Hôpital de La Tour | swiss olympic | Medical Center

François FOURCHET PT, PhD

Ankle sprain and Chronic Ankle Instability Management

LIBM Laboratoire Interuniversitaire de Biologie de la Motricité

International Ankle Consortium

SFMKS Société Française des Masseurs Kinésithérapeutes du Sport

Société Française
des Masseurs Kinésithérapeutes
du Sport

Ankle injuries

Anatomy

UNIVERSITÉ SAVOIE MONT BLANC

Brice PICOT :
Kinésithérapeute du Sport-PhD
Société Française des Masseurs Kinésithérapeutes du Sport

Hôpital de La Tour | swiss olympic | Medical Center

François FOURCHET
Kinésithérapeute du Sport-Ostéopathe-PhD

Anatomy

✓ Synergy:

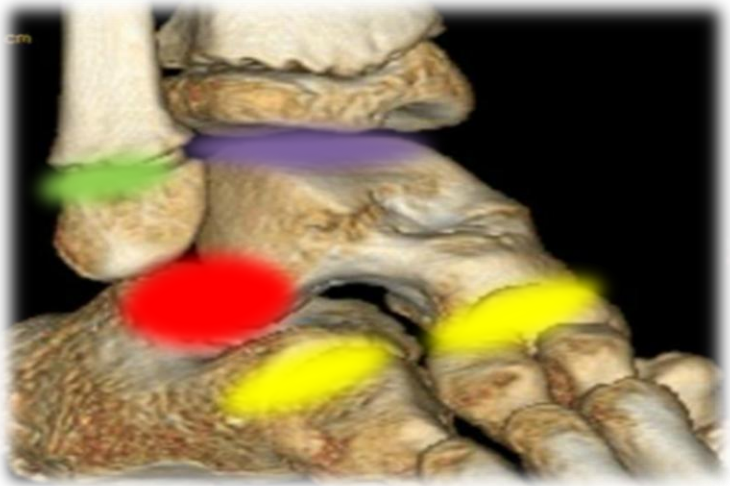
> Tibio-fib sup

> Tibio-talar

> Tibio-fib inf

> Sub talar

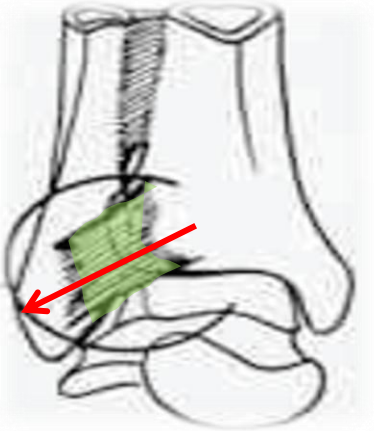
> Tarsus transv.

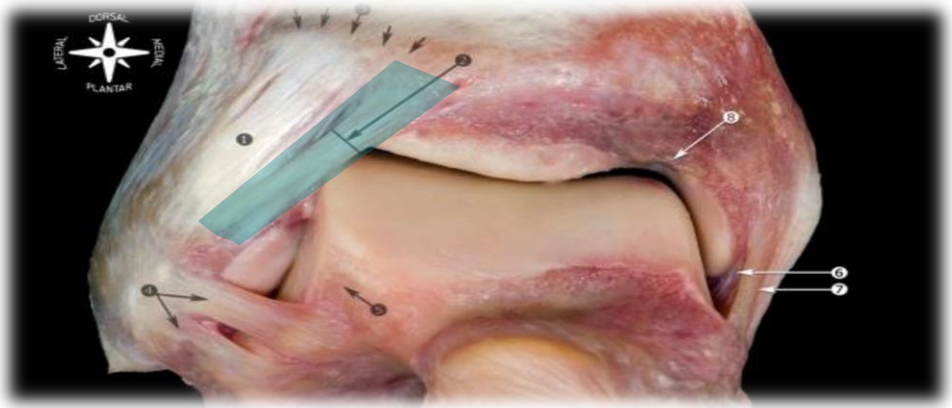


Tibio-fib. inf,. (Syndesmosis)

✓ **ligament:**

= AITFL



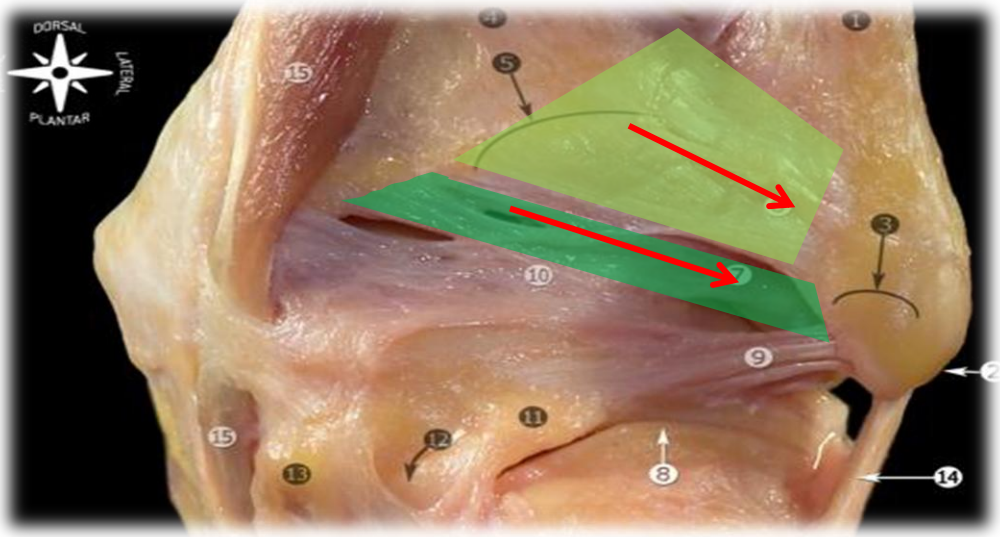


Bassett Ligament

!!! Hypertrophy !!!

Syndesmosis

- ✓ Ligament tibio fib. Inf. et post.:
  - superficial
    - Deep => Labrum



Knee Surg Sports Traumatol Arthrosc (2010) 18:557–569
DOI 10.1007/s00167-010-1100-x

ANKLE

Anatomy of the ankle ligaments: a pictorial essay

Pau Golanó · Jordi Vega · Peter A. J. de Leeuw · Francesc Malagelada · M. Cristina Manzanares · Víctor Götzens · C. Niek van Dijk

Received: 13 February 2010 / Accepted: 16 February 2010 / Published online: 23 March 2010

Abstract Understanding the anatomy of the ankle ligaments is important for correct diagnosis and treatment. Ankle ligament injury is the most frequent cause of acute ankle pain. Chronic ankle pain often finds its cause in laxity of one of the ankle ligaments. In this pictorial essay, the ligaments around the ankle are grouped, depending on their anatomic orientation, and each of the ankle ligaments is discussed in detail.

Keywords Ankle anatomy · Lateral collateral ligament · Medial collateral ligament · Ankle impingement · Ankle sprain

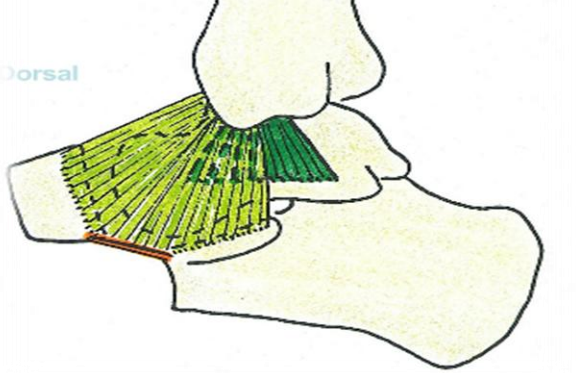
Introduction

Despite the fact that the ankle ligaments are prone to injury during the fast majority of sports, literature focusing on the ankle ligaments is rare. Proper anatomic knowledge of the different ligaments is important for a correct diagnosis and subsequent treatment.

The most common mechanism of injury to the ankle ligaments is inversion of the foot [4, 33]. With this mechanism of injury, the anterior talofibular ligament is the first or only ligament to sustain injury [43]. A total rupture involves the calcaneofibular ligament and the posterior talofibular ligaments as well [9]. An eversion injury will

Golano et al. *@KSTA* 2010

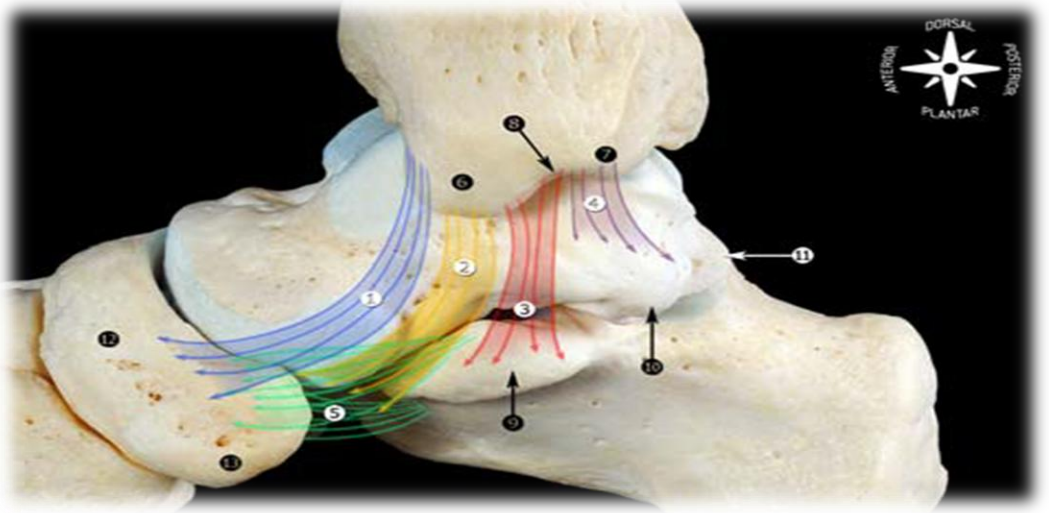
Tibio-talar joint



✓ Medial Collateral Ligament:

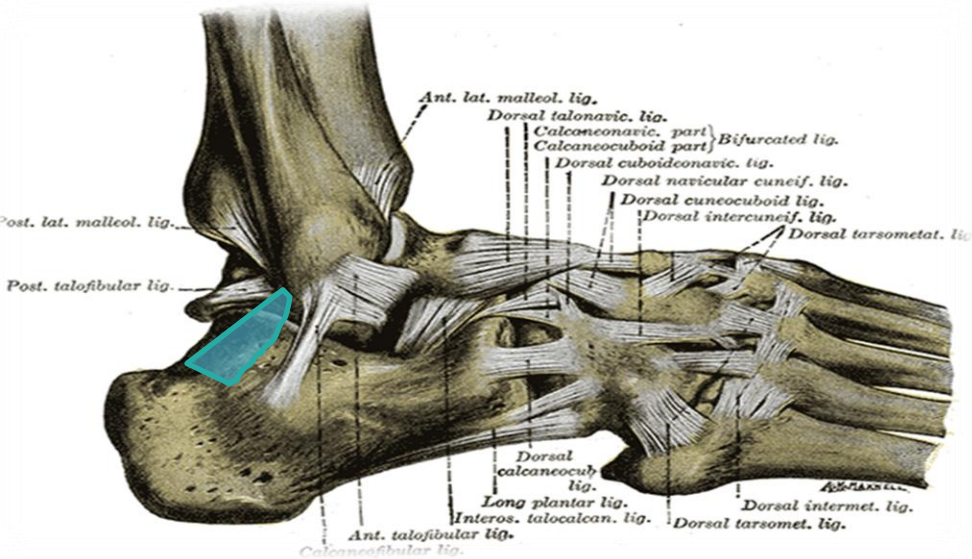
Tibio-navicul.
Tibio spring
Tibio-calcaneal

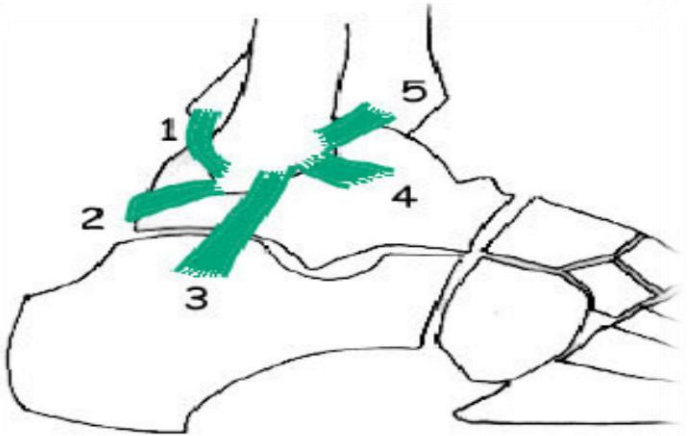
Spring ligament



Tibio-talar joint

✓ Lateral collateral ligament:

