Management of chronic lateral ankle instability: alternatives for diagnosis and treatment

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Summary
Chapter 1 - Introduction

The definition of chronic lateral ankle instability, as used in this thesis, is ‘recurrent sprains or giving way for more than six months in spite of a period of conservative treatment’.

In the section ‘anatomy, biomechanics and neuromuscular control’ the emphasis lays on how stability in the normal ankle is preserved. The bony structures and the (anterolateral) ankle ligaments provide for passive stability, whereas muscles, regulated by the central and peripheral nervous system, provide for active stability.

In most patients chronic lateral ankle instability starts with a primary inversion injury. Predisposing factors are certain foot and gait characteristics and possibly primarily disturbed neuromuscular control. Established instability is caused by disturbed neuromuscular control and/or increased ligament laxity.

The diagnosis is primarily based on history and physical examination, providing good assessment of both functional instability and ligament laxity. Standard radiological evaluation consists of conventional ankle radiographs. Nowadays, ankle stress radiography, to assess ligament laxity, is infrequently used in the clinical situation. Other radiological modalities are mainly used to evaluate concomitant diagnoses. Additional investigations to assess neuromuscular control are currently not part of the clinical evaluation.

Treatment of chronic lateral ankle instability starts with correct management of the primary ankle inversion injury. Conservative treatment provides complete recovery in the majority of patients. The purpose of treatment of chronic ankle instability is to restore functional ankle stability and to prevent long-term sequelae, mainly osteoarthritis. Initial treatment is also conservative and consists of training of neuromuscular control, if necessary combined with preventive use of ankle braces. If conservative treatment is ineffective and increased ligament laxity is present, surgical anatomic reconstruction of the lateral ankle ligaments is indicated.

The questions addressed in this thesis regarding chronic lateral ankle instability are: what is the best conservative and surgical treatment according to a systematic review based on randomized controlled trials; what is the best management of athletes; what are the short-term results of arthroscopic capsular shrinkage with thermal radiofrequency; what are the long-term results of the Weber procedure (an anatomic reconstruction using the plantaris tendon); what is the reliability of a dynamic test to assess ankle ligament laxity; and: are static balance measures useful to assess disturbed neuromuscular control?
Chapter 2 - Interventions for treating chronic ankle instability

Chronic lateral ankle instability occurs in 10% to 20% of people after an acute ankle sprain. The initial form of treatment is conservative but if this fails and ligament laxity is present, surgical intervention is considered. A Cochrane systematic review was conducted to evaluate what the best treatment for chronic ankle instability is based on highest available evidence, randomized controlled trials (RCT’s).

According to the Cochrane Collaboration rules, seven RCT’s were included and assessed for methodological quality. Their data were extracted and analyzed. The studies were divided into three groups: surgical interventions (four studies); rehabilitation programs after surgical interventions (two studies); and conservative interventions (one study). None of the studies was methodologically flawless. Only one study described an adequate randomization procedure. Only two studies, both about rehabilitation programs after surgery, had a moderate risk of bias; all other studies had a high risk of bias. Both studies about rehabilitation after surgical intervention provided evidence that early functional mobilization leads to an earlier return to work and sports than immobilization.

It is concluded that, in view of the low quality methodology of almost all the studies, this review did not provide sufficient evidence to support any specific surgical or conservative intervention for chronic ankle instability. However, after surgical reconstruction, early functional rehabilitation was shown to be superior to six weeks immobilization regarding time to return to work and sports.

Chapter 3 - Treatment of chronic anterolateral ankle instability in athletes

This study is a review about the management of chronic ankle instability in athletes was written. The risk to sustain an inversion trauma is high in sports that involve cutting maneuvers, jumping, and direct body contact (e.g. volleyball, basketball, and soccer), whereas residual problems, like chronic lateral ankle instability, are more disabling for athletes than for people with a more sedentary lifestyle.

The best available evidence was used to provide a guideline for the management of chronic ankle instability in this important subgroup. Chronic lateral ankle instability is often caused by disturbed proprioception of ankle joint and increased ligament laxity may be present. Initial treatment in athletes is functional, consisting of propriocepsis training and prevention of recurrent sprains by taping or bracing of the ankle.
When functional treatment fails and increased laxity of the ligaments is present, surgical treatment is warranted. Recent literature has shown that an anatomical reconstruction leads to better long-term results in athletes than a non-anatomical reconstruction and is therefore the surgical treatment of choice in athletes with chronic lateral ankle instability.

Chapter 4 - Arthroscopic capsular shrinkage for chronic ankle instability with thermal radiofrequency - prospective multicenter trial

Arthroscopic thermal capsular and ligament shrinkage is a relative new option for the treatment of joint instability. Potential advantages of the procedure, compared to an open procedure, are the minimally invasive character, reduced operating time, outpatient setting, less surgical morbidity, fast recovery and quick return to work and sports. Retrospective studies about arthroscopic capsular shrinkage for chronic lateral ankle instability showed good results in the vast majority of patients up to 2.5 years follow-up.

In a prospective multicenter study, chronic lateral ankle instability in 39 patients was treated with arthroscopic capsular shrinkage. The hypothesis was that increased lateral ligament would be reduced and functional ankle stability would be restored. Latest follow-up for each patient was nine months.

Ligament laxity showed moderate improvement whereas clinical and functional parameters, including proprioception, showed a substantial improvement. Three patients underwent a secondary procedure, of which one was due to failure of the study intervention. It is concluded that capsular shrinkage of the ankle is a safe procedure, leading to resolution of symptoms in the majority of patients with chronic ankle instability.

