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Searching for consensus in the approach to patients with chronic lateral ankle instability: ask the expert

Frederick Michels[1] · H. Pereira[2] · J. Calder[3] · G. Matricali[4,5,6] · M. Glazebrook[7] · S. Guillo[8] · J. Karlsson[9] · The ESSKA-AFAS Ankle Instability Group · Jorge Acevedo · Jorge Batista · Thomas Bauer · James Calder · Dominic Carreira · Woojin Choi · Nuno Corte-real · Mark Glazebrook · Ali Ghorbani · Eric Giza · Stéphane Guillo · Kenneth Hunt · Jon Karlsson · S. W. Kong · Jin Woo Lee · Frederick Michels · Andy Molloy · Peter Mangone · Kentaro Matsui · Caio Nery · Saturo Ozeki · Chris Pearce · Hélder Pereira · Anthony Perera · Bas Pijnenburg · Fernando Raduan · James Stone · Masato Takao · Yves Tourné · Jordi Vega

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Abstract
Purpose The purpose of this study is to propose recommendations for the treatment of patients with chronic lateral ankle instability (CAI) based on expert opinions.
Methods A questionnaire was sent to 32 orthopaedic surgeons with clinical and scientific experience in the treatment of CAI. The questions were related to preoperative imaging, indications and timing of surgery, technical choices, and the influence of patient-related aspects.
Results Thirty of the 32 invited surgeons (94%) responded. Consensus was found on several aspects of treatment. Preoperative MRI was routinely recommended. Surgery was considered in patients with functional ankle instability after 3–6 months of non-surgical treatment. Ligament repair is still the treatment of choice in patients with mechanical instability; however, in patients with generalized laxity or poor ligament quality, lateral ligament reconstruction (with grafting) of both the ATFL and CFL should be considered.
Conclusions Most surgeons request an MRI during the preoperative planning. There is a trend towards earlier surgical treatment (after failure of non-surgical treatment) in patients with mechanical ligament laxity (compared with functional instability) and in high-level athletes. This study proposes an assessment and a treatment algorithm that may be used as a recommendation in the treatment of patients with CAI.
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✉ Frederick Michels
frederick_michels@hotmail.com

H. Pereira
helderduartepereira@gmail.com

J. Calder
james.calder@fortiusclinic.com

G. Matricali
giovanni.matricali@uzleuven.be

M. Glazebrook
markglazebr@hotmail.com

S. Guillo
steguillo@gmail.com

J. Karlsson
jon.karlsson@telia.com

[1] Orthopaedic Department, AZ Groeninge Kortrijk, 8500 Kortrijk, Belgium

[2] International Sports Traumatology Centre of Ave, Taipas Termal, Caldas Taipas, Portugal

[3] Fortius Clinic, 17 Fitzhardinge St, London, UK

[4] Department of Development and Regeneration, KU Leuven, Leuven, Belgium

[5] Department of Orthopaedics, Foot and Ankle Unit, University Hospitals Leuven, KU Leuven, Leuven, Belgium

[6] Institute of Orthopaedic Research and Training, KU Leuven, Leuven, Belgium

[7] Queen Elizabeth II Health Sciences Center Halifax Infirmary, Dalhousie University, 1796 Summer Street, Halifax, NS B3H3A7, Canada

[8] Clinique du Sport, 2 rue Negrevergne, 33700 Bordeaux-Mérignac, France

[9] Department of Orthopaedics, Sahlgrenska University Hospital, Sahlgrenska Academy, Gothenburg University, Göthenburg, Sweden

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Introduction

Chronic lateral ankle instability (CAI) is a common problem after an acute ankle sprain, and surgery is indicated if conservative treatment fails. In recent years, there has been a move towards the development of minimally invasive and endoscopic techniques to treat CAI [1, 4, 8, 13–15, 23, 26, 27, 29, 35, 37, 42]. The advent of new techniques offers new opportunities, but several questions remain unanswered. The most important questions are; Which patients should be operated on? At what moment should surgical treatment be considered? Is there a place for surgery in the treatment of functional ankle instability? Which imaging modalities are most useful? What are the indications to perform a reconstruction? How should subtalar instability be assessed? Should both the ATFL and CFL be reconstructed?