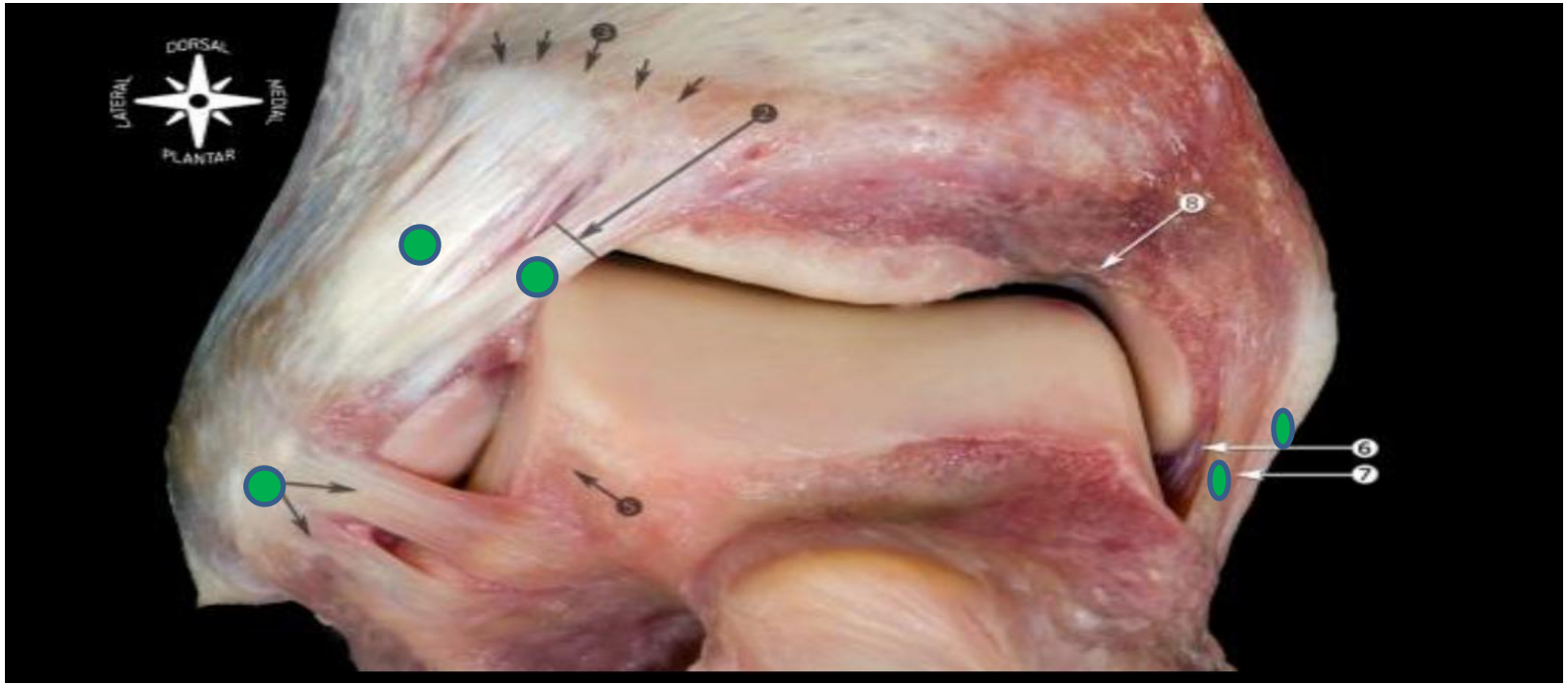




- Talo-fib. Ant. bundle
- Calcan.-fib. bundle
- Talo-fib. Post bundle

Resistance

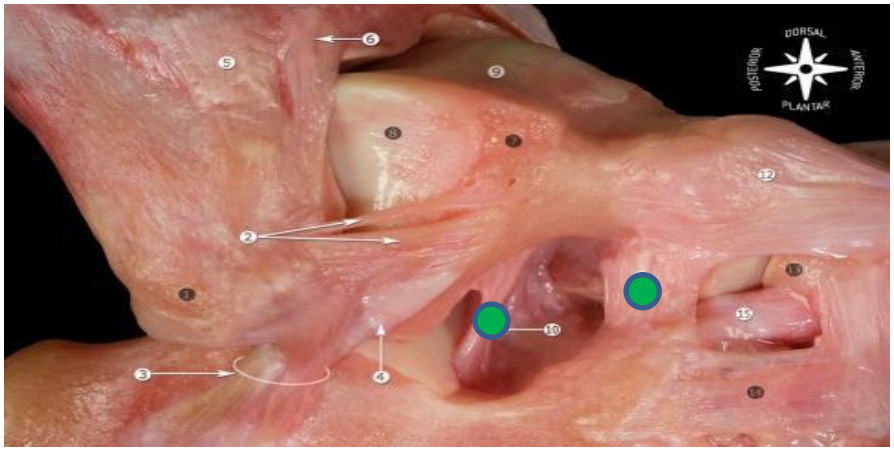
From Netter, modified.

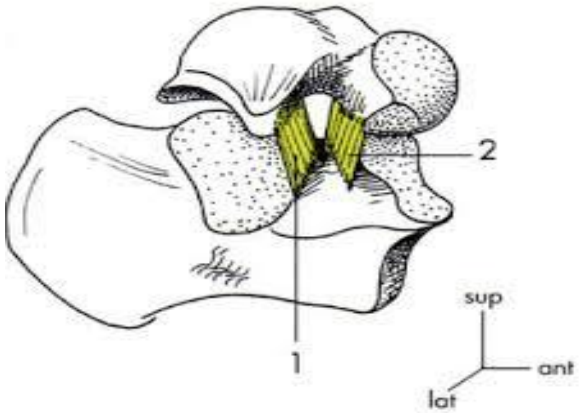


Golano et al. *@KSTA* 2010

Subtalar joint

- Talo-calcan. Interosseus Ligaments
- Cervical Ligament (talo calcan. Ant.-lat.)

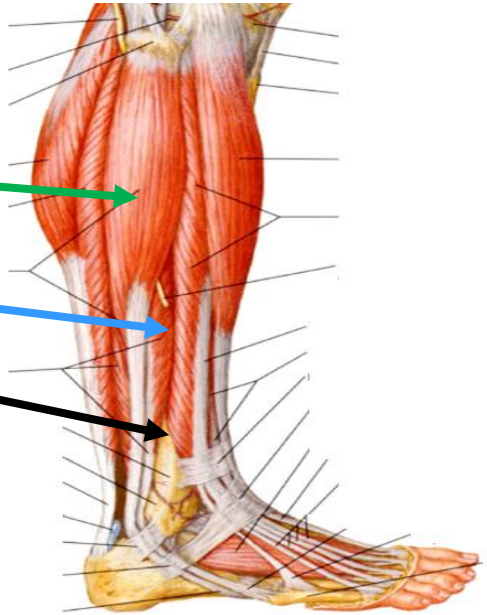




Muscles on the lateral side

Borne et al. 2002

- Fibularis longus
- Fibularis brevis
- Third Fibularis (90% !!)
- Fourth Fibularis (10-20%)



From Netter

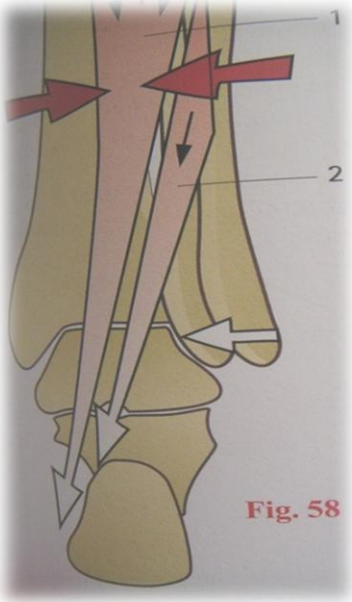
✓ Third Fibularis

The only proper evertor

Bony stability

- Posterior muscles contractions role+++ (LFH + TP)

Closed pack



Société Française
des Masseurs Kinésithérapeutes
du Sport

Ankle Sprain

Injury mechanisms and risk factors

UNIVERSITÉ SAVOIE MONT BLANC

Brice PICOT :
Kinésithérapeute du Sport-PhD
Société Française des Masseurs Kinésithérapeutes du Sport

Hôpital de La Tour | swiss olympic Medical Center

François FOURCHET
Kinésithérapeute du Sport-Ostéopathe-PhD

What is Chronic Ankle Instability?

BJSM Online First, published on November 19, 2013 as 10.1136/bjsports-2013-093175

Consensus statement

Selection criteria for patients with chronic ankle instability in controlled research: a position statement of the International Ankle Consortium

Phillip A Gribble,[1] Eamonn Delahunt,[2] Chris Bleakley,[3] Brian Caulfield,[4] Carrie Docherty,[5] François Fourchet,[6] Daniel Tik-Pui Fong,[7] Jay Hertel,[8] Claire Hiller,[9] Thomas Kaminski,[10] Patrick McKeon,[11] Kathryn Refshauge,[9] Philip van der Wees,[12] Bill Vincenzino,[13] Erik Wikstrom[14]

… and what is Ankle Sprain?

Ankle sprains specificity:

Epidemiology & recurrences

Hôpital de La Tour
Avenue J.-D. Maillard 3
CH-1217 Meyrin/Genève

François FOURCHET

Dr Boris Gojanovic

francois.fourchet@latour.ch

A piece of data…

6500… Lateral ankle sprains per day in France

2,400,000 Lateral ankle sprains per year in France

Lateral ankle sprains per day= 1/10,000 pax

30 à 40x > ACL

1/2 Lateral ankle sprain … no show

We miss a lot of patients/cases!!!

We do not treat early enough the others!!!

BJSM Online First, published on June 3, 2016 as 10.1136/bjsports-2016-096188

Consensus statement

2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains

Phillip A Gribble,[1] Chris M Bleakley,[2] Brian M Caulfield,[3] Carrie L Docherty,[4] François Fourchet,[5] Daniel Tik-Pui Fong,[6] Jay Hertel,[7] Claire E Hiller,[8] Thomas W Kaminski,[9] Patrick O McKeon,[10] Kathryn M Refshauge,[8] Evert A Verhagen,[11] Bill T Vicenzino,[12] Erik A Wikstrom,[13] Eamonn Delahunt[14]

RECURRENCE+++

Rate of recurrence: **40-70%** (Yeung et al., 1994; Gerber et al., 1998; IAC 2016)

BJSM Online First, published on June 3, 2016 as 10.1136/bjsports-2016-096188
Consensus statement

2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains

Phillip A Gribble,[1] Chris M Bleakley,[2] Brian M Caulfield,[3] Carrie L Docherty,[4] François Fourchet,[5] Daniel Tik-Pui Fong,[6] Jay Hertel,[7] Claire E Hiller,[8] Thomas W Kaminski,[9] Patrick O McKeon,[10] Kathryn M Refshauge,[8] Evert A Verhagen,[11] Bill T Vicenzino,[12] Erik A Wikstrom,[13] Eamonn Delahunt[14]

RECURRENCE → Chronique ankle instability

Mechanical or functional causes of CAI?