Chapter 5 - Long-term results of the Weber operation for chronic ankle instability - 37 patients followed for 20-30 years

Surgical procedures for repair of the anterolateral ankle ligaments can be divided in two groups: Non-anatomical reconstructions, in which a functional reconstruction is created, usually with the peroneus brevis tendon, and anatomical reconstructions, in which the ligaments itself are sutured or reattached to the fibula. Recent comparative studies showed better long-term results for anatomical reconstruction techniques compared to non-anatomical reconstruction. The Weber technique, using the plantaris tendon for reconstruction of the anterior talofibular ligament, is considered to be an anatomical reconstruction, since the tendon graft is attached to the original sites of insertion of the ligament.
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Forty ankles in 37 patients were evaluated at an average of 24 years after the procedure. Symptoms were present in a varying degree in half of the ankles, 32 patients were satisfied with the result and approximately two thirds of the patients had a good or excellent result with the Karlsson- and Good-score. Three ankles had secondary arthritic changes with narrowing or disappearance of the joint space. It is concluded that the Weber procedure is a good alternative for treatment of chronic lateral ankle instability when a direct anatomical reconstruction is not feasible or has failed.

Chapter 6 - Clinical evaluation of a dynamic test for lateral ankle ligament laxity

The Dynamic Anterior Ankle Tester (DAAT) was developed to objectively measure anterolateral ankle ligament laxity, to overcome the disadvantages of apprehensive muscle contractions leading to false negative results seen with static manual and instrumented tests and to avoid röntgen radiation necessary for radiographic stress testing. Reliable results were found in small groups of healthy subjects and patients with increased lateral ankle ligament laxity.

The goal of this study was to clinically evaluate the DAAT in 39 patients treated surgically for chronic lateral ankle instability. Ankle ligament laxity was pre- and postoperatively measured with the DAAT, ankle stress radiographs and the manual anterior drawer test.

Contrary to both other tests, the DAAT did not detect increased laxity preoperatively or decreased laxity of the effected ankle postoperatively. It also had a low sensitivity to change, evaluated with Cohen’s d, compared to both other tests. Reliability of the DAAT was low, whereas the ankle stress radiographs and the manual drawer test had an acceptable and accurate reliability, respectively. There were now correlations between the three tests. It is concluded that the Dynamic Anterior Ankle Tester in its current form is not useful to reliably evaluate ankle ligament laxity.

Chapter 7 - Difference in balance measures between patients with chronic ankle instability and patients after an acute ankle inversion trauma

It is assumed that disturbed neuromuscular control plays an important role in the development of chronic lateral ankle instability and that it is probably caused by a primary acute ankle inversion trauma. To be able to provide preventive measures in selected patients, it would be necessary to identify those patients after an initial ankle inversion trauma that have disturbed
neuromuscular control and will develop chronic ankle instability. Preferably, it should be a simple test that can be used outside the laboratory. Based on the literature, static balance tests were thought to be a good choice for this.

A study was performed to compare healthy subjects (n=15) with patients after an acute ankle inversion trauma (n=14) and patients with chronic ankle instability (n=23) to evaluate whether there is a difference in static balance measures between these groups in the first place. Static balance was tested with a single leg test on a force plate (Postural Sway test) and on a compliant floor (Simple Balance test). Functional impairment was evaluated with the Karlsson- and AOFAS-ankle-scores and the SF-36.

No difference in balance measures between the groups was found. There was, however, a statistically significant difference in functional scores between the groups. Postural Sway and the Simple Balance tests were correlated with each other but not with the functional scores. It is concluded that there is a functional difference between the groups, but this difference was not evident with the static balance measures. Therefore, balance tests appear not to be useful for clinical application in the individual patient.

Chapter 8 - General discussion
Regarding diagnostics for chronic lateral ankle instability, several devices and tests have been developed to evaluate both functional instability and ligament laxity. However, none has emerged as a gold standard. The dynamic anterior ankle tester, subject of the study in chapter 6, proves not to be reliable in assessing the laxity of the lateral ankle ligaments. The static balance measures, subject of the study in chapter 7, do not show a difference between small groups of patients with chronic ankle instability, patients after an acute ankle inversion trauma and healthy subjects. Although other studies have reported differences between affected and non-affected ankles with similar tests, these differences are small, usually only statistically significant at the group level, and they are not consequently found. Therefore, history and physical examination remain the corner stones for the diagnosis of chronic lateral ankle instability in clinical practice.

Regarding the treatment of chronic lateral ankle instability many studies have been published showing good results with both conservative and surgical interventions. The systematic review of chapter 2 shows that there are only few good quality randomized controlled trials evaluating the relative effectiveness of different treatment options. Only two randomized trials, of moderate methodological quality, showed that functional mobilization
after surgical ankle ligament reconstruction is better when compared to six weeks of immobilisation regarding return to work and sports. Preferred treatment of chronic lateral ankle instability is therefore based on lower levels of evidence. The consensus in literature is that initial treatment is conservative, with training of neuromuscular control and preventive use of ankle braces. If conservative treatment fails and increased ligament laxity is present, an anatomic reconstruction of the lateral ankle ligaments is indicated. Treatment of chronic instability in athletes, as described in the review in chapter 3, does not differ from this algorithm. Arthroscopic capsular shrinkage with thermal radiofrequency shows promising short-term results for the treatment of chronic lateral ankle instability in a prospective study described in chapter 4. However, longer-term evaluation and (randomized) comparison with other surgical interventions is needed. Anatomic reconstruction of the anterior talofibular ligaments with the plantaris tendon (Weber procedure), evaluated in a retrospective study in chapter 5, seems a good salvage procedure when an anatomical reconstruction is not feasible or when an earlier reconstruction has failed.