In this study, a distinction was made between functional instability and mechanical instability because the treatment may differ. Functional instability was described by Freeman [10], who defined it as a subjective feeling of giving way that may occur despite an absence of deviation beyond the normal physiological range of motion of the talus. Mechanical instability is defined as a pathologic laxity of the tibiotalar joint (with reproducible increased motion) in association with complaints of giving way. In terms of surgical treatment, a distinction is made between repair and reconstruction [15]. A repair is defined as suturing of the torn lateral ligaments. The classic Broström procedure is thus defined as a true repair of the lateral ligaments including the ATFL and CFL [5, 15]. The Gould modification adds an augmentation with a transfer of the extensor retinaculum. A reconstruction refers to the replacement of the chronically deficient lateral ligaments with local tissues or with autograft or allograft tissue. A reconstruction may be anatomical or non-anatomical. Non-anatomical positioning of the graft (including tenodesis) may alter the joint biomechanics, resulting in joint loading alterations that may lead to joint degeneration over time [15]. In this manuscript, besides the repairs, only anatomical reconstruction was considered. In more recent publications, this is usually a tendon graft [27, 28]. The purpose of this study is to provide guidelines for the treatment of chronic lateral ankle instability, based on the current literature and expert opinions.

Materials and methods

The ESSKA-AFAS Ankle Instability Group (ESSKA-AFAS AIG) is an international group of orthopaedic surgeons with a special interest in ankle instability [15]. A questionnaire (Fig. 1) was send to 32 orthopaedic surgeons dedicated to foot and ankle surgery, to obtain their opinions about the treatment of patients with symptoms of ankle instability. Inclusion criteria were that the surgeons included in this study must have been trained in foot and ankle surgery or sports surgery. They should have an extensive clinical experience with the surgical treatment of patients with chronic ankle instability. In addition, they should have peer-reviewed publishing in history on ankle instability. The questionnaire was designed to obtain data about the choice of preoperative imaging, indication and timing of surgery, technical preference and influence of patient-related factors. A cover letter was included, explaining the purpose of the questionnaire. No ethical issues were raised, and no conflicts of interests were registered concerning this study. The final outcome of this study was approved by all participants prior to submission.

Results

Response was obtained from 30 of the 32 invited surgeons (an overall response rate of 94%). The responding surgeons are from 15 different countries and 24 are active members of the ESSKA-AFAS AIG. The participating surgeons were involved in a total of 123 peer-reviewed publications related to ankle instability.

Preoperative planning

The results of the preoperative imaging exams considered are shown in Table 1. The majority of the surgeons did not use stress radiographs. Almost all the surgeons found MRI to be useful. Three surgeons recommended ultrasonography.

Functional instability

Almost all the experts agreed that surgical treatment should be considered in patients with functional instability, but only after failure of non-surgical treatment (Table 2). In addition, several surgeons recommended checking whether the non-surgical treatment had been performed properly. If not, they recommended restarting

Imaging

- When considering surgery in a patient with chronic ankle instability, do you request preoperative stress radiographs? YES / N0
- When considering surgery in a patient with chronic ankle instability, do you request a preoperative MRI? YES / N0

Functional ankle instability

We present a patient with only functional instability (the subjective feeling of ankle instability, recurrent, symptomatic ankle sprains; or both) but without mechanical instability (no instability at physical examination, negative stress radiographs), no other abnormalities.

- Is there a place for surgical treatment? YES / N0
- How long should non-surgical treatment be attempted before considering surgical treatment?
- What surgical treatment should be considered as first choice? Open, arthroscopic? debridement, repair, reconstruction, other?

Mechanical ankle instability

We present a patient with symptomatic mechanical instability (clear instability on physical examination, positive stress X-rays), no other abnormalities.

