Lateral Ankle Instability
An International Approach by the Ankle Instability Group
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the Ankle Instability Group
Ankle instability is one of the leading causes of disability amongst athletes and general population.

Furthermore, in recent years, there has been a revolution in the research from the pathophysiology, implications, and surgical options which might have no comparison with any other field of orthopedics and sports traumatology.

We are assisting to an arthroscopic revolution in the management of this condition, in a broad and comprehensive perspective.

The European Society for Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA), mainly its section Ankle and Foot Associates (AFAS), founded by Niek Van Dijk, and The Ankle Instability Group (AIG) are proud to present this book.

The AIG study group has been founded by Stéphane Guillo, in 2014, is currently led by Masato Takao and in a short period has been able to produce an incredible amount of quality science on the topic.

Together we were able to gather most of the scientific and clinical leaders in this field.

This was a joint venture with a story to keep, but we must be and we are all very proud of the end result.

This book represents one step, but many more will come from the continuous effort in research and education uprising from ESSKA-AFAS and the very prestigious and productive AIG study Group.

I send a big thank you to all those who have contributed to bring this project to life on behalf of all Editors, Hélder Pereira, Stéphane Guillo, Mark Glazebrook, Masato Takao, James Calder, Niek Van Dijk, and Jón Karlsson.

Hope you will also enjoy.

Braga-Guimarães, Portugal

Hélder Pereira
Orthopedic and Sports Medicine science has advanced tremendously in the last decades. This is certainly the case with the topic of lateral Ankle Instability.

We who have worked on solutions of ankle problems have all learnt from the classical paper of Lennart Broström, published more than 50 years ago (Broström L. Sprained ankles. VI. Surgical treatment of “chronic” ligament ruptures. Acta Chir Scand 1966;132(5):551–565.). This paper was the cornerstone of the scientific approach towards the unstable ankle. The understanding of basic science, anatomy, and clinical implications as well as treatment options have advanced much since this classic paper was published. Much has changed, but much is in fact still the same. The field has evolved, especially the last 5–10 years with benefits from minimally invasive techniques, arthroscopic evaluation of the entire ankle joint, especially better understanding of cartilage injuries and other concomitant injuries. Lately, advanced arthroscopic techniques are being frequently used for ankle stabilization. Moreover, ankle-specific instruments and implants are commonly used today.

This book combines the efforts of world-leading experts in the field, covering the basics as well as the most updated technical developments and future perspectives, one of the most relevant hot topics in orthopedics today.

This comprehensive book provides a systematic and thorough approach to the topic including classic and updated references, as well as the most recent information about arthroscopic and minimally invasive surgical approaches.

We are confident that this book will serve for the coming years as a “pillar” for all those involved in the treatment of chronic lateral ankle instability. We are equally confident that it will stand out as a reference work for the next decade or more.

It is a must read for all Foot and Ankle surgeons, especially those involved in the treatment of patients with chronic ankle instability.

We hope you all enjoy it as much as we did!

Mölnadal, Sweden
Amsterdam, The Netherlands

Jón Karlsson
Niek Van Dijk
Preface

“I disapprove of what you say, but I will defend to the death your right to say it”
Voltaire

We are all, I am sure, inside us driven by the same deep motivation: to improve the care for patients we are responsible in our daily practice. What tool do we have for that?

First of all our individual reflections. We all wonder about our practice and most of the major advances have been based on personal reflections from professionals who “think out of the box” as Niek Van Dijk would say. But these individual reflections are nothing in science if they are not confronted with other opinions. This is why listening to others is a second inseparable component and necessary for our commitments. We are all carriers whatever our “grade,” our age, or our geography, possessing our own knowledge ‘eminently respectable, which we must cultivate. Exchanging this wealth elevates us. I am convinced that any idea must be shared and confronted by the trials of others. Having had some new ideas on ankle ligamentoplasty, it was therefore natural that I proposed to people who have treated this same subject in recent articles to meet. The Ankle Instability Group was born. This is 2014. This is without a doubt, from a human point of view, one of the most beautiful memories of my professional and scientific life.

