Review article

Does antero-lateral ankle impingement exist?

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1. Links between antero-lateral ankle impingement syndrome (ALAINS) and chronic ankle instability

Antero-lateral ankle impingement syndrome (ALAINS) manifests as anterior ankle pain at the talo-fibular groove. A distinction is classically made based on whether the impingement is due to bone or soft tissue [1–9]. Bony impingement is caused by osteophytes originating at the anterior tibial margin and talar neck [10]. However, whereas antero-medial ankle impingement syndrome usually involves tibial and talar osteophytes, ALAINS is usually due only to soft tissue interposition. The first report of ALAINS, written in 1950 by Wollin, describes joint invasion by a mass of connective tissue originating from the anterior talo-fibular ligament (ATFL) [11]. In 1991, Ferkel and Scranton provided further details on the pathophysiology of ALAINS [1]. The inciting event is an ankle sprain with injury to the ATFL. If ligament healing is incomplete, repeated ankle movements result in synovitis, followed by fibrosis with the development of a soft tissue mass, whose interposition in the joint space causes pain at the talo-fibular groove. Thus, pain due to ALAINS is extremely common and perhaps even inevitable after an ankle sprain, as the ATFL healing process is accompanied with local inflammation. However, the pain is expected to resolve within a few weeks after complete ATFL healing.

Chronic ALAINS raises two main issues. First, pain due to impingement must be differentiated from pain due to chronic ankle instability. Both entities may co-exist and produce nearly identical symptoms. In particular, rotational micro-instability may closely resemble ALAINS, given the absence of objective ankle laxity. Second, the possible consequences of the pathogenesis of ALAINS on the treatment strategy must be considered. Isolated antero-lateral synovectomy is the standard of care for ALAINS, but the key pathogenic role for the ATFL suggests that a procedure on this structure may be in order.

Thus, ALAINS is closely linked to ATFL injury and, in some patients, to chronic ankle instability. Rotational micro-instability of the ankle is challenging to document. Pain may be the only manifestation, with no objective evidence of laxity, and the presentation is then identical to that of ALAINS. To examine this issue, we conducted a review of current data on ALAINS, its links to chronic ankle instability, and the potential therapeutic implications.

2. Diagnostic strategy

The diagnosis of ALAINS rests on clinical findings. ALAINS should be considered in patients with persistent pain 6 months after appropriate treatment of an inversion ankle injury [12]. The reported frequency of ALAINS after ankle sprains is 1% to 2% but is no doubt considerably underestimated [12–14].
The clinical manifestations of ALAIS [1,5,15,16] include range-of-motion limitation, a swelling in the antero-lateral groove, and a locking sensation or snapping during dorsiflexion and evasion of the foot. The best diagnostic test is the Molloy test, which is 94.8% sensitive and 88% specific for ALAIS [17]. The examiner places the foot in forced dorsiflexion while applying pressure to the antero-lateral groove (Fig. 1). The test is positive if this manoeuvre replicates the usual pain.

A careful assessment of the differential diagnoses is mandatory. The main differentials are chronic ankle instability, fibular tendinopathy, sinus tarsi syndrome, and osteochondroma.

The diagnosis rests on the physical examination. Imaging studies show the exact location of the lesions and their nature (osteoophytes, simple synovial lesion, meniscoid lesion, irregular capsular thickening, plicae). Furthermore, the images often evidence concomitant lesions that should be considered when determining the treatment strategy and assessing the prognosis (loose bodies, osteochondral lesions, lesions of the ATFL, bone oedema) [14].

Antero-posterior and lateral radiographs of the ankle rule out bony impingement and osteochondroma and may provide suggestive evidence of an osteochondral lesion [18]. Ultrasonography documents the soft tissue impingement. A heterogeneous mass larger than 7 mm in diameter is visible at the antero-lateral corner of the ankle [19,20]. The mass is hypervascular by Doppler ultrasonography. Performing the Molloy test during ultrasonography confirms the soft tissue impingement, with a mass bulging in the antero-lateral groove during ankle dorsiflexion, but fails to add to the physical examination (77% sensitivity and 55% specificity) [19]. Importantly, ultrasonography serves to guide the corticosteroid injection, which is crucial to both the diagnosis and the treatment of ALAIS [20,21]. Computed tomography (CT) arthrography has 97% sensitivity and 71% specificity for ALAIS. Nodules may be visible in the antero-lateral groove, and the joint capsule contour may appear uneven. However, CT arthrography has little impact on therapeutic decision-making [22]. Magnetic resonance imaging (MRI) contributes little to the diagnosis of ALAIS. Sensitivity has ranged from 39% to 100% and specificity from 50% to 100% [23–28]. MR arthrography performs better, however, with 96% sensitivity and 97% specificity [29].