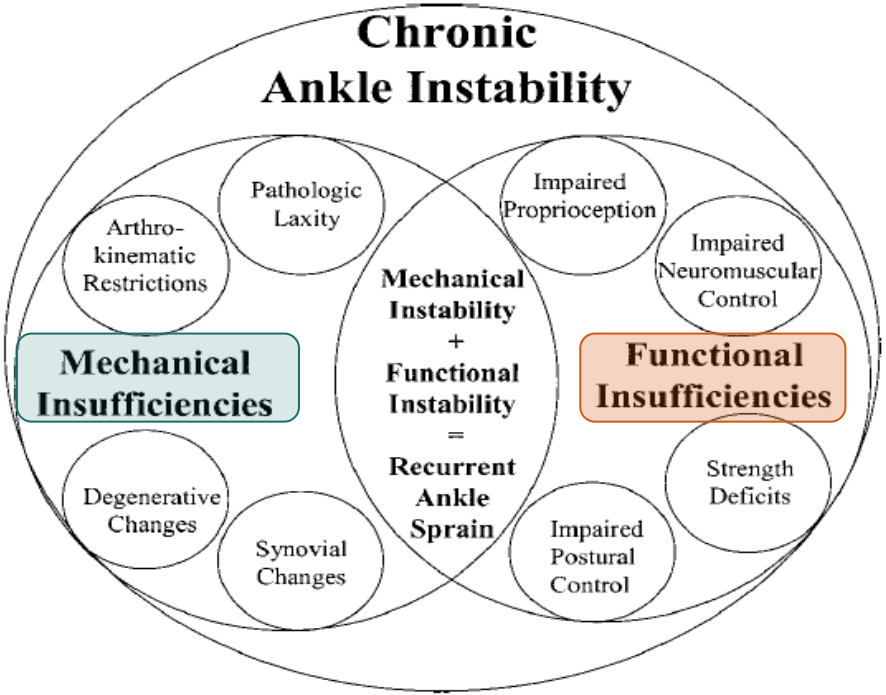


Figure 5. Paradigm of mechanical and functional insufficiencies that contribute to chronic ankle instability.

Hertel et al. (2002)

BJSM Online First, published on June 3, 2016 as 10.1136/bjsports-2016-096188
Consensus statement

2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains

Phillip A Gribble,[1] Chris M Bleakley,[2] Brian M Caulfield,[3] Carrie L Docherty,[4] François Fourchet,[5] Daniel Tik-Pui Fong,[6] Jay Hertel,[7] Claire E Hiller,[8] Thomas W Kaminski,[9] Patrick O McKeon,[10] Kathryn M Refshauge,[8] Evert A Verhagen,[11] Bill T Vicenzino,[12] Erik A Wikstrom,[13] Eamonn Delahunt[14]

RECURRENCE → Chronique ankle instability

Chronic ankle instability: … 25%, 50%, … 70% … after initial sprain

BJSM Online First, published on June 3, 2016 as 10.1136/bjsports-2016-096188
Consensus statement

2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains

Phillip A Gribble,[1] Chris M Bleakley,[2] Brian M Caulfield,[3] Carrie L Docherty,[4] François Fourchet,[5] Daniel Tik-Pui Fong,[6] Jay Hertel,[7] Claire E Hiller,[8] Thomas W Kaminski,[9] Patrick O McKeon,[10] Kathryn M Refshauge,[8] Evert A Verhagen,[11] Bill T Vicenzino,[12] Erik A Wikstrom,[13] Eamonn Delahunt[14]

Chronic ankle instability → Osteoarthritis

70%-80% post traumatic OA…

… younger

→ Sprains = 15 à 20% of future OA at the ankle

Inclusion Criteria

1. A history of at least 1 significant ankle sprain
   - The initial sprain must have occurred at least 12 months prior to study enrollment
   - Was associated with inflammatory symptoms (pain, swelling, etc)
   - Created at least 1 interrupted day of desired physical activity
   - The most recent injury must have occurred more than 3 months prior to study enrollment
   - We endorse the definition of an ankle sprain as "an acute traumatic injury to the lateral ligament complex of the ankle joint as a result of excessive inversion of the rear foot or a combined plantar flexion and adduction of the foot. This usually results in some initial deficits of function and disability"[15]
2. A history of the previously injured ankle joint "giving way," and/or recurrent sprain, and/or "feelings of instability."
   - We endorse the definition of "giving way" as "the regular occurrence of uncontrolled and unpredictable episodes of excessive inversion of the rear foot (usually experienced during initial contact during walking or running), which do not result in an acute lateral ankle sprain"[15]
     - Specifically, participants should report at least 2 episodes of giving way in the 6 months prior to study enrollment
   - We endorse the definition of "recurrent sprain" as "two or more sprains to the same ankle"[15]
   - We endorse the definition of "feeling of ankle joint instability" as "the situation whereby during activities of daily living (ADL) and sporting activities the subject feels that the ankle joint is unstable and is usually associated with the fear of sustaining an acute ligament sprain"[15]
     - Specifically, self-reported ankle instability should be confirmed with a validated ankle instability–specific questionnaire using the associated cutoff score. Currently recommended questionnaires:
       - Ankle Instability Instrument[16]: answer "yes" to at least 5 yes/no questions (this should include question 1 plus 4 others)
       - Cumberland Ankle Instability Tool[26]: score of ≤ 24
       - Identification of Functional Ankle Instability[40]: score of ≥ 11
3. A general self-reported foot and ankle function questionnaire is recommended to describe the level of disability of the cohort, but should only be an inclusion criterion if the level of self-reported function is important to the research question. Currently endorsed questionnaires:
   - Foot and Ankle Ability Measure[11]: activities of daily living subscale <90%, sport subscale <80%
   - Foot and Ankle Outcome Score[37]: score of <75% in 3 or more categories

Gribble et al. BJSM 2013

The *catastrophic cascade*

Lateral Ankle Sprain

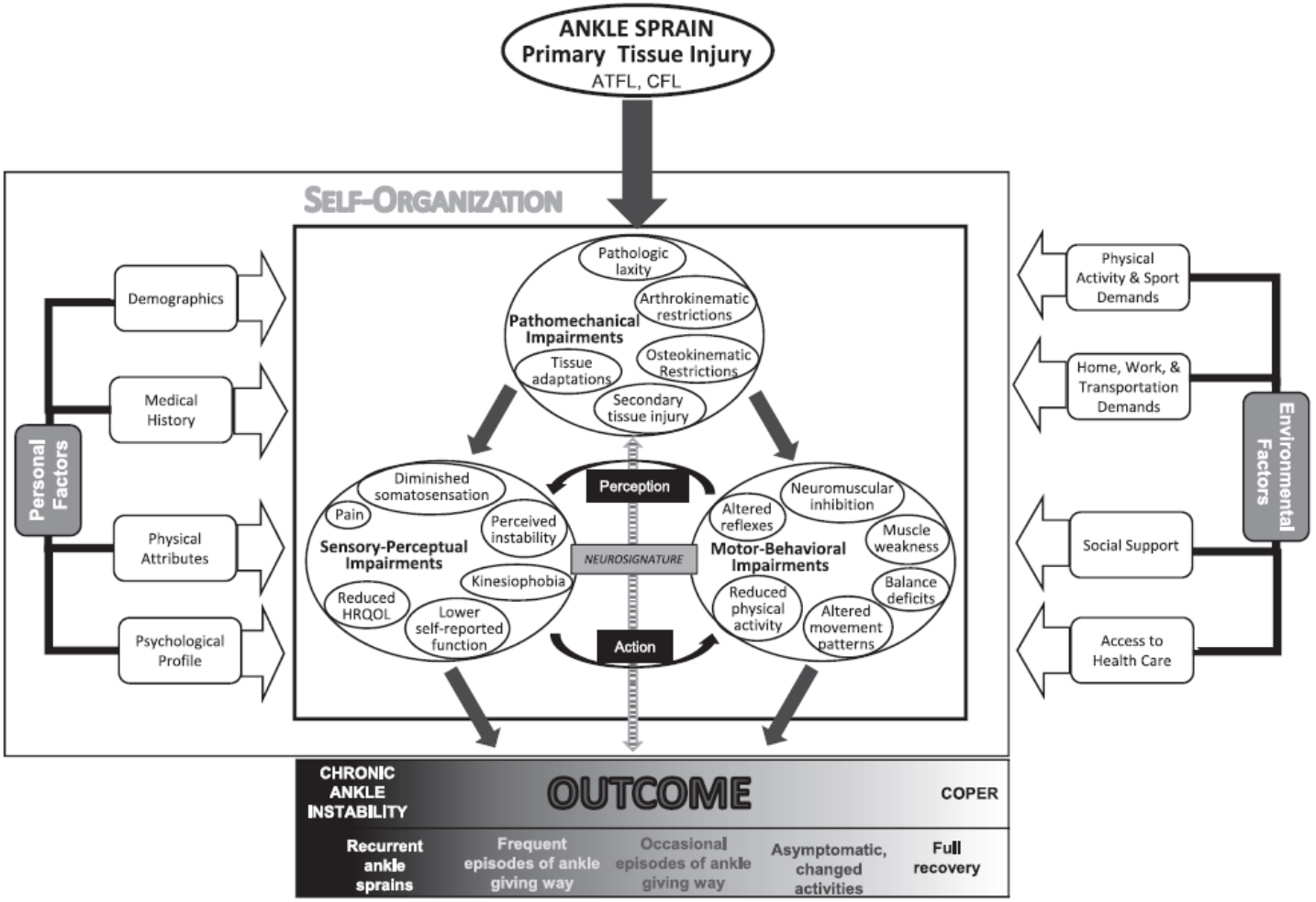
→ Recurrence

→ Chronic Ankle Instability

→ Osteo Arthritis

Hôpital de La Tour | swiss olympic Medical Center

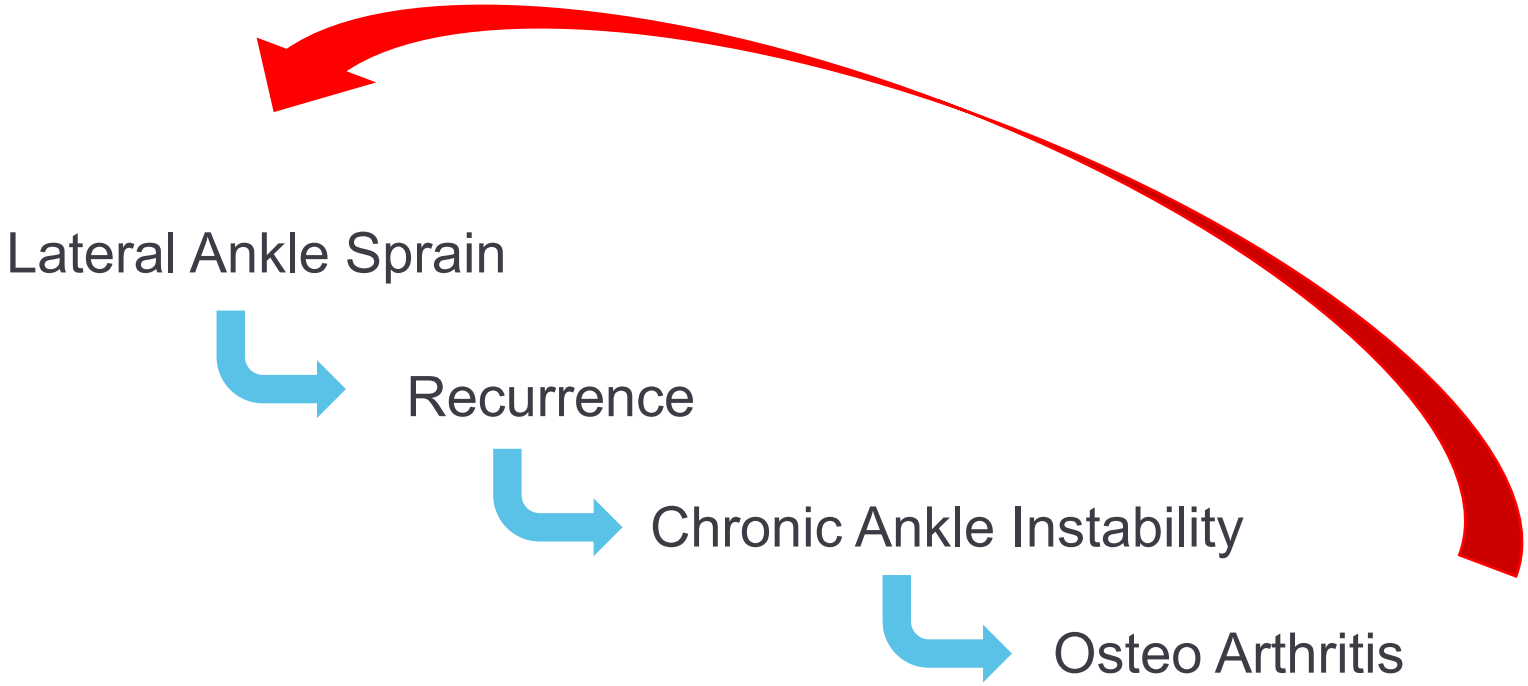
Multi-factorial



Jay Hertel
Journal of Athletic Training
2019

Figure 1. The updated model of chronic ankle instability (CAI). The outcome is determined at least 12 months after the initial ankle sprain. Abbreviations: ATFL, anterior talofibular ligament; CFL, calcaneofibular ligament; HRQOL, health-related quality of life.