The third component on which we must rely to build our own thinking are publications. Scientific journals are responsible for allowing all scientific work to express themselves without judgment other than their scientific quality because they must simply contribute to improving the daily care. Regarding our subject, we all know that it is necessary to publish to increase the evidence of ligamentoplasty, whether it is arthroscopic or not.

Finally, the fourth pillar of our individual reflection is scientific society. Its role is to federate, organize, and disseminate scientific advances to the whole of society. When a scientific society federates ideas, currents of thought, when it integrates new techniques, when it advances independently of any pressure, it feeds the debate, confronts reflection, disseminates novelty, it is useful for the common interest. As a scientific society, ESSKA trusted us for this work. We cannot thank James Calder and Hélder Pereira enough for their tireless work to bring this book to life.

This book is a collective scientific work which aims to present all the solutions described today to deal with a huge social and economic burden that is chronic ankle instability. The representation of all opinions, even if it is not
ours, will always remain in the Voltairean DNA of the Ankle Instability Group.

I join all the members of the AIG in wishing you a good read, hoping that it will help you in your professional life with your patients and that it will be the seed of new collaborations.

Bordeaux-Mérignac, France

Stéphane Guillo
This book has united the work of many global leaders with a common purpose of summarizing and improving our current understanding of ankle instability. It takes the reader from the authoritative anatomy to novel dissection findings and relates them to the various pathological conditions seen in clinical practice. The pathophysiology underlying ankle instability plays an important role in determining which treatments may be appropriate to consider but more importantly may also enable clinicians to discern which individuals may benefit from a particular management pathway. The treatment of elite athletes may differ from that of “normal” individuals or even the “weekend warrior,” and this book discusses this controversial area and proffers guidance for treating clinicians.

Ankle injuries are one of the most common to befall recreational and elite athletes and resulting instability is a cause for concern both from the immediate impact on preventing optimal athletic performance and also on the possible long-term adverse sequelae. There has been a rapid evolution of various surgical procedures in recent years aiming to improve speed of recovery and return to sport whilst avoiding postoperative complications or compromising ultimate function for the patients. This book follows the path of these developments, explaining the rationale for their use in individual groups and summarizes their results to date whilst trying to avoid personal preferences and single author series. The surgical treatment of ankle instability (particularly arthroscopic) is very much an evolving sub-specialty. Much may be gained by the Ankle Instability Group (AIG) encouraging scientific advances which can then determine the enhancement of specific surgical procedures in a structured way. It has always been the purpose of AIG through scientific presentations and collaboration with AFAS-ESSKA to promote science, push the boundaries of understanding, and ultimately improve the outcome for our patients following ankle injuries. The book is up to date today, but AIG will continue to grow with experts from across the world helping to “make a difference.”

London, UK

James Calder
Daniel Haverkamp
Activity Report of Ankle Instability Group (AIG)

Surgery for lateral ankle instability has evolved annually from non-anatomical to anatomical, and more recently to arthroscopic anatomic procedure. Arthroscopic surgery for ankle ligaments had been delayed compared to knee and shoulder joints. Ankle instability group (AIG) was established in 2013 for the purpose of development of effective diagnosis and treatment including minimally invasive surgeries for ankle instability. Since 2013, 11 English papers have been published by AIG [1–11]. The first AIG meeting was held at Bordeaux in 2013, second at Chicago in 2014, third at Seoul in 2015, and fourth at Bordeaux again in 2017. The fifth AIG meeting was held in 2018 at Kisarazu, Japan, as a combined meeting of the 43rd annual meeting of the Japanese Society for Surgery of the Foot approved by Ankle & Foot Associates a section of European Society of Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA-AFAS), Arthroscopy Association of North America (AANA), Asian Federation of Foot and Ankle Surgeons (AFFAS), International Society for Cartilage Repair of the Ankle (ISCRA), and French Arthroscopy Society (SFA) with 890 participants from 20 countries. The live demonstration surgeries of minimally invasive surgery for lateral instability of the ankle by ten worldwide experts were also held during the fifth AIG meeting.