- How long should non-surgical treatment be attempted before considering surgical treatment?
- What surgical treatment should be considered as first choice? Open, arthroscopic? debridement, repair, reconstruction, other?

Patient related issues

In which patients do you prefer to perform a reconstruction above a repair?

- Obesity Repair / Reconstruction
- Ossicle > 1 cm diameter Repair / Reconstruction
- High-level sports Repair / Reconstruction
- Generalized hyperlaxity Repair / Reconstruction
- Positive stress radiographs Repair / Reconstruction
- MRI finding of CFL injury Repair / Reconstruction
- Poor ligament quality during surgery Repair / Reconstruction
- Suspicion of subtalar instability Repair / Reconstruction

Subtalar instability

- How do you assess subtalar instability? Physical examination? What kind of imaging do you perform?

Reconstruction of ATF and CFL?

If you consider a reconstruction of the ATFL, do you perform a reconstruction of the CFL? Almost always, almost never, it depends on...?

Fig. 1 Survey questionnaire

Table 1 Preoperative imaging

	Yes	No
When considering surgery in a patient with chronic ankle instability, do you request preoperative stress radiographs?	12 (40.0%)	18 (60.0%)
When considering surgery in a patient with chronic ankle instability, do you request preoperative MRI?	26 (86.7%)	4 (13.3%)

Table 2 Functional instability

Is there a place for surgical treatment?	Yes: 26 (86.7%)	No: 4 (13.3%)
For how long should non-surgical treatment be attempted before considering surgical treatment?	<1 month: none 1–3 month: 2 (6.7%) 3–6 months: 17 (56.6%) 6–12 months: 10 (33.3%) >1 year: 1 (3.3%)	
What surgical treatment should be considered as first choice? Open, arthroscopic? Debridement, repair, reconstruction, other?	Open debridement: none Endoscopic debridement: 6 (20.0%) Open repair: 3 (10.0%) Endoscopic repair: 12 (40.0%) Open reconstruction: 1 (3.3%) Endoscopic reconstruction: 1 (3.3%) Other: 3 (10.0%)	

rehabilitation. Most of the surgeons recommended at least 3–6 months of non-surgical treatment.

The responses to the question in terms of the best surgical technique to treat functional instability revealed greatly divided answers, and also led to questions regarding the exact cause of the patient's complaint. Some suggested causes were tight gastrocnemius, soft tissue impingement syndrome, lesions of the peroneal tendons, missed osteochondral lesions, and underestimated ligament injuries. Many surgeons recommended a second clinical assessment to ensure that all possible causes of the ankle problems had been ruled out. Several surgeons who proposed open repair of the lateral ligament complex recommended arthroscopic assessment of the joint prior to repair.

Mechanical instability (Table 3)

In contrast to patients with functional instability, most surgeons (23/30) appear to consider earlier surgery when clinical signs of instability were present. Most considered early surgery in high-level athletes with an acute grade III ankle ligament injury.Patient-related factors influence the choice of the surgeon for treatment (Table 4)

Table 3 Mechanical instability

For how long should non-surgical treatment be attempted before considering surgical treatment?	<1 month: 5 (16.7%) 1–3 months: 6 (20.0%) 3–6 months: 12 (40.0%) 6–12 months: 2 (6.7%) >1 year: 1 (3.3%) It depends: 4 (13.3%)
What surgical treatment should be considered as first choice? Open, arthroscopic? Debridement, repair, reconstruction, other?	Open repair: 9 (30.0%) Endoscopic repair: 14 (46.7%) Open reconstruction: 2 (6.7%) Endoscopic reconstruction: 3 (10.0%) Other: 2 (6.7%)

The surgeons were asked whether factors such as obesity, presence of an ossicle, or suspected subtalar instability would influence their choice of treatment. Generally, there was limited consensus about which technique would be chosen (Table 4). However, most surgeons still preferred to perform a repair in patients who were involved in high-level sports, patients with positive stress radiographs, and patients with a CFL rupture on MRI. Most surgeons preferred reconstruction in patients with generalized hyperlaxity and patients with poor ligament quality detected during surgery.