The *catastrophic cascade*



Journal of Athletic Training 2019;54(6):671–675
doi: 10.4085/1062-6050-428-17

www.natajournals.org

Original Research

Lack of Medical Treatment From a Medical Professional After an Ankle Sprain

Tricia Hubbard-Turner, PhD, ATC, FACSM

Department of Kinesiology, University of North Carolina, Charlotte

Context: Despite the prevalence of ankle sprains and the potential for developing chronic ankle instability and ankle osteoarthritis, ankle sprains are often perceived as an innocuous injury.

Objective: To understand the initial management and treatment sought by patients after a lateral ankle sprain (LAS) and to identify any differences in subjective function and self-reported injury.

Design: Cross-sectional study.

Setting: Research laboratory.

Patients or Other Participants: A total of 175 participants with chronic ankle instability (73 men, 102 women; age = 20.9 ± 3.4 years, height = 173.5 ± 13.2 cm, mass = 81.4 ± 24.6 kg) were involved in the study.

Main Outcome Measure(s): Participants were administered a questionnaire regarding their initial LAS. All participants also completed the Foot and Ankle Ability Measure (FAAM). The primary questions of interest were (1) Did the participants seek treatment from a medical professional for their initial LAS? (2) Did the participants perform rehabilitation? (3) Was the initial LAS immobilized? and (4) Did the participants use crutches? The other variables measured were scores on the FAAM and the FAAM Sports subscale, total number of ankle sprains, and incidents of giving way.

Results: Sixty-four percent of participants did not seek medical treatment after their LAS. Those who did not seek medical treatment scored worse on the FAAM (81.21% ± 3.1% versus 89.23% ± 2.8%, $P = .03$) and the FAAM Sports subscale (72.34% ± 5.3% versus 81.26% ± 3.1%, $P = .001$). Those not seeking treatment also reported more ankle sprains since the initial injury (4.7 ± 2.4 versus 1.9 ± 0.90, $P = .02$) and more incidents of giving way each month (3.8 ± 1.9 versus 1.1 ± 0.87, $P = .04$).

Conclusions: It is not surprising that those who did not seek medical treatment for their LASs had worse subjective function, more ankle sprains, and more incidents of the ankle giving way. The public needs to be educated on the significance of ankle sprains and the need for medical attention to provide appropriate management. However, we also need to continue to evaluate initial management and rehabilitation to ensure that those who seek treatment receive the best care in order to reduce reinjury rates.

Key Words: exercise, physical activity, rehabilitation, function

Who comes?

*« **64%** of participants did not seek medical treatment after their LAS »*

Key Points

- The majority of participants in this study did not seek medical treatment for their initial lateral ankle sprains.
- Those who did not seek medical treatment for their ankle sprains scored worse on the Foot and Ankle Ability Measure.
- The public needs to be educated on the significance of an ankle sprain and the need for proper treatment and management to prevent long-term joint dysfunction.

Multifactorial

so each factor or parameter must be assessed

1.Clinical examination

ROAST (2019) : Rehabilitation Oriented ASsesmenT

Consensus statement

Clinical assessment of acute lateral ankle sprain injuries (ROAST): 2019 consensus statement and recommendations of the International Ankle Consortium

Eamonn Delahunt,[1,2] Chris M Bleakley,[3] Daniela S Bossard,[1,2] Brian M Caulfield,[1,4] Carrie L Docherty,[5] Cailbhe Doherty,[4] François Fourchet,[6] Daniel T Fong,[7] Jay Hertel,[8] Claire E Hiller,[9] Thomas W Kaminski,[10] Patrick O McKeon,[11] Kathryn M Refshauge,[9] Alexandria Remus,[4] Evert Verhagen,[12] Bill T Vicenzino,[13] Erik A Wikstrom,[14] Phillip A Gribble[15]

- **Assess and quantify the deficits contributing to the cascade: sprain - recurrence – CAI – osteoarthritis**
- **Enable rehabilitation to be directed according to the deficits found: "à la carte rehabilitation".**

Delahunt et al. (2019)

ROAST (2019)

Assessments

Relationships with CAI

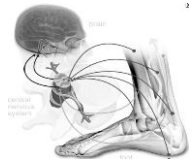
Best tests

Table 1 International Ankle Consortium ROAST

What clinicians should assess following acute lateral ankle sprain injury	Why?	How?
Ankle joint pain	Guide progression of exercise-based rehabilitation. Assess the efficacy of treatments implemented.	Numeric rating scale for pain.[35] FADI.[36]
Ankle joint swelling	Swelling can cause arthrogenic muscle inhibition. Guide progression of exercise-based rehabilitation. Evaluate the efficacy of treatments implemented.	Figure-of-eight.[38–41]
Ankle joint range of motion	High propensity for the development of a dorsiflexion deficit. Impairments in ankle joint range of motion are consistently identified in individuals with CAI.	Weight-bearing lunge test.[44–46]
Ankle joint arthrokinematics	Disruption in ankle joint arthrokinematics can result in a dorsiflexion deficit. Impairments in ankle joint arthrokinematics are regularly identified in individuals with CAI.	Posterior talar glide test.[48]
Ankle joint muscle strength	Impairments in ankle joint strength compromise the functional integrity of the ankle joint. Impairments in ankle joint strength are regularly identified in individuals with CAI.	Hand-held dynamometry.[53]
Static postural balance	Impairments in static postural balance are consistently identified in individuals with CAI.	BESS.[56] FLT.[57]
Dynamic postural balance	Impairments in dynamic postural balance are consistently identified in individuals with CAI.	SEBT.[58]
Gait	Impairments in gait are consistently identified in individuals with CAI.	Visual assessment for antalgic gait.
Physical activity level	Guide the specificity of exercise-based rehabilitation.	Tegner activity-level scale.[63]
Ankle joint specific patient-reported outcome measures	Evaluate the efficacy of treatments implemented.	FADI.[36] FAAM.[65]

BESS, Balance Error Scoring System; CAI, chronic ankle instability; FAAM, Foot and Ankle Ability Measure; FADI, Foot and Ankle Disability Index; FLT, Foot Lift Test; ROAST, Rehabilitation-Oriented AS-sessmenT; SEBT, Star Excursion Balance Test.

Delahunt et al. (2019)



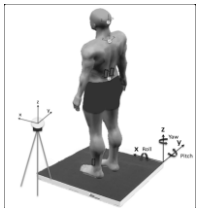
Proprioceptive deficit
(De Noronha 2013, Kobayashi 2016)

Evertors weakness
(Kobayashi 2016, Terrier et al. 2016)

Dynamic postural stabilty alteration
(Suda et al. 2009)

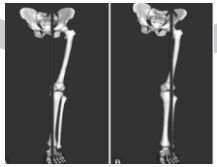
Sprain medical history
(McGuine 2006, DeNoronha 2012)

RECURRENCE INSTABILITY

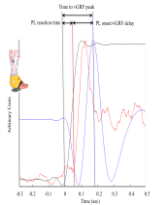


Static postural stabilty alteration
(McKeon et al. 2008, Hertel et al. 2008)

Limitation DF ROM
(Pope 1998, De Noronha 2006, Kobayashi 2013)



Hip abductors weakness
(Lee et Powers 2013)



Fibularis reaction time
(Hoch et al. 2014)

Courtoisie Picot B.

Multifactorial,

meaning that each factor or parameter has to be addressed

2.Treatement

Quelques notions importantes… et trop souvent méconnues

- L'amplitude de flexion dorsale doit absolument être recouvrée afin d'éviter les compensations à long terme.
- Les éverseurs doivent absolument être testés quantitativement (dynamomètre à main) et renforcés (en analytique et en fonctionnel) si besoin. Les autres muscles du pied et de la cheville (les inverseurs ni les muscles intrinsèques du pied notamment) ne doivent pas être oubliés.
- Exercises aimed at the skill of static/dynamic postural balance should preferably be practised on stable ground (or at least with very little instability) and in unipodal support as soon as possible, but with strong perturbations applied to the upper body or contralateral side. This is important in order to encourage distal (foot/ankle) rather than proximal (lumbopelvic-femoral) loading.
- Walking gait can be filmed from the back and in slow motion, or better still, assessed on an instrumented treadmill if possible, in order to identify any movement of the step exclusively on the lateral edge of the foot (without pronation). This indicates a lack of activation of the fibular muscles, which can be corrected by specific rehabilitation of these muscles.

Multifactorial,

so each factor or parameter must be treated..... until full return to play.

3.RTP

Hôpital de La Tour | swiss olympic Medical Center

BJSM Online First, published on May 25, 2016 as 10.1136/bjsports-2016-096278

Consensus statement

2016 Consensus statement on return to sport from the First World Congress in Sports Physical Therapy, Bern

Clare L Ardern,[1,2,3] Philip Glasgow,[4,5] Anthony Schneiders,[6] Erik Witvrouw,[1,7] Benjamin Clarsen,[8,9] Ann Cools,[7] Boris Gojanovic,[10,11] Steffan Griffin,[12] Karim M Khan,[13] Håvard Moksnes,[8,9] Stephen A Mutch,[14,15] Nicola Phillips,[16] Gustaaf Reurink,[17] Robin Sadler,[18] Karin Grävare Silbernagel,[19] Kristian Thorborg,[20,21] Arnlaug Wangensteen,[1,8] Kevin E Wilk,[22] Mario Bizzini[23]

Hôpital de La Tour | swiss olympic Medical Center

Ardern et al. *@BJSM* **2016**

1. INJURY MANAGEMENT

STAKEHOLDERS
clinicians, coaches, family organisation, management

ROLES
Definition, competence project leader identified

NEEDS
Assessment & management

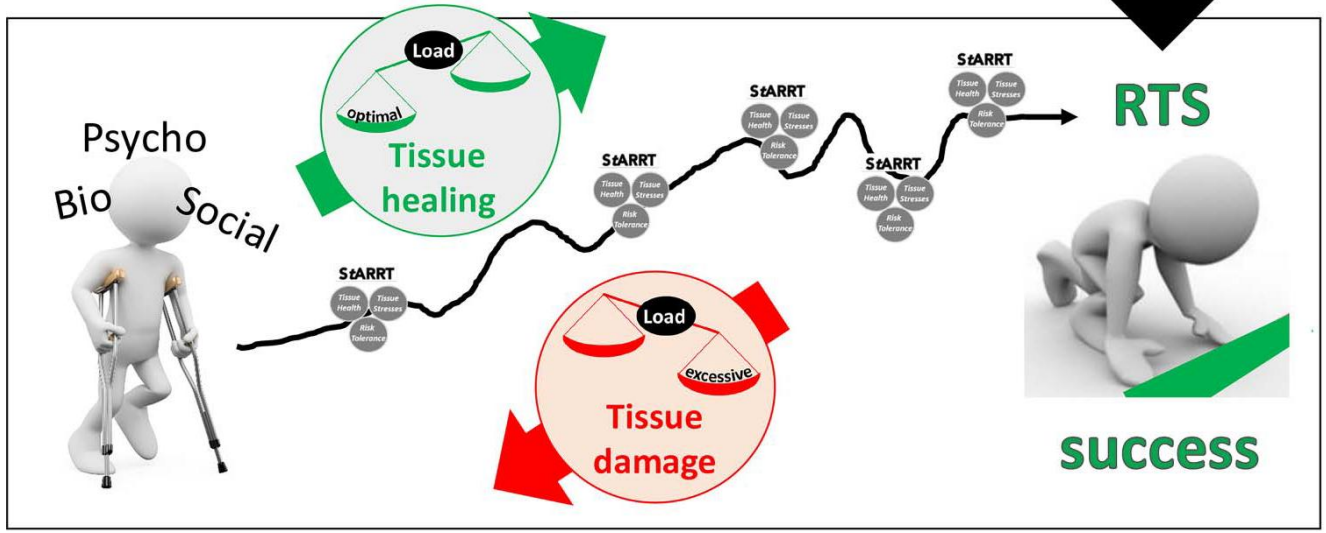
GOALS
SMART principles applied

MONITORING
Functional tests, health, well being, motivation

COMMUNICATION
Systematic, efficient, informative → all stakeholders

+ **StARRT**: Tissue health, Tissue stresses, Risk tolerance = **SHARED DECISION MAKING**