In 1966, Broström firstly reported the repair technique for lateral instability of the ankle, and this technique has used as a gold standard still now [12]. In 1987, Hawkins initially described an arthroscopic repair procedure to fix the remnant of anterior talofibular ligament (ATFL) with a staple to the talus [13]. While arthroscopic surgery of other joints has been evolved after the development of suture anchor technique, a procedure for suturing a residual ligament arthroscopically using a suture anchor was introduced to ankle lateral ligament repair by Corte-Real in 2009 [14]. Since then, various procedures have been reported for arthroscopic ligament repair using suture anchors. The arthroscopic repair of the lateral ankle ligament consists of three steps: placement of a suture anchor at ATFL attachment to the lateral malleolus, threading the suture anchor to the remnant, and knotting. Arthroscopic repair procedures can be classified into three types according to the process of threading the suture anchor to the remnant; arthroscopy-assisted mini-open procedure, arthroscopic with percutaneous procedure, and all-inside...
arthroscopic procedure. Arthroscopy-assisted mini-open procedure reported by Nery in 2011 [15]. Placement of the suture anchor is performed arthroscopically from the portal. But threading the suture anchor to the remnant and knotting are performed via 15 mm extension incision of the portal under direct view. It is easy to operate, but more invasive than following procedures. Nery has improved this procedure to the following arthroscopic with percutaneous procedure [10]. Arthroscopic with percutaneous procedure was firstly reported by Corte-Real in 2009 [14] and has since been developed by several doctors [10, 16–19]. Placement of the suture anchor is performed arthroscopically from the portal. Threading the suture anchor to the remnant are performed by percutaneously inserted needle under arthroscopic view. It is less invasive than arthroscopic assisted mini-open procedure. And it has the advantage of being able to apply sutures to CFL as well as ATFL. On the other hand, it is difficult to apply a thread only to the ligament. Accordingly, it is not an anatomic procedure because the ligament and the inferior extensor ligament are sutured together with the same suture anchor. In addition, the knotting is performed under a small incision or subcutaneously guided to the portal with an additional invasion. In the live demonstration surgery during the fifth AIG meeting, there was a case in which peroneus tertius tendon and a branch of the superficial peroneal nerve were simultaneously knotted with a remnant in dissection after surgery. The risk of above complications cannot be denied. For all-inside arthroscopic procedure, the knotless anchor procedure was firstly reported by Vega in 2013 [20]. It is the most minor invasive procedure because all three steps are performed arthroscopically through one portal. We also reported a suture anchor procedure with lasso-loop stitch technique [4, 21] and developed to modified lasso-loop stitch technique [22]. Since all-inside arthroscopic procedure is possible to suture the ligament in direct arthroscopic view, it can be performed anatomically. On the other hand, since only the ATFL can be observed by arthroscopy, it is impossible to apply a suture directly to CFL. Because CFL is an extra-articular ligament, a wide resection should be required to approach to its attachment to fibula, which is eliminated in minimally invasive surgery. ATFL and CFL are connected with lateral talocalcaneal ligament [8, 23] and detached at these fibular attachment as one unit in most cases of chronic lateral ligament rupture [12]. Although there is a theory that the function of CFL can be restored automatically only with ATFL sutures, the need for suturing CFL and the method how to suture CFL remain as unsolved problems.

For arthroscopic reconstruction of the lateral ligament of the ankle, Lui reported an arthroscopic assisted mini-open ligament reconstruction procedure in 2007 [24]. All-arthroscopic ligament reconstruction technique was firstly reported by Guillo in 2014 [25]. This procedure consisted of seven steps to create bone tunnels at the attachment of ATFL and CFL to fibula, talus, and calcaneus via four portals under ankle arthroscopy, subtalar arthroscopy, and peroneal arthroscopy; and a tendon graft using autologous gracilis tendon was inserted and fixed into each bone tunnels. At the first AIG meeting held in 2013, eight groups were divided to try this procedure using fresh cadaver, but there was only one group to complete surgery because the procedure was complicated and difficult to understand. In addition, there was a
discussion about the demerit to release the peroneal tendon sheath under ten-
tendoscopically. Accordingly, Guillo developed it simpler as five steps technique
via three portals under ankle and subtalar arthroscopy [5]. We also developed
the AntiRoll (Anatomical Reconstruction of the ankle lateral ligament) method in collaboration with Dr Glazebrook and was published in 2015 [26].
The ankle and subtalar arthroscopic procedure in which the tendon graft is
introduced into each bone tunnels by the all inside-out technique and fixed
with the interference screw is simple, easy to understand, and reproducible surgery. On the other hand, the process of reconstructing CFL under subtalar
arthroscopy is technically demanding. Glazebrook recommends the percuta-
aneous AntiRoll (P-AntiRoLL), which allows the surgery to be easier [27]. On
the other hand, since it is not possible to confirm the run of the tendon graft
under direct view, the risk remains in particular of reliably passing the tendon
graft under the peroneal tendon. In addition, there have been few researches
for the suitable placement of each bone tunnels. It is similar to the history of
anterior cruciate ligament reconstruction, and biomechanical study should be
needed for further development of ankle lateral ligaments’ reconstruction.

