al., one had a pulmonary embolus, one had Sudeck atrophy, six had a sensory deficit about the ankle, and two had increased sensitivity of the skin over the scar. Evans et al. were the only authors to report a complication (deep venous thrombosis of the calf) in the group that had only immobilization in a cast. Clark et al. reported that manipulation of the ankle under anesthesia was needed four months after one operative repair. Klein et al. noted hypersensitivity of the scar in 19 per cent of the patients who had an operation. Finally, Prins reported three infections of the wound and two paresthesias on the lateral side of the foot.

Of the seven studies that had three treatment groups, four reported complications, all but two of which occurred in the operatively treated patients. Van Moppens and van den Hoogenband reported that three patients had pain in the area of the scar and one had hyperesthesia of the scar. Korkala et al. observed five cases of deep venous thrombosis of the calf: two in the group that had a cast and three in the group that had an operation. Grönmark et al. noted one deep venous thrombosis of the calf in an operatively treated patient. Finally, Broström reported that one patient who had operative treatment had superficial necrosis of the skin adjacent to the operative wound that necessitated skin-grafting. In addition, seven patients who had operative repair had a neuroma in the scar, and five had reduced sensitivity in the area.

Thus, with complications as the criterion, functional treatment is the safest choice (no complications in these twelve studies). Immobilization in a cast is very safe as well. Operative treatment may, on occasion, produce serious complications.

Comparison of the Final Conclusions of Each Study

In each study, the authors reached a final conclusion about the proper treatment of acute grade-III sprains of the lateral ligaments of the ankle.

Of the five studies in which treatment with an operation and a cast was compared with treatment with a cast alone, the authors of three concluded that conservative treatment (cast alone) is the method of choice, even though they indicated that early mobilization might give better results. Clark et al. also recommended conservative treatment, with one exception — a young athlete who had a severe tear and a talar tilt of more than 15 degrees — for whom they recommended operative treatment. Prins recommended operative repair as the basic method of treatment.

In all seven studies that had three treatment groups, the authors recommended functional treatment as the primary choice. Four recommended functional treatment without any reservations, and three cited one reservation: the young, active athlete, for whom primary operative repair should be considered.

Conclusions

The treatment of acute complete (grade-III) tears of the lateral ligaments of the ankle has generated much controversy in the medical literature because the long-term prognosis is excellent or good in most patients, regardless of the treatment (operative repair and cast, cast alone, or early controlled mobilization). Perhaps, therefore, retrospective, uncontrolled studies have been able to show fine results whatever the actual treatment was.

After a critical review of these twelve studies, it is not difficult to select functional treatment as the treatment of choice for acute complete tears of the lateral ligaments of
the ankle. Functional treatment includes only a short period of protection by tape, bandage, or a brace, and allows early weight-bearing. Range-of-motion exercises, as well as neuromuscular training of the ankle, should begin early. This program clearly provides the quickest recovery to a full range of motion and return to work and physical activity. It does not, however, compromise the late mechanical stability of the ankle more than the other treatments, and it does not produce more late symptoms (giving-way, pain, swelling, stiffness, or muscular weakness) than operation and immobilization in a cast or a cast alone. In addition, functional treatment seems to be virtually free from complications, while after the other methods of treatment, especially operation, serious complications sometimes occur.

There are other reasons to consider functional treatment as a method of choice. First, as has been reported by many authors, secondary operative reconstruction or delayed repair of the ruptured ligaments of the ankle can be performed years after the injury if necessary, with good results that are fully comparable with those of primary repair. Therefore, even competitive athletes may be treated functionally at first, with the realization that 10 to 20 per cent may need elective secondary repair. Second, functional treatment saves the patient from additional trauma to the tissues and complications that are caused by operation. Finally, the costs of the different treatments must be considered. Appreciation of the cost-benefit ratio for all types of medical treatment has become extremely important in modern health-care systems with limited economic resources. In the treatment of sprains of the lateral ligaments of the ankle, functional treatment can mean enormous economic savings compared with an operation.

There are, however, some situations to which these twelve studies did not give a specific answer, and when operation should still be considered in the acute phase. Such situations include large avulsions of bone and severe ligamentous damage on both the medial and lateral sides of the ankle, indicating a major injury of the joint. An operation may also be appropriate when the injury is severe and recurrent. Finally, because in none of these twelve studies were the patients followed for more than four years, no conclusion can be drawn regarding the effect of the three methods of treatment on the late development of osteoarthrosis of the ankle joint.

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