2. CLINICAL REHABILITATION



Hôpital de La Tour | swiss olympic Medical Center

Ardern et al. *@BJSM* **2016**

RTP criteria following lateral ankle sprain

DELPHI PROCESS INTERNATIONAL

Smith et al., **2020**

Return to sport decisions after an acute lateral ankle sprain injury: introducing the PAASS framework—an international multidisciplinary consensus

Michelle D Smith ,[1] Bill Vicenzino ,[1] Roald Bahr ,[2,3] Thomas Bandholm ,[4,5] Rosalyn Cooke ,[6] Luciana De Michelis Mendonça ,[7,8] François Fourchet,[9,10] Philip Glasgow,[11,12] Phillip A Gribble,[13] Lee Herrington,[6,14] Claire E Hiller ,[15] Sae Yong Lee,[16,17] Andrea Macaluso ,[18,19] Romain Meeusen,[20] Oluwatoyosi B A Owoeye ,[21,22] Duncan Reid,[23] Bruno Tassignon ,[20] Masafumi Terada ,[24] Kristian Thorborg ,[25,26] Evert Verhagen ,[27] Jo Verschueren,[20] Dan Wang,[28] Rod Whiteley ,[3,29] Erik A Wikstrom ,[30] Eamonn Delahunt [31,32]

Br J Sports Med: first published as 10.1136/bjsports-2021-1

Conclusions

- **Chronic ankle instability is collateral damage:**
  - **trivialisation of lateral ankle sprains**
  - **combined with botched or stereotyped assessments and treatments.**

- **These failures cost our patients and our healthcare systems dearly.**

- **At present, the scientific literature provides all the information needed for proper management of these conditions, thanks in particular to the work of the International Ankle Consortium.**

Understanding the extent of the problem

Consensus statement

2016 consensus statement of the International Ankle Consortium: prevalence, impact and long-term consequences of lateral ankle sprains

Phillip A Gribble,[1] Chris M Bleakley,[2] Brian M Caulfield,[3] Carrie L Docherty,[4] François Fourchet,[5] Daniel Tik-Pui Fong,[6] Jay Hertel,[7] Claire E Hiller,[8] Thomas W Kaminski,[9] Patrick O McKeon,[10] Kathryn M Refshauge,[8] Evert A Verhagen,[11] Bill T Vicenzino,[12] Erik A Wikstrom,[13] Eamonn Delahunt[14]

First LAS

↓

Recurrences *(30-70%)*

↓

CAI *(40%)*

↓

OA *(15-20%)*

70%-80% are post traumatic

Valderrabano et al. *@AJSM* **2006,** Gribble et al. *@BJSM* **2016**

Who is who?

Healthy

« Coper »

Instable

Who is who?

Healthy

- No history of LAS

« Indivuals with no history of Lateral Ankle Sprain (LAS) » *(Hertel et al. 2002)*

Sportif « coper »

- First LAS « serious » or « severe »
- RTP without instability
- (> 12 mois)
- Minimal or no functional impairments

"individuals who have suffered an LAS but failed to develop CAI" *(Wikstrom et al. 2013)*

Sportif instable

- Frequent « giving way »
- Instability feeling
- Frequent LAS with or without mechanical instability
- Pain and loss of function
- Limititiona in former sport activities

30%-70% of patients with former LAS
((Hertel et al. 2002, Anandacoomarasamy et al. 2005, Hershkovich et al. 2015)

CAIT

QUESTIONNAIRE

French version of the Cumberland Ankle Instability Tool (F-CAIT). Echelle d'auto-évaluation pour les instabilités de cheville

Geerinck A et al. French translation and validation of the Cumberland Ankle Instability Tool, an instrument for measuring functional ankle instability. Foot Ankle Surg. 2019 May 9. pii: S1268-7731(19)30065-7

ICC si score <24

Nom du patient : ..... Date : .....

Pour chaque question, merci de cocher la phrase qui décrit le mieux vos chevilles.

1. J'ai des douleurs à la cheville	**Gauche**	**Droite**
❑ Jamais	5	5
❑ Quand je fais du sport	4	4
❑ Quand je cours sur des surfaces irrégulières	3	3
❑ Quand je cours sur des surfaces planes	2	2
❑ Quand je marche sur des surfaces irrégulières	1	1
❑ Quand je marche sur des surfaces planes	0	0

2. Ma cheville me semble INSTABLE quand	**Gauche**	**Droite**
❑ Jamais	4	4
❑ Parfois quand je fais du sport (pas à chaque fois)	3	3
❑ A chaque fois que je fais du sport	2	2
❑ Parfois lors d'activités quotidiennes	1	1
❑ Fréquemment lors d'activités quotidiennes	0	0

3. Quand je pivote BRUSQUEMENT, j'ai l'impression que ma cheville est INSTABLE	**Gauche**	**Droite**
❑ Jamais	3	3
❑ Parfois quand je cours	2	2
❑ Souvent quand je marche	1	1
❑ Quand je marche	0	0

4. Quand je descends les escaliers, j'ai l'impression que ma cheville est INSTABLE	**Gauche**	**Droite**
❑ Jamais	3	3
❑ Si je vais vite	2	2
❑ Occasionnellement	1	1
❑ Toujours	0	0

5. Quand je marche sur UNE jambe, j'ai l'impression que ma cheville est INSTABLE	**Gauche**	**Droite**
❑ Jamais	2	2
❑ Quand je suis sur la pointe du pied	1	1
❑ Quand j'ai le pied à plat	0	0

6. J'ai l'impression que ma cheville est INSTABLE quand	**Gauche**	**Droite**
❑ Jamais	3	3
❑ Je sautille d'un côté à l'autre	2	2
❑ Je sautille sur place	1	1
❑ Je saute	0	0

7. J'ai l'impression que ma cheville est INSTABLE quand	**Gauche**	**Droite**
❑ Jamais	4	4
❑ Je cours sur des surfaces irrégulières	3	3
❑ Je trottine sur des surfaces irrégulières	2	2
❑ Je marche sur des surfaces irrégulières	1	1
❑ Je marche sur des surfaces planes	0	0

8. HABITUELLEMENT, quand ma cheville commence à se tordre, je peux l'arrêter	**Gauche**	**Droite**
❑ Immédiatement	3	3
❑ Souvent	2	2
❑ Parfois	1	1
❑ Jamais	0	0
❑ Je ne me suis jamais tordu la cheville	3	3

9. Après un incident HABITUEL de torsion de cheville, ma cheville revient à la « normale »	**Gauche**	**Droite**
❑ Presque immédiatement	3	3
❑ En moins d'une journée	2	2
❑ En un à deux jours	1	1
❑ En plus de deux jours	0	0
❑ Je ne me suis jamais tordu la cheville	3	3

Score total **/30 à Gauche** **/30 à Droite**

Merci d'avoir pris le temps de répondre à ce questionnaire.

Geerinck et al. *@FAS,* **2019**

1. J'ai des douleurs à la cheville			
Jamais	◻	◻	5
Quand je fais du sport	◻	◻	4
Quand je cours sur des surfaces irrégulières	◻	◻	3
Quand je cours sur des surfaces planes	◻	◻	2
Quand je marche sur des surfaces irrégulières	◻	◻	1
Quand je marche sur des surface planes	◻	◻	0
2. Ma cheville me semble INSTABLE quand			
Jamais	◻	◻	4
Parfois quand je fais du sport (pas à chaque fois)	◻	◻	3
A chaque fois que je fais du sport	◻	◻	2
Parfois lors d'activités quotidiennes	◻	◻	1
Fréquemment lors d'activités quotidiennes	◻	◻	0
3. Quand je pivote BRUSQUEMENT, j'ai l'impression que ma cheville est INSTABLE			
Jamais	◻	◻	3
Parfais quand je cours	◻	◻	2
Souvent quand je cours	◻	◻	1
Quand je marche	◻	◻	0
4. Quand je descends les escaliers, j'ai l'impression que ma cheville est INSTABLE			
Jamais	◻	◻	3
Si je vais vite	◻	◻	2
Occasionnellement	◻	◻	1
Toujours	◻	◻	0

5. Quand je me tiens sur UNE jambe, j'ai l'impression que ma cheville est INSTABLE			
Jamais	◻	◻	2
Quand je suis sur la pointe du pied	◻	◻	1
Quand j'ai le pied à plat	◻	◻	0
6. J'ai l'impression que ma cheville est INSTABLE quand			
Jamais	◻	◻	3
Je sautille d'un côté à l'autre	◻	◻	2
Je sautille sur place	◻	◻	1
Je saute	◻	◻	0
7. J'ai l'impression que ma cheville est INSTABLE quand			
Jamais	◻	◻	4
Je cours sur des surfaces irrégulières	◻	◻	3
Je trottine sur des surfaces irrégulières	◻	◻	2
Je marche sur des surfaces irrégulières	◻	◻	1
Je marche sur des surfaces planes	◻	◻	0
8. HABITUELLEMENT, quand ma cheville commence à se tordre, je peux l'arrêter			
Immédiatement	◻	◻	3
Souvent	◻	◻	2
Parfois	◻	◻	1
Jamais	◻	◻	0
Je ne me suis jamais tordu la cheville	◻	◻	3
9. Après un incident HABITUEL de torsion de cheville, ma cheville revient à la « normale »			
Presque immédiatement	◻	◻	3
En moins d'une journée	◻	◻	2
En un à deux jours	◻	◻	1
En plus de deux jours	◻	◻	0
Je ne me suis jamais tordu la cheville	◻	◻	3

Which differences?

Sports Med
DOI 10.1007/s40279-013-0111-4

REVIEW ARTICLE

Minimum Reporting Standards for Copers in Chronic Ankle Instability Research

Erik A. Wikstrom · Cathleen N. Brown

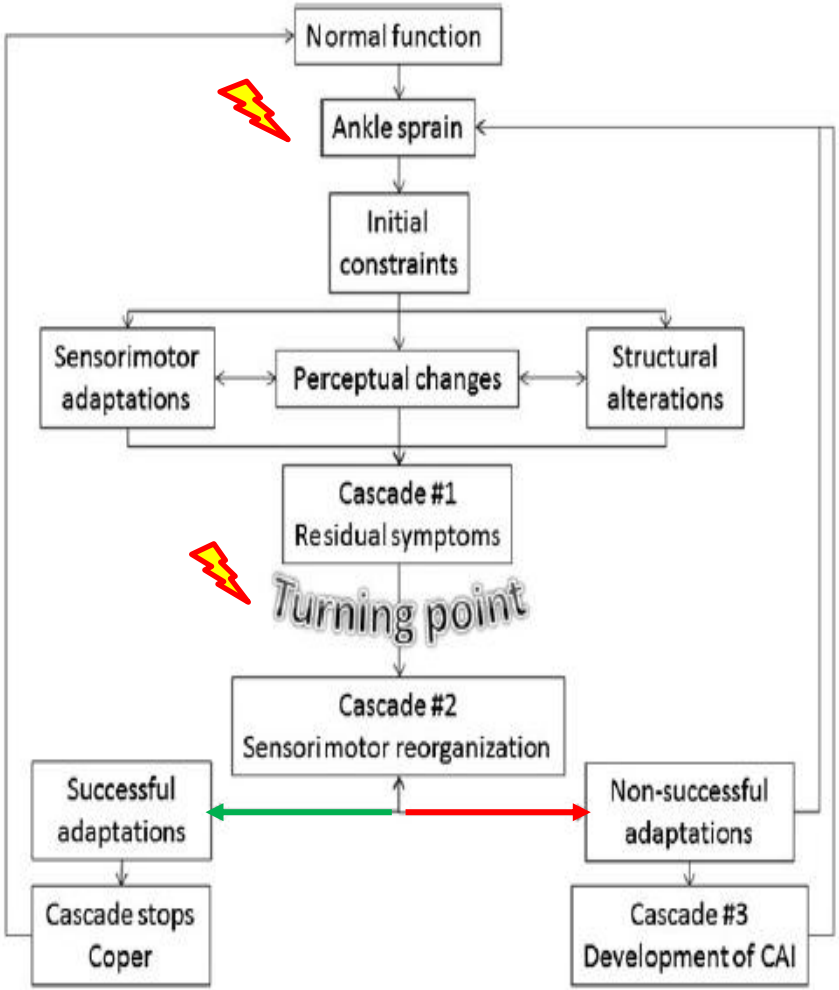


Fig. 3 Integration of hypothesized cascade of events with known consequences of an initial and recurrent lateral ankle sprains to illustrate the 'turning point' where copers and those who will eventually develop chronic ankle instability (CAI) diverge

Wikstrom et al. *@SMed* **2013**

The primary objective of rehabilitation is...