Kisarazu, Chiba, Japan

Masato Takao

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About the Editors

Hélder Pereira, MD, PhD is a Specialist in Orthopaedics and Traumatology at Póvoa de Varzim-Vila do Conde Hospital Centre, Portugal, and he is researcher, PhD candidate, and invited instructor at Minho University, Braga-Guimarães, Portugal. Moreover, he is member of the Foot and Ankle Unit at Ripoll y De Prado Sports Clinic, FIFA Medical Centre of Excellence, Murcia-Madrid, Spain, where he is Coordinator of Clinical Research. He is past Chairman of ESSKA-AFAS (Ankle and Foot Associates Section) and from 2014 to 2016 chaired the Basic Science Research Committee of ESSKA. He is an editorial board member of Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA) and has authored around 100 publications.

Stéphane Guillo is the Medical Director of SOS Pied Cheville Bordeaux, France, a clinical and research institute for foot and ankle surgery. He is also the founder of the Ankle Instability Group and has held leadership roles in various associations. His research is focused now mainly on ankle ligament treatment.
Mark Glazebrook, BSc(H), MSc, PhD, MD, FRCS(C) is a full-time Professor of Orthopaedic Surgery at Dalhousie University. He completed his medical training in 1994 and completed specialty training in Orthopaedic Surgery in 1999 at Dalhousie. He then went on to complete a fellowship in Orthopedic Foot and Ankle and Sports Medicine at the University of Western Ontario. This was followed with a PhD in Achilles Tendon Disease at Dalhousie University. Dr Glazebrook devotes 80% of his working time to clinical practice focusing on Orthopedic Foot and Ankle Reconstruction and Sports Medicine. During research time, focus is on outcome studies on evidence-based medicine, ankle arthritis, MTP arthritis, bone graft substitutes, and Achilles tendon rupture care. He is Past President of the Canadian Orthopaedic Association (COA).

Masato Takao, MD, PhD is Professor and President of Clinical and Research Institute for Foot and Ankle Surgery (CARIFAS), Jujo Hospital, Kisarazu, Chiba, Japan. He has worked at CARIFAS since 2017. His clinical focus is on foot and ankle surgery. His PhD-thesis in 1999 was devoted to “Anatomy for ankle arthroscopy,” and since then he has been the author of more than 250 peer-reviewed publications, more than 50 book chapters and textbooks in orthopedic foot and ankle surgery including English and domestic papers.

He is a founding member of Ankle Instability Group (AIG) and chaired the fifth AIG meeting at 2018.

James Calder, TD, MD, PhD, FRCS completed higher surgical training in London before completing a Fellowship in Brisbane, Australia, with Dr Terry Saxby. He was appointed consultant at Hampshire Hospitals and then Chelsea and Westminster Hospital, London. He is Professor in the Department of Bioengineering, Imperial College, London, specializing in sports injury research. He has gained a reputation for his clinical interest in
the management of foot and ankle injuries in the elite athlete. He looks after many of the professional football teams across Europe and National Olympic, rugby, and cricket teams as well as the Royal Ballet, Covent Garden, and Birmingham Royal Ballet. He is past chairman of ESSKA-AFAS and the Achilles Tendon Study Group, sub-editor of the *Journal of Bone and Joint* and previously Associate Editor KSSTA. He co-founded the Fortius Clinic, London.