Assessment of subtalar instability

The surgeons were asked how they assess subtalar instability. Many different techniques were used, including newer techniques such as stress MRI and standing CT-scan with the foot in inversion. The surgeons agreed that it is difficult to assess subtalar instability, and no consensus was obtained (Table 5).

Whether or not CFL reconstruction is routinely performed (Table 6)

Surgeons frequently noted that during lateral ligament repair, subtalar instability should also be treated. Since

Table 4 Associated aspects

	Repair	Reconstruction
Obesity	16 (53.3%)	14 (46.7%)
Ossicle size >1 cm	16 (53.3%)	14 (46.7%)
High-level sports	25 (83.3%)	5 (16.7%)
Generalized hyperlaxity	12 (40.0%)	18 (60. 0%)
Positive stress radiographs	27 (90.0%)	3 (10.0%)
MRI finding of CFL injury	24 (80.0%)	6 (20.0%)
Poor ligament quality during surgery	9 (30.0%)	21 (70.0%)
Suspicion of subtalar instability	16 (53.3%)	14 (46.7%)

Table 5 Assessment of subtalar instability

How should subtalar instability be assessed?	
Clinical examination	24 (80.0%)
Stress radiographs	13 (40.3%)
MRI	8 (26.7%)
Arthroscopy	3 (10.0%)
Evaluation under anaesthesia	2 (6.7%)
Other	Stress MRI(1), standing CT(1)

Table 6 Reconstruction of the CFL

CFL reconstruction in addition to ATFL reconstruction?	
(almost) Always	18 (60.0%)
(almost) Never	4 (13.3%)
Depends on subtalar instability	6 (20.0%)
Depends on CFL quality	3 (10.0%)

there are connecting fibres between the ATFL and CFL, it is possible to tension the CFL during reattachment of the ATFL. Additionally, reinforcement using the extensor retinaculum, such as the Gould's modification, also stabilizes the subtalar joint.

Discussion

The main finding of the present study was that despite the lack of evidence-based studies there appears to be agreement on the best strategy for the treatment of CAI. This study has a high response rate among surgeons with significant experience in treatment and research of CAI.

The patient's history and a physical examination are the first and most important steps when lateral ankle instability is assessed. Although there are conflicting reports on the accuracy of clinical assessment of the degree of ligamentous injury using the anterior drawer and talar tilt tests [12], most participants felt confident in using those tests. In this study, for reasons of simplicity, only the most common patient without other pathology such as hindfoot varus, gastrocnemius tightness, tarsal coalition, osteochondral lesions were presented. However, those are important aspects which should be taken into account treating each patient [15, 39].

The use of preoperative imaging

Standard plain radiographs should include standing anteroposterior, lateral and mortise views and a comparative Saltzmann view [15]. Only 40% of the responding surgeons stated that they use stress radiographs because they were confident with their physical examination findings when testing for ligamentous laxity. This is in agreement with the literature, which suggests that with high specificity (up to 100%) but low sensitivity (57%) [39], dynamic radiographs only have diagnostic value if they are positive [11].

MRI has very high specificity and positive predictive value for establishing the diagnosis of ATFL and CFL lesions [19, 30, 36] and can be used for the assessment of associated pathology. Most of the surgeons in the present study (87%) routinely use MRI. However, the sensitivity of MRI is low and in a symptomatic patient with normal ligaments on MRI, arthroscopy may still be required for a definitive diagnosis [6, 9, 36]. In patients with CAI, there is a high percentage of patients with associated intra-articular pathology which may result in a symptomatic ankle despite a stable reconstruction [7, 9, 31]. Common intra-articular findings are synovitis, loose bodies, ossicles, chondral lesions, osteochondral lesions of the talus, adhesions and osteophytes [9, 22, 24, 31, 34, 41]. A thorough arthroscopic evaluation and treatment of intra-articular pathology prior to ligament surgery is recommended by several authors [9, 18, 22]. This recommendation is also followed by most participants in this study.