Liu et al. defined six clinical criteria for the diagnosis of ALAIS [4]: persistent antero-lateral pain after a sprain of the lateral collateral ligaments, antero-lateral effusion and swelling, recurrent tibio-talar pain after exercising, antero-lateral pain during dorsiflexion with eversion, pain during single-leg squats, and absence of lateral laxity. Patients with at least five of these criteria were diagnosed with ALAIS [4]. These criteria require the elimination of ankle instability based on the absence of objective lateral laxity. They do not consider rotational micro-instability, which is difficult to establish clinically. The six criteria may be met in patients with true rotational micro-instability who have no symptoms other than those of ALAIS. The physical examination alone has 94% sensitivity and 75% specificity for the diagnosis of ALAIS [4,30].

3. Arthroscopic treatment

Antero-lateral tibio-talar synovectomy is performed as an arthroscopic procedure. The standard patient installation for anterior ankle arthroscopy is used, without joint distraction. Two portals are created, one antero-medial and the other antero-lateral. The arthroscope is 4.0 mm in diameter.

In patients with ALAIS, arthroscopy may show several abnormalities, which are often present in combination: focal or extensive inflammation of the synovial membrane, which has a pinkish-purple hue; one or more bands of scar tissue, in some cases with a meniscoid appearance at the level of the distal band of the antero-inferior fibular-ligament; osteophytes arising from the anterior margin of the distal tibia and neck of the talus, best seen with the ankle in forced dorsiflexion; ossifications at the anterior edge and tip of the lateral malleolus; and osteochondral loose bodies in the anterior talo-fibular groove.

The instruments (hook probe, 4.0-mm power shaver, power scalpel) are introduced through an antero-lateral portal created under direct visual guidance after insertion of a needle. The anterior part of the joint is cleared with the ankle in forced dorsiflexion until the anterior tibial margin, talar neck, and both malleoli are visible. The fibrous and inflammatory tissue is removed completely, to make the bony landmarks and any osteophytes clearly visible. The resection is started at the distal band of the antero-inferior tibio-fibular ligament in order to visualise this major anatomical landmark. The synovectomy is then extended to the antero-lateral corner of the ankle and, subsequently, to the anterior tibio-talar compartment and antero-lateral groove.

At the antero-lateral groove, the resection of synovial membrane and fibrous tissue should be stopped at the upper edge of the ATFL, which should be identified routinely. At this point, the risk is excessive extension of the synovectomy, with partial or complete resection of the ATFL, which would worsen any pre-existing instability and, even more importantly, result in persistent pain from ALAIS.

After starting the synovectomy, the crucial step in the arthroscopy procedure is a visual assessment of the antero-lateral groove with detection of any ATFL lesions. Following the antero-inferior tibio-fibular ligament in the medial-to-lateral direction leads to the ATFL, where any lesions can be assessed visually and with the probe [31,32]. Distension of the ligament plane should be sought, as well as detachment from the malleolus (by inserting the hook between the anterior malleolar edge and the ATFL), talar avulsion, and a tear in the body of the ligament (which is

Fig. 1. Molloy test: the examiner applies pressure to the antero-lateral groove while moving the ankle into forced dorsiflexion.
less common). The quality of the residual ATFL should be assessed as thinned, discontinuous and irregular, or thick and strong [32]. Appropriate repair of any ATFL lesions seems reasonable [33].