**Niek Van Dijk, MD, PhD** is a leading authority for surgery of the ankle. He is currently working in the FIFA Medical Centers of Excellence in Madrid, Clinic Ripol&DePrado&VanDijk and in Porto, Clinica de Dragão. Between 2002 and 2016, he was head of the Orthopaedic Department of the AMC Hospital (Amsterdam UMC). He is emeritus professor in Orthopaedic Surgery at the University of Amsterdam.

In 2000, Niek Van Dijk started the first international Amsterdam Foot and Ankle Course. His great interest in teaching and his belief in the techniques of the Amsterdam Foot and Ankle School stimulated him to develop the free access website Amsterdam Foot and Ankle Platform (www.ankleplatform.com). Today, the platform has >4000 members from more than 115 countries. Niek Van Dijk was president of the Dutch Orthopedic Association, president of the Nordic Orthopedic Association, and president of ESSKA and ESSKA-AFAS. He is honorary member of several Societies and Associations. He is the tutor of 50 PhD students who he guided to a successful defense of their PhD-thesis. Niek Van Dijk published over 350 scientific indexed publications, wrote over 100 book chapters, and is editor of several books. He is founding editor of JISAKOS, the *Journal of ISAKOS.*
Jón Karlsson, MD, PhD is a Professor of Orthopaedics and Sports Traumatology at the Sahlgrenska Academy, Gothenburg University, Gothenburg, Sweden. Originally from Iceland, he has worked at the Sahlgrenska University Hospital since 1981. His clinical focus is knee surgery, especially complex knee injuries, knee dislocations, and revision surgery. He works as Foot and Ankle surgeon as well.

His PhD-thesis in 1989 was devoted to “Chronic Lateral Ankle Instability,” and since then he has been the author of more than 500 peer-reviewed publications, more than 100 book chapters and over 40 textbooks in orthopedics and sports traumatology.

He has mentored 60 PhD students and is currently (since 12 years) the chief Editor of KSSTA (Knee Surgery Sports Traumatology Arthroscopy). He has been the care-taking physician of a professional football club (IFK Göteborg) since 1984.
Part I

Introduction
1.1 The Lateral Ligament Complex

The lateral joint capsule of the ankle is reinforced by the anterior talofibular ligament (ATFL) and posterior talofibular ligament (PTFL) and the calcaneofibular ligament (CFL) [1]. The increasing popularity of minimally invasive techniques to treat lateral hindfoot instability increases the need for knowledge of the local anatomy [2–6].

1.1.1 Anterior Talofibular Ligament (ATFL)

The ATFL is the first ligament to be injured during an inversion trauma of the ankle. The ATFL is a flat, quadrilateral, and relatively thin ligament (Fact Box 1). Its origin is located on the anterior edge of the lateral malleolus and it inserts on the lateral side of the talus [7, 8]. The ATFL is the main stabilizer during supination and anterior talar translation in all ankle positions [9, 10].

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standing position, this ligament runs parallel to the ground. In plantar flexion, its orientation changes and it becomes more tense. In this position, the ATFL is most vulnerable and more prone to injuries [10–15].

According to the literature, ATFL can have 1, 2, or 3 bands [1, 16–21]. Nevertheless, recent publications state it is a 2-bands ligament, and that reported cases where only 1 band is present should be considered pathological (Fig. 1.1) [22].

A small perforating fibular artery separates the superior from the inferior band and anastomoses with the lateral malleolar artery. This small branch is responsible for the bleeding and subsequent hematoma following an ankle sprain, or for postsurgical bleeding, after arthroscopic ATFL repair.

The origin of the superior band is located just below the origin of the anterior tibiofibular ligament (ATiFL). The inferior band is connected with the CFL through arciform fibers in its malleolar origin (Fig. 1.2) [22].

During arthroscopic exploration, the lateral gutter must be recognized and felt, in order to look for injuries in the ATFL. This is possible due to the intra-articular location of ATFL’s superior fascicle, which allows for arthroscopic examination and treatment of this ligament (Fig. 1.3) [23]. However, this intra-articular location would possibly impair healing of this band after an ankle inversion sprain, a fact that can explain the very high index of chronic pain after an ankle sprain.