Nowadays, subtalar instability is difficult to diagnose, and this aspect is often overlooked as a component of traditional ankle instability [2, 3]. The present study confirms that there is no general consensus in terms of the best method for evaluating subtalar instability [33]. Although the Brodén view is widely used, several studies question its correlation with pathological subtalar laxity [16, 25, 33]. Seebauer et al. have recently reported using the MRI stress examination to assess subtalar and ankle instability [32], but further studies are needed to find a reliable and accessible test to assess subtalar instability.

The role of surgery in patients with functional instability

The precise cause of functional instability remains unknown, but there are probably multiple possible causes, such as proprioceptive and neuromuscular deficit; unrecognized subtalar instability; damaged ligaments; scar tissue; and micro-instability [17, 21, 36, 43]. This makes treatment in this group of patients difficult, and the role of surgery controversial, both with regard to timing and the type of procedure.

This study shows a consensus among experts that surgery may be considered in patients with prolonged complaints of functional instability. All surgeons agreed that non-surgical treatment should be advised before considering surgery in patients with CAI. Proprioceptive and neuromuscular deficits are probably important causes of functional instability [17], and the adequacy of any prior rehabilitation should be questioned. A minimum period of 3–6 months of physiotherapist-supervised rehabilitation, consisting of strengthening exercises of the active stabilizers of the ankle and proprioceptive training was recommended.

Several authors have published the results of endoscopic treatment of patients with functional instability. Takao found 100% abnormal ligaments in 14 patients with functional instability and concluded that a deficient ligament is one of the reasons for this instability [36]. Patients

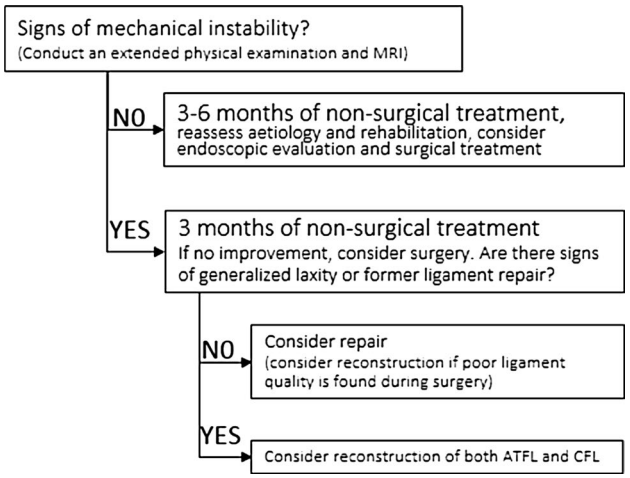

Fig. 2 Algorithm about chronic lateral ankle instability

were treated with AFTL reconstruction using a gracilis autograft, with good or excellent results being obtained in all cases. Arthroscopic assessment of the ATFL and ankle joint was recommended in patients with functional ankle instability. Kerr et al. found scar tissue in 93.1% of 72 patients with functional instability [21], concluding that scar tissue resulting in pain is one of the reasons for functional instability. Arthroscopic debridement of the scar tissue was performed, resulting in improvement in 72.2% of the patients. Vega et al. [43] reported abnormal lateral ligaments in 100% and synovitis or adhesions in 50% of the patients, concluding that micro-instability led to intra-articular ankle pathology and symptomatic instability.

The present study supports the use of arthroscopy in the assessment of concomitant pathologic lesions; however, no agreement was reached about what kind of treatment should be performed [26]. Further studies are needed on how to determine the characteristics of normal ligaments and how to grade abnormal ligaments endoscopically. The different surgical treatments should also be compared by controlled trials.