TO AVOID RECURRENCE

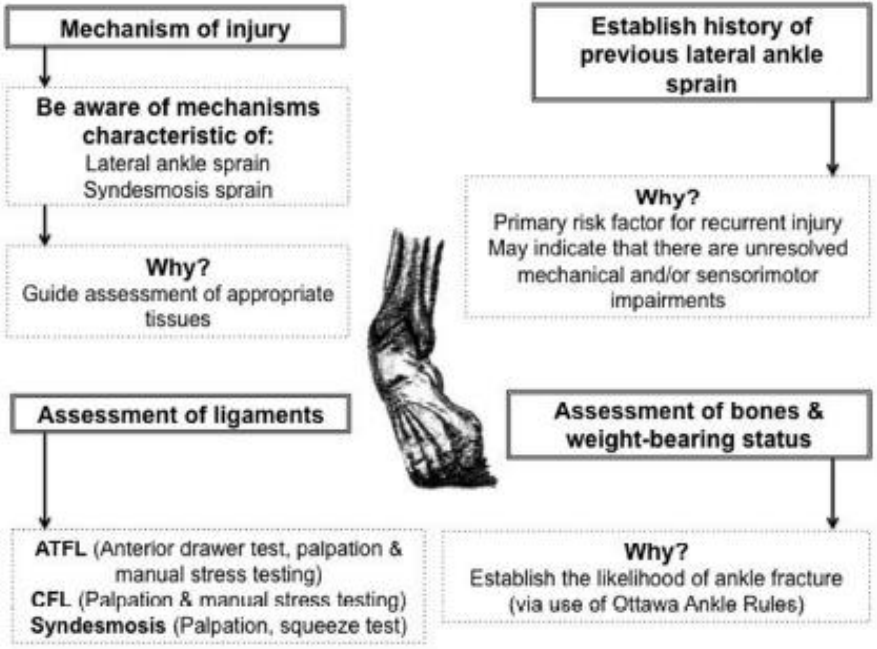
Consensus statement

Clinical assessment of acute lateral ankle sprain injuries (ROAST): 2019 consensus statement and recommendations of the International Ankle Consortium

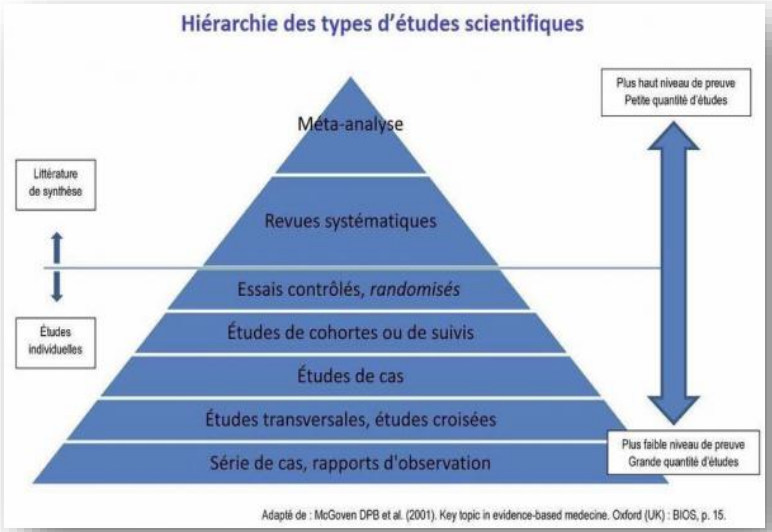
Eamonn Delahunt,[1,2] Chris M Bleakley,[3] Daniela S Bossard,[1,2] Brian M Caulfield,[1,4] Carrie L Docherty,[5] Cailbhe Doherty,[4] François Fourchet,[6] Daniel T Fong,[7] Jay Hertel,[8] Claire E Hiller,[9] Thomas W Kaminski,[10] Patrick O McKeon,[11] Kathryn M Refshauge,[9] Alexandria Remus,[4] Evert Verhagen,[12] Bill T Vicenzino,[13] Erik A Wikstrom,[14] Phillip A Gribble[15]

Initial clinical examination is crucial

➔ The first step in secondary prevention



Caption: Figure 1. Clinical Diagnostic Assessment
Legend: ATFL = anterior talofibular ligament; CFL = calcaneofibular ligament



"How best can clinicians undertake a clinical assessment of acute lateral ankle sprain, ***if the primary aim is to prevent the development of lateral ankle sprain recurrence ?"***

Delahunt et al. *@BJSM* **2018**

Why should we care about the mechanism?

Mechanism of injury

↓

Be aware of mechanisms characteristic of:
Lateral ankle sprain
Syndesmosis sprain

↓

Why?
Guide assessment of appropriate tissues

*"Establishing the **mechanism of injury** is advocated as it can give clinicians […] what tissues should be **prioritised during clinical assessment** »*

Delahunt et al. *@BJSM* **2018**

What's new for 30 years?

Société Française des Masseurs Kinésithérapeutes du Sport

"previously suggested [Vitale et al. 1988] injury mechanism, which was a talocrural joint **plantar flexion** with the subtalar joint **adducting and inverting** may **not be the only** possible mechanism" *(Purevsuren et al. 2018)*

THE AMERICAN JOURNAL OF SPORTS MEDICINE, Vol. 5, No. 6

The frequency of injury, mechanism of injury, and epidemiology of ankle sprains*

JAMES G. GARRICK,† M.D., *Phoenix, Arizona*

From the Division of Sports Medicine, Department of Orthopaedic Surgery, University of Washington, Seattle, Washington

"The typical mechanism of injury is one of **inversion plantar flexion** and **internal rotation**"

O Donoghue **1970**, Mack **1975**, Fiorana **1976**, Garrick **1977**

Biomechanics of Supination Ankle Sprain: A Case Report of an Accidental Injury Event in the Laboratory

Daniel Tik-Pui Fong, Youlian Hong, Yosuke Shima, Tron Krosshaug, Patrick Shu-Hang Yung and Kai-Ming Chan

Am J Sports Med 2009 37: 822 originally published online February 2, 2009
DOI: 10.1177/0363546508328102

*The injury mechanism has been theorized to take place in **as little as 40 milliseconds** and move through an arc of motion greater than **700°/s***

Mckeon M et al. @*JAT* **2019,** Fong et al.@*AJSM* **2009**

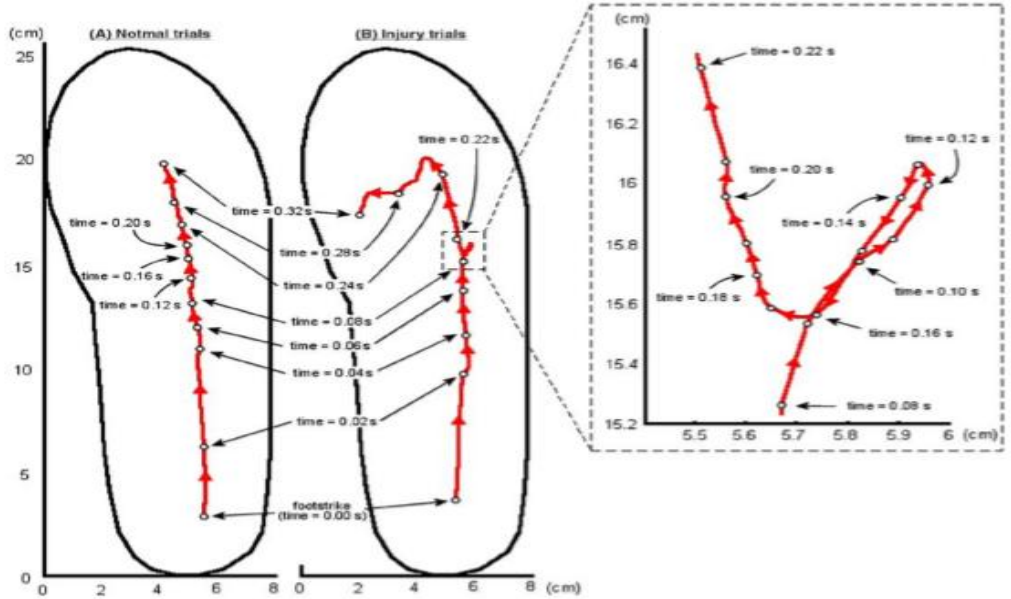
LAS in the Lab…

- Lateral deviation of the centre of pressure after 100ms

⇒ Lateral rotation of the rear foot

=> High-risk situation + increased lever arm

Figure 4. The excursion path of the center of pressure of the mean of the normal trials (A) and the injury trial (B).



Fong et al.**2009**

Video analysis

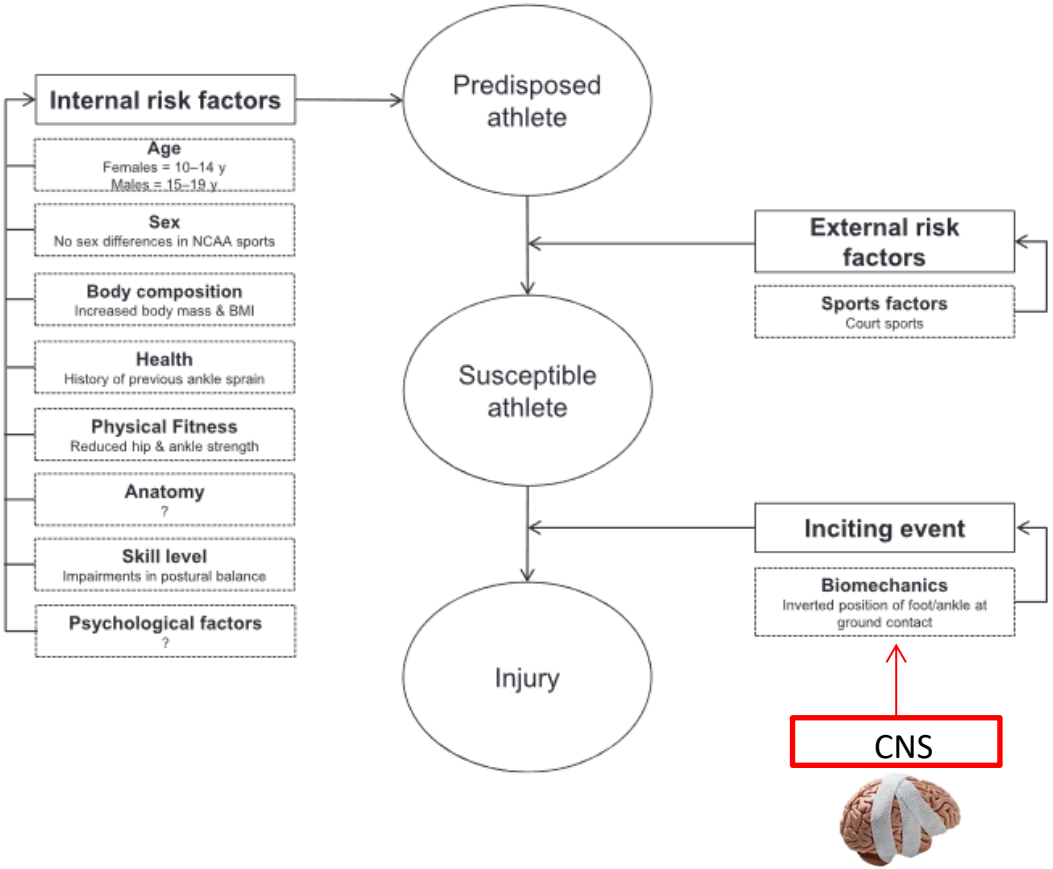
- MBIM (Model Based Image Matching)