It should not be difficult for the arthroscopist to identify a healthy, whole ligament, or a complete rupture of the ATFL: there are, however, partial injuries associated with the anterolateral soft tissue impingement syndrome, which makes diagnosis difficult (Fig. 1.4).
1.1.2 Calcaneofibular Ligament (CFL)

The CFL ligament plays a part in the stability of two joints: the talocrural joint and the subtalar joint. The CFL is a thick and cord-like ligament that is inserted on the anterior side of the lateral malleolus, immediately below, and very close to the insertion of the ATFL, to which it is usually joined by arciform fibers [1, 6, 24]. It is important to recognize that the tip of the lateral malleolus is free of any insertions; this can be clearly seen during ankle arthroscopy. This technical detail is critical when carving a tunnel in the fibula during ligament repair or reconstruction [2, 6, 25, 26].

The direction is oblique, towards posterior and distal, inserting on the lateral side of the calcaneus, almost perpendicularly to the subtalar joint, 13–20 mm dorsally and posterior in relation to the lateral tubercle, involving itself in its medial surface with the talocalcaneal lateral ligament (TCLL) (Fig. 1.5) [16]. Laidlaw studied 750 cadaveric specimens and showed a slight variation in its calcaneal insertion: 64.5% typical location, 25.5% anterior location, 5.5% posterior location, and 4.5% distal location [27]. This variation in its insertion is the result of the obliquity of the ligament in relation to the longitudinal axis of the fibula [27].

Immediately over its anterior edge and separated by a thin fatty tissue which sometimes goes unnoticed, we find the talocalcaneal ligament (TC), which separates it from the subtalar joint. The TC, usually underestimated by most authors, plays an important role in the lateral stability of the ankle [24].

The CFL is an extracapsular ligament that, according to some authors, plays an independent role in the stability of the ankle [28]. During the plantar flexion of the ankle, the CFL is set horizontally; meanwhile, when flexed, it is set vertically, though, in both cases, it is tensed throughout the arc of motion. The only ankle movement during which this ligament is relaxed is in the ankle valgus [1, 17]. In plantar flexion, the CFL limits supination, along with the ATL. In dorsal flexion, the CFL limits supination along with the PTFL. This injury mechanism throughout the
range of motion of the ankle has been the subject of debate for many years.

This ligament is the second ligament to become injured during an ankle sprain, with an injury incidence of 20% approximately; when it is injured, the ATFL is usually injured as well.

1.1.3 Lateral Talocalcaneal Ligament (LTCL)

This ligament is seldom discussed in publications. It lies in front of the CFL, sometimes parallel to it, and sometimes slightly diverting towards the calcaneus; its orientation varies fundamentally in 35% of the cases in both insertions by the talus and the calcaneus [29]. In 40% of the cases, this ligament is not identified in cadaveric dissections [30]. Usually, its rupture occurs along with the rupture of the CFL, and its pattern of injury is similar to that of the latter [24].

1.1.4 Posterior Talofibular Ligament (PTFL)

The PTFL has a semi cord-like shape, and it is the strongest and most resilient of the ligaments that are part of the lateral structures of the ankle (Fig. 1.6) [7, 17, 24]. Rasmussen states that this structure plays a minor role in the stability of the ankle when the rest of the lateral structures are untouched [28]. The PTFL is rarely injured, except in cases of ankle fracture or dislocation.
Golano described the intracapsular but extrasynovial trajectory of the ligament, it explains why it is easily visualized during posterior ankle arthroscopy [1]. This ligament has a conical shape and is 30 mm long, with an average width of 12 mm; its thickness varies depending on the position of the foot. In plantar flexion and neutral position, the ligament is relaxed, while in dorsiflexion, it is tensed. This ligament is much more prominent in sportsmen or dancers [15, 21, 24].

It inserts in the digital fossa, located in the medial, posterior part of the fibular malleolus. It runs medially, almost horizontally towards its insertion in the posterior area of the talus. The footprint on the talus is quite large and must be detached when resecting an os trigonum.

Some fibers of the superior part of the PTFL lie proximally and medially, inserting themselves into the posterior edge of the tibia, and are fused with the fibers of the deep layer of the posterior tibiofibular ligament.