The role of surgery in patients with mechanical instability

Several studies support early surgical repair in grade III acute ankle sprains in high-level athletes [15, 20, 38, 40, 44]. Takao et al. compared non-operative functional treatment to primary surgical repair after an acute ankle sprain in athletes [38]. Non-surgical treatment had a failure rate of approximately 10% and a slower return to full athletic activity. The authors recommended that treatment should be tailored to suit each individual athlete.

Broström-Gould repair is still considered the gold-standard first-line treatment in patients with chronic lateral ankle ligament laxity requiring surgical treatment [15]. Although there are no studies to determine the best timing for surgery, most of the surgeons consulted recommended at least 3 months of non-operative treatment before recommending surgery.

Almost 80% of the surgeons recommended surgical repair (open or endoscopic) including in patients with lesions of the CFL or suspicion of subtalar instability, as previously discussed.

Only in patients with generalized hyperlaxity and poor ligament quality was reconstruction by grafting the preferred technique. Many surgeons used an endoscopic technique, although it is recognized that the group of surgeons selected for this study was highly experienced in this technically demanding procedure, which could be a source of bias. Moreover, as there is no evidence today favouring arthroscopic over open repair so, an open technique may be preferred or recommended, depending on the surgeon's experience. When performing ATFL reconstruction, most surgeons also recommended reconstructing the CFL, especially in patients where there is a proven lesion of the CFL or suspicion of subtalar instability. Further research is needed to prove if this is sufficient to treat major subtalar instability.

Algorithm

Based on the currently available literature and the points of agreement reported in this study, a treatment algorithm is proposed (Fig. 2). This is necessarily based on expert opinion (level V) rather than on clinical evidence, as there is a lack of high-level evidence studies to determine a treatment protocol. Although the timing of the transition from acute to chronic lateral ankle instability is not clearly defined in literature, this study gives guidelines about the timing of the treatment. This algorithm has been agreed by the surgeons who participated in the study and may be a useful guideline in clinical practice when treating patients with CAI.

An important limitation of this study is the fact that it is based purely on expert opinion, and not on a clinical, controlled, study. A recent meta-analysis highlighted the need for prospective and preferably randomized comparative studies, to assist in making evidence-based recommendations [26]. Due to the high response rate and strict inclusion criteria, this study offers valuable information about the current treatment strategies. Owing to the fact that only surgeons were included in this study, there is obviously some bias. Moreover, this group might not be representative of the general population of orthopaedic surgeons, reflected by the high percentage of the use of arthroscopic-assisted techniques. However, all the participants have clinical experience with various methods of treating CAI, and they work in very different geographic and clinical environments, so it is expected that a reasonably balanced and global perspective would be obtained.

Conclusion

This study presents several areas of agreement among experts in the treatment of patients with CAI and proposes a treatment algorithm that may be used as a guideline in the treatment of patients with CAI. Experts agree that stress radiographs appear to have limited use compared to MRI, which was considered the most valuable imaging examination in preoperative planning, enabling further assessment of comorbidities. Broström-Gould repair is still considered the gold-standard treatment in patients with chronic lateral ankle ligament laxity requiring surgical treatment. However, most surgeons preferred reconstruction in patients with generalized hyperlaxity and patients with poor ligament quality detected during surgery.

Despite the general indication for non-surgical treatment as the initial approach in most patients, there is a consensus towards earlier surgical treatment in patients with mechanical instability, and in top-level athletes.

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ESSKA-AFAS Ankle Instability Group Contributors Jorge Batista, Thomas Bauer, James Calder, Woojin Choi, Mark Glazebrook, Ali Ghorbani, Stéphane Guillo, Jon Karlsson, SW Kong, Jin Woo Lee, Frederick Michels, Andy Molloy, Peter Mangone, Kentaro Matsui, Caio Nery, Saturo Ozeki, Chris Pearce, Hélder Pereira, Anthony Perera, Bas Pijnenburg, Fernando Raduan, James Stone, Masato Takao, Yves Tourné.

Compliance with ethical standards

Conflict of interest Each author certifies that he has no commercial associations that might pose a conflict of interest in connection with the submitted article.

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