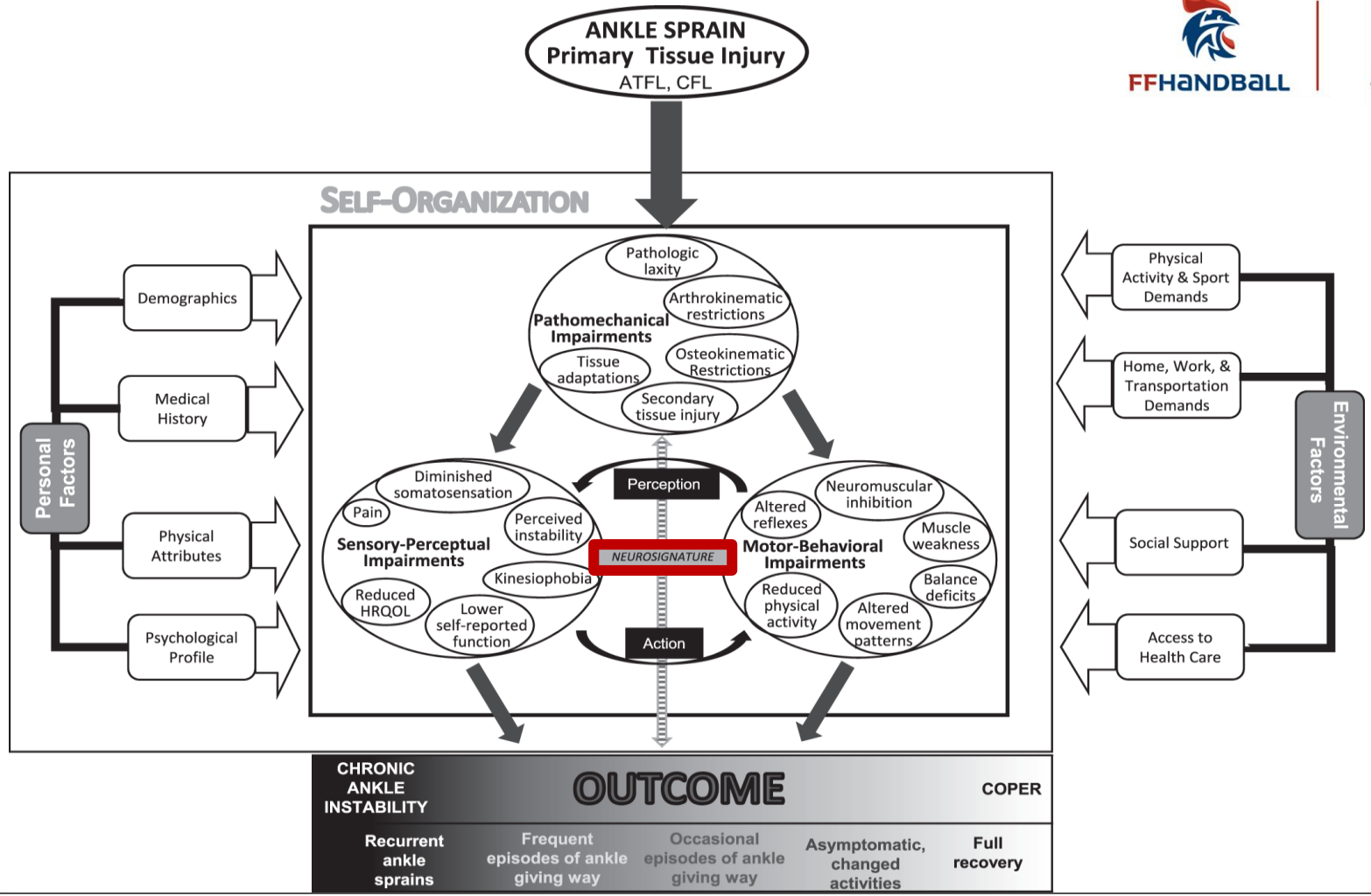
3D analysis of human movements from uncalibrated cameras

Fig. 3. An example of completed skeleton matching using MBIM motion analysis technique, skeleton model on video images.

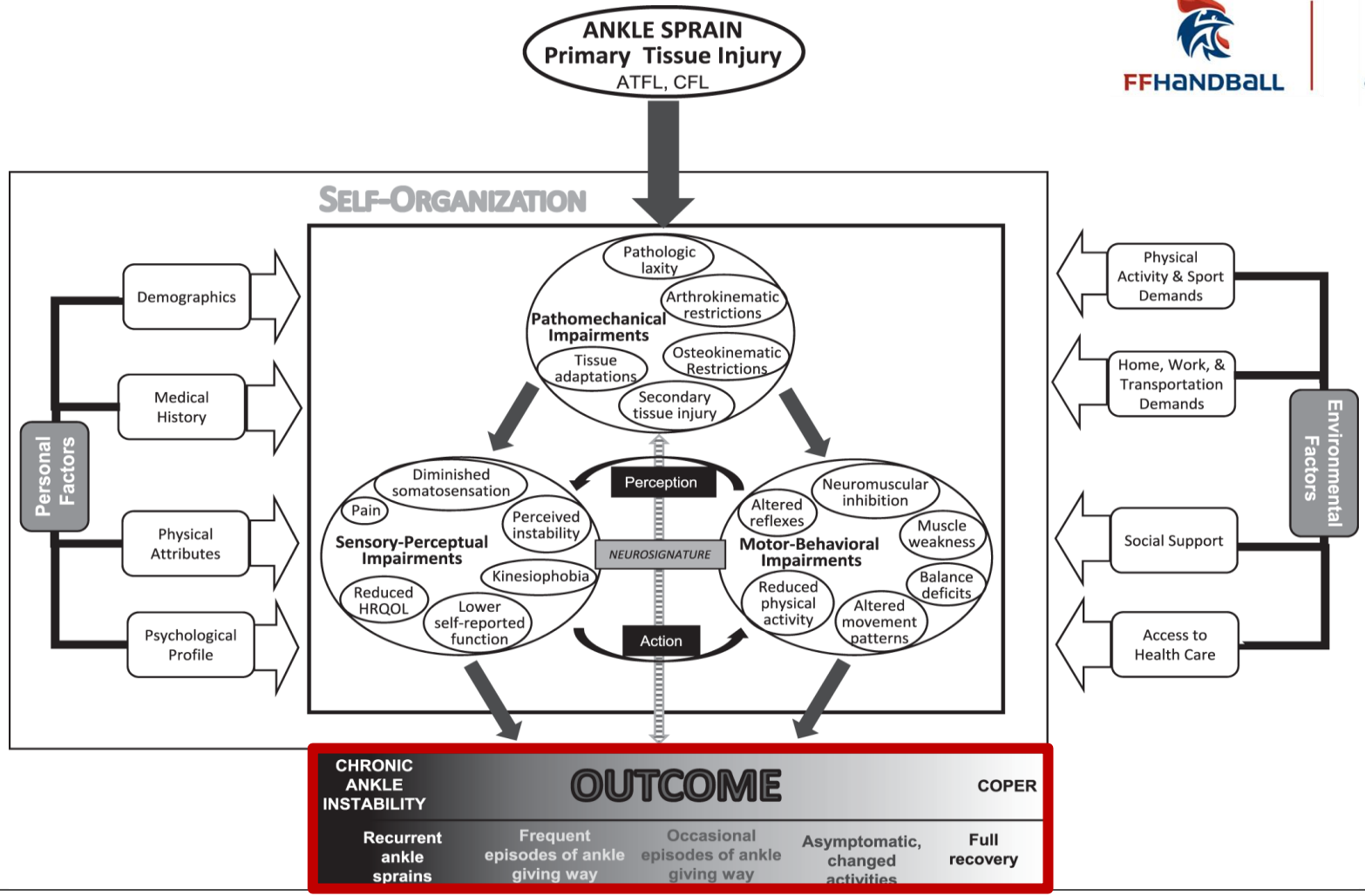
Mok et Fong **2011**, Krosshaug et Bahr **2005**

Inciting event ?





Hertel & Corbett @*JAT* **2019**


ANKLE SPRAIN
Primary Tissue Injury
ATFL, CFL
SELF-ORGANIZATION
Pathologic laxity
Arthrokinematic restrictions
Pathomechanical Impairments
Osteokinematic Restrictions
Tissue adaptations
Secondary tissue injury
Perception
Diminished somatosensation
Pain
Perceived instability
Sensory-Perceptual Impairments
NEUROSIGNATURE
Kinesiophobia
Reduced HRQOL
Lower self-reported function
Action
Neuromuscular inhibition
Altered reflexes
Muscle weakness
Motor-Behavioral Impairments
Balance deficits
Reduced physical activity
Altered movement patterns
Demographics
Medical History
Physical Attributes
Psychological Profile
Personal Factors
Physical Activity & Sport Demands
Home, Work, & Transportation Demands
Social Support
Access to Health Care
Environmental Factors
CHRONIC ANKLE INSTABILITY
OUTCOME
COPER
Recurrent ankle sprains
Frequent episodes of ankle giving way
Occasional episodes of ankle giving way
Asymptomatic, changed activities
Full recovery

Inciting event…!!

J Sci Med Sport. 2017 Dec;20(12):1057-1061. doi: 10.1016/j.jsams.2017.05.006. Epub 2017 May 25.

Biomechanical analysis of ankle ligamentous sprain injury cases from televised basketball games: Understanding when, how and why ligament failure occurs.

Panagiotakis E[1], Mok KM[2], Fong DT[3], Bull AMJ[4].

Landing-related ankle injuries do not occur in plantarflexion as once thought: a systematic video analysis of ankle injuries in world-class volleyball

Christopher Skazalski,[1] Jacek Kruczynski,[2,3] Martin Aase Bahr,[4] Tone Bere,[1,4] Rod Whiteley,[1] Roald Bahr[1,3,4]

Panagiotakis et al. *@BJSM* **2017**, Skazalski et al. *@JSMS* **2017**

Special case: syndesmosis

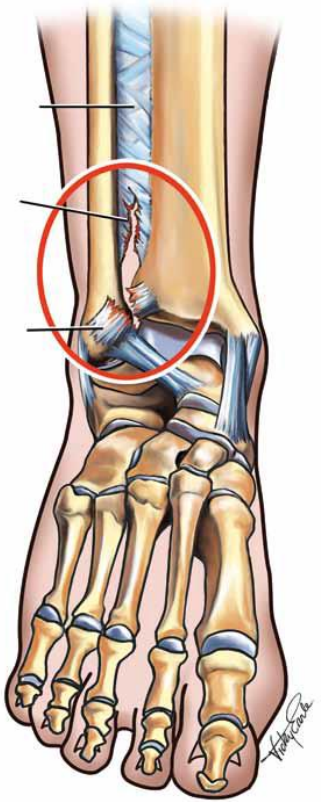
“dorsiflexion and **external rotation** with a **firmly planted foot** is most commonly described.” *(Sman et al. 2013)*

Lesion in « open book » with injury at Ant TiFib Lig

(Lin et al. 2006, Sman et al. 2013, Van Djick et al. 2016)

Injury mechanism

dorsiflexion and **external rotation** with a **firmly planted foot** is most commonly described.



Injury predominance at the anterior compartment +++

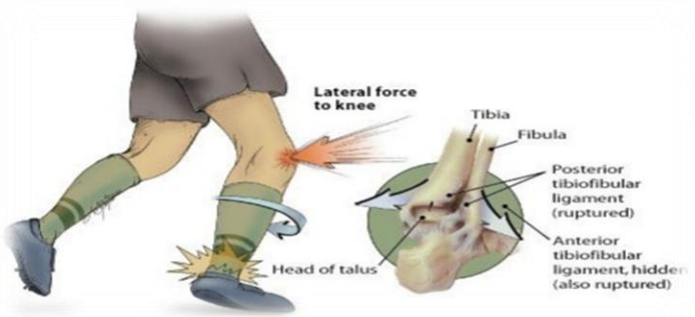
Delahunt et al. *@BJSM* **2018**, Lin et al. **2006**, Brukner P, Kahn K. *@Clinical sports medicine*.**2007**

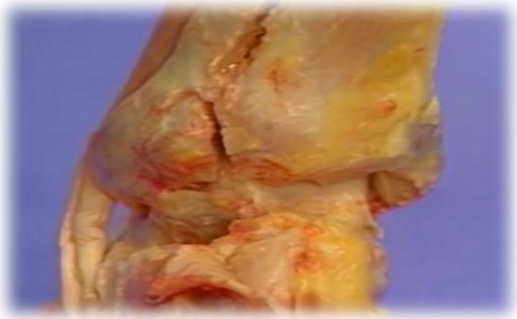
Special case… Syndesmosis

Société Française des Masseurs Kinésithérapeutes du Sport

✓ Crucial: Anamnesis and Observation!