In cadaveric dissections, it has been noted that these fibers reach, in 90% of the cases, the posterior surface of the medial malleolus, creating a labrum on the posterior margin of the tibia. This cluster of fibers is the posterior intermalleolar ligament (or capsular reinforcement bundle, or tibial bundle of PTFL) [1]. Desinsertion of these distal fibers of the PTFL ligament does not generate residual instability.

1.1.5 Arciform Fibers (AF)

These fibers are an expansion of the regular, collagenous, and elastic dense connecting tissue, in the shape of a triangle or a semicircle, with an anteroinferior base that connects the inferior band of the ATFL, the lateral talocalcaneal ligament, and the CFL, in a constant way (Fig. 1.7). This structure has been clearly described by Sarrafian, and has been confirmed by Pau Golano, but has attracted attention again in recent years due to the critical role it is believed to play in
endoscopic repairs of the ATFL [1, 17, 19–21]. It is clearly identified in all cadaveric dissections, and play a critical role within the lateral ligament complex of the ankle. A recent study assessed the macroscopic and microscopic morphology of these arciform fibers, through different colorings [24]. It was found that the histologic structure of these fibers is similar to that of the ligamentous structures, with an abundance of collagenous fibers, low adipose cell content, plus high vascular content (Fig. 1.8) [24].

1.2  The Medial Ligament Complex

1.2.1  Anatomy

The deltoid ligament, or medial collateral ligament (MCL), is a strong broad multibanded complex, made up of a group of ligaments that span out from the medial malleolus towards the talus, calcaneus, and navicular bones. The characteristic deltoid shape explains the commonly used term.

The different ligaments of the deltoid complex are anatomically difficult to distinguish, due to the tight continuity of the components and the close relation with surrounding structures, as the posterior tibial and flexor digitorum tendon sheath [19, 31, 32]. Golano found that the inherent anatomy of the MCL complex makes the distinction in individual bands artificial and inconstant [19]. These observations explain the variable and sometimes confusing anatomical descriptions of the MCL available in the literature [32–35].

The MCL can roughly be divided into a superficial and deep group of fibers, separated by a fat pad, each one formed by multiple components (Figs. 1.9 and 1.10) [19, 31, 32]. The superficial layer crosses both the ankle and subtalar joint, while the deep layer crosses solely the tibiotalar joint [21, 32, 34, 36]. The variations reported in the literature about the prevalence and size of each component have been summarized by Yammine et al. in a meta-analysis [32]. In order to offer surgical landmarks for deltoid ligament repair or reconstruction, Campbell et al. furnished a thorough description of the anatomical attachment sites of the ligamentous bands of the

**Fig. 1.7** Anterior view of CFL with arciform fibers

**Fig. 1.8** Histological image of arciform fibers with different colorings
deltoid complex, analyzing 14 non-paired ankle cadaveric specimens (Fact Box 2) [34].

**Fact Box 2 Characteristics of the Deltoid Ligament as Described by Yammine and Campbell [32, 34]**

**Superficial layer**

**Tibiospring ligament**

- Prevalence: 94%
- Origin: tibial attachment slightly proximal and posterior to the tibial attachment of the tibionavicular ligament
- Insertion: onto the spring ligament, usually within its posterior half. The width of its insertion at the spring ligament averaged 5.9 mm.

**Tibionavicular ligament**

- Prevalence: 90%
- Origin: on the anterior colliculus of the medial malleolus
- Insertion: in an expansive manner onto the dorsomedial surface of the navicular

**Superficial posterior tibiotalar ligament**

- Prevalence: 80%
- Origin: from the distal center of the intercollicular groove
- Insertion: the posterosinferior medial talar body

**Tibiocalcaneal ligament**

- Prevalence: 85%
- Origin: near the intercollicular groove of the medial malleolus
- Insertion: at the most posterior aspect of the sustentaculum tali on the calcaneus

**Deep layer**

**Deep posterior tibiotalar ligament**

- Constantly (100%) the largest and thickest band of the whole deltoid ligamentous complex
- Origin: near the center of the medial malleolus intercollicular groove
- Insertion: on the posterosuperior aspect of the medial talar body inferior to the articular cartilage of the trochlea

**Deep anterior tibiotalar ligament**

- Prevalence: 63%