Clinical examination of Deltoid Ligt +++





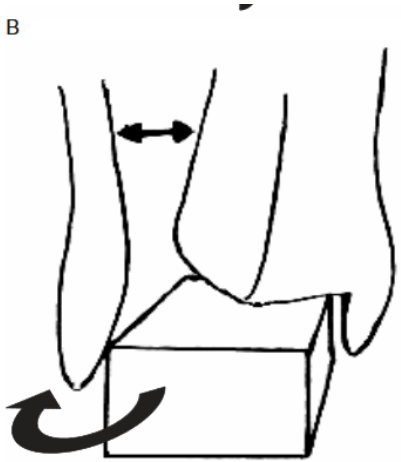


FIGURE 2. (A) The wider anterior portion of the talar dome forces the distal tibiofibular syndesmosis apart when the talus is subjected to a forceful dorsiflexion load. (B) The talus forces the distal tibiofibular syndesmosis apart when the talus is subjected to a forceful external rotation load.

Lin et al. **2006**

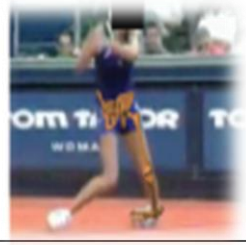
Concretely

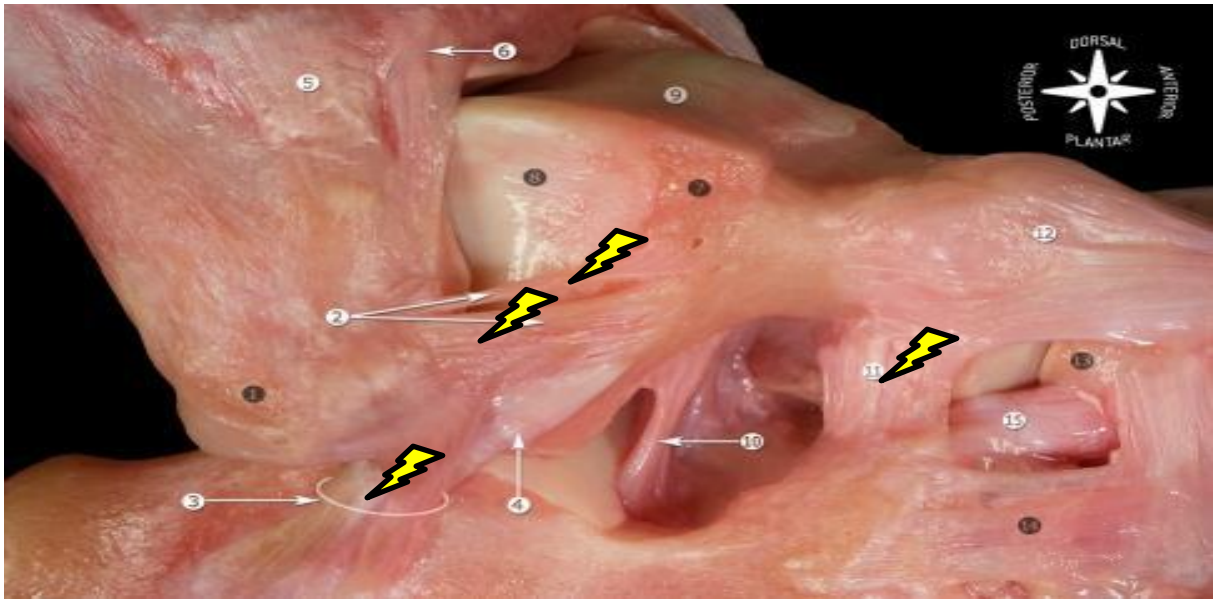
Société Française des Masseurs Kinésithérapeutes du Sport

- What are the implications for the practitioner?

Concretely

- Medial Rotation + Inversion => **ATFL + CFL cervical Ligament**





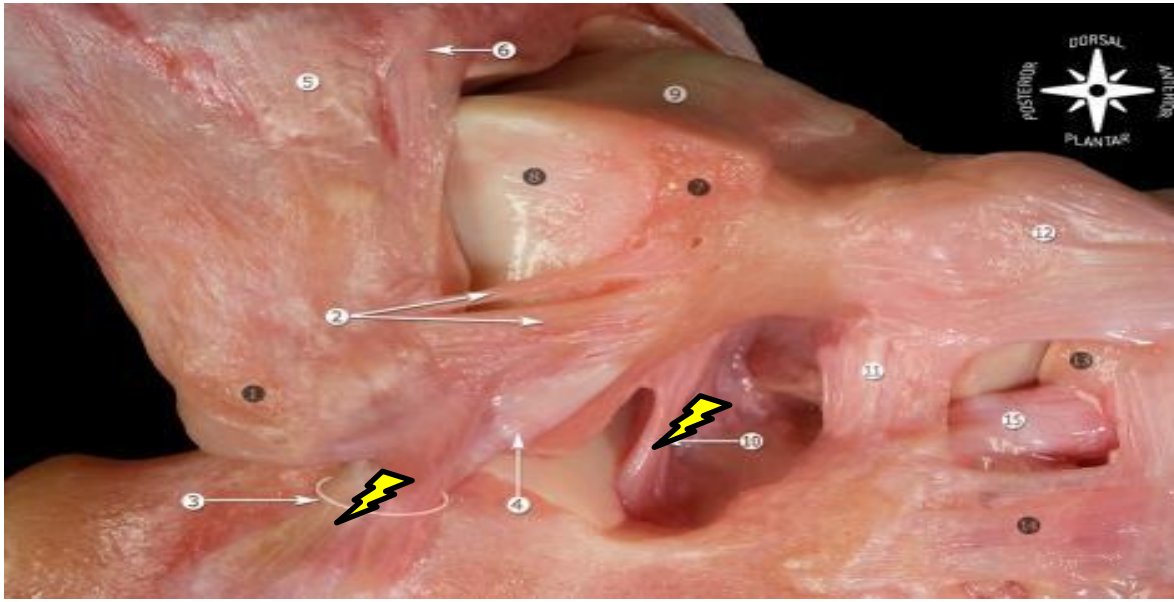
Hand-Basket-Foot-tennis

« Non contact injury » during cut-off

Golano et al. *@KSTA* **2010**

Concretely

- Inversion => **CFL + Sub Talar**

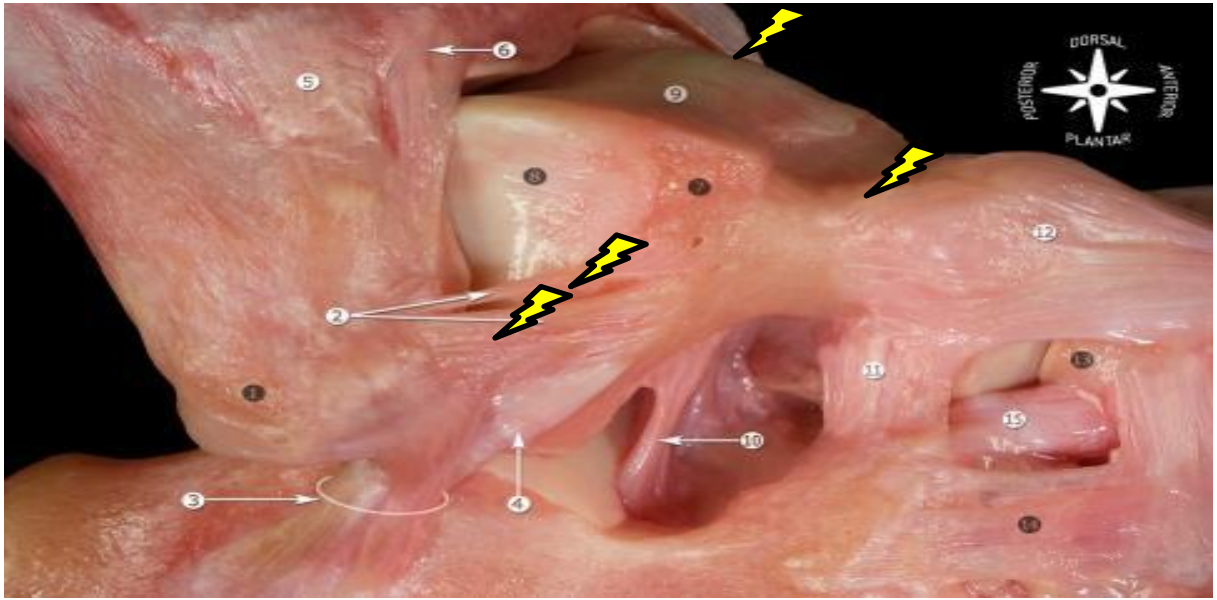


Volley landing on a foot

Concretely

- Forced plantar flexion => **Anterior capsula + Collat Med Lig + Lisfranc**

Figure 7. Probable mechanism for development of footballer's ankle. Illustration reproduced with permission by ©Oslo Sports Trauma Research Center/T. Bolic.



***Football*:**

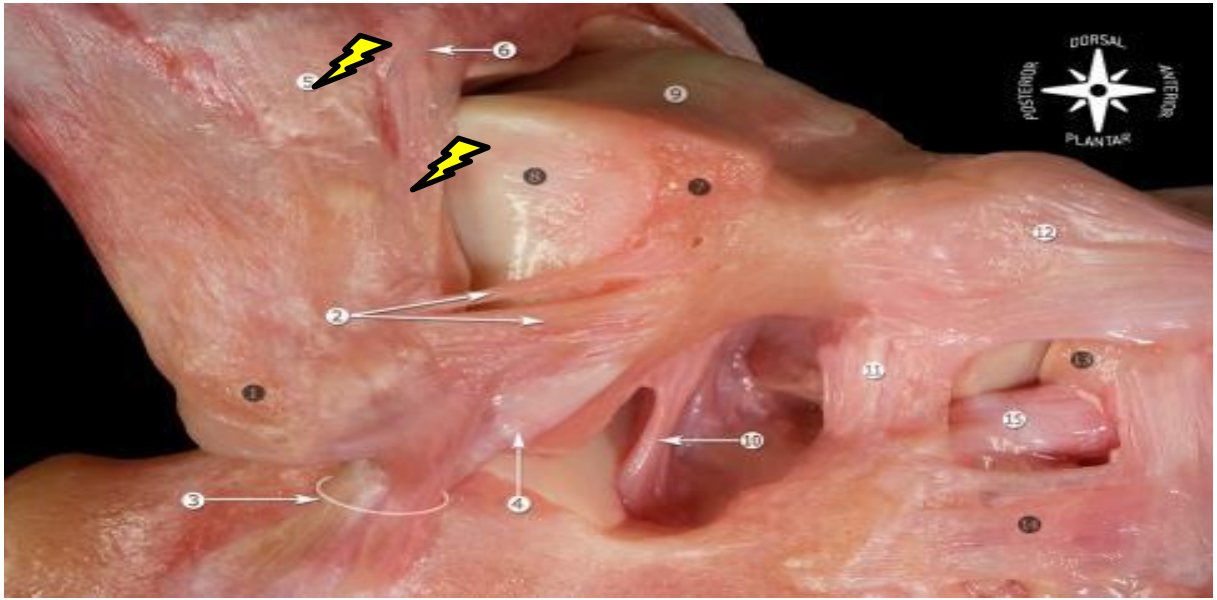
- Anterior injury of collateral ligaments + capsula

Andersen et al. **2004**, Golano et al. *@KSTA* **2010**

Concretely

Société Française des Masseurs Kinésithérapeutes du Sport

- Lateral Rotation and/or dorsal flexion => **Syndesmosis (AntTiFib Ligt)**



- Foot anchored to the ground and rotation of the tibia in a closed chain.

Conclusion practical implications

Mechanisms of injury

- **Understanding injury amplitudes**
- **High angular speeds > 600°/s**
- **Between 90 and 180ms depending on running speed**

➢ Few or no plantar Flexion

Clinical examination:

- Importance of questioning and observation of the mechanism of injury (Garrick et al. 1977)

- Clinical tests close to the mechanism of injury! (Delahunt et al. 2018)

Conclusion

Société Française des Masseurs Kinésithérapeutes du Sport

Kinematic and kinetic analysis:

- **Impairment of the whole lower limb**
- **The problem seems to begin before the foot contacts the ground**

➢ **Lateral shift of plantar pressure distribution** (CAI+++) *(Morrison et al. 2010)*

In Rehabilitation:

- The rehabilitation of chronic ankle instability could be conceived in a context of motor relearning.
- It seems important to develop the feed forward system of the whole lower limb during sensory-motor rehabilitation and to prevent recurrences (Terada et al. 2015).