4. Outcomes of surgical treatment: literature review

In early studies of arthroscopic methods for treating ALAIS, outcomes were good or excellent in over 60% of cases, with a complication rate ranging from 10% to 15% (nerve injury, superficial surgical-site infection) [4]. In more recent studies, the rate of good or excellent outcomes was 67% to 100% and complications were considerably less common than with open surgery and in early studies of arthroscopic treatment [3,5,8,34,35]. Anterior bony impingement involving osteophytes had the best prognosis, with over 80% of good or excellent outcomes [3,5,9,35–37]. Compared to open surgical treatment of ALAIS, the time to recovery is halved with arthroscopic treatment, and the time to sports resumption is decreased by about 1 month [35]. An important distinction is between isolated anterior impingement, in which a good outcome can be expected, and impingement due to osteophytes occurring as an early manifestation of tibio-talar cartilage degeneration, which has a more reserved prognosis. Tol et al. and van Dijk [27,35] reported that the proportion of patients with good or excellent outcomes after arthroscopic treatment for anterior osteophytes was 82% when the joint space was intact compared to only 50% in the event of joint space narrowing. In the medium or long term, however, no progression of the cartilage lesions occurs after arthroscopic treatment for ALAIS, and about two-thirds of patients remain satisfied or very satisfied for many years despite experiencing functional impairments [35]. Furthermore, although the osteophytes recur within a few years after the arthroscopic procedure, most patients remain free of symptoms, indicating that the ankle pain is not caused by the osteophytes but, instead, by pinching of the synovial membrane and synovitis [35]. A multicentre study reported in 2007 identified three predictors of arthroscopic treatment failure in patients with ALAIS [36]: older age (mean age at surgery was 46 years in patients with poor outcomes and 34 years in those with good or excellent outcomes), longer trauma-to-surgery time (mean was 33 months in the group with good outcomes and 20 months in the group with good or excellent outcomes), and cartilage damage (grade 2 lesions were present in 50% of patients with poor outcomes compared to only 18% of those with good or excellent outcomes).

Arthroscopic treatment of ALAIS is extremely effective in relieving the anterior ankle pain, allowing a return to previous activities, providing a good subjective outcome, and improving range of motion. Mobility can be maximised by extensive capsulic and ligament release combined with extensive resection of any anterior osteophytes [37]. The low complication rate is among the main advantages of arthroscopic treatment. Proper arthroscopic technique must be followed to avoid injury to nerves and tendons.

In a recent systematic review of arthroscopic treatment for anterior ankle impingement syndrome, outcomes did not differ significantly between antero-lateral and antero-medial impingement, bony and soft tissue impingement, or impingement versus without concomitant lesions [38]. The main published studies pooled all types of anterior ankle impingement and thus provided no specific data on ALAIS.

5. Concept of rotational ankle micro-instability

Rotational ankle micro-instability is defined as any combination of chronic ankle instability symptoms with no objective evidence of forced–varus or anterior–drawer laxity. The symptoms may consist of recurrent ankle sprains, weakness of the ankle, ankle pain and instability, and manifestations of ALAIS. No anterior or lateral laxity is found upon physical examination or imaging studies. Use of the term “functional instability” to designate this presentation, as opposed to “mechanical instability” (with objective laxity), in the English-language literature adds to the confusion. In a study by Takao et al. of 14 patients with functional instability, arthroscopy consistently showed lesions of the ATFL (partial fibrosis, n = 9; total fibrosis, n = 3; and detachment, n = 2) [39]. More recently, Vega et al. reported findings in 38 patients with ALAIS and functional instability who underwent arthroscopic surgery [40]. Only half the patients had evidence of synovitis. However, proximal detachment and fibrosis of the ATFL were noted in 60% and 50% of patients, respectively. These recent data confirm the very high prevalence of ATFL lesions in patients with ALAIS. Most of the studies reporting outcomes in patients treated for ALAIS did not consider micro-instability, which is a recent concept. Thus, for many years, ALAIS was described under the assumption that the absence of objective laxity ruled out ankle instability. Although outcomes of anterior ankle impingement overall are generally described as good, the data are less clear for ALAIS. Most importantly, although the symptoms of ALAIS originate in ATFL lesions, the treatment and outcome of these is only very rarely discussed in the literature [1]. This underestimation of the close intertwining between ATFL lesions and ALAIS is probably ascribable to the definition of ALAIS, which excludes ankle instability, and to the techniques used early in the development of anterior ankle arthroscopy (trection, 2.7-mm arthroscope).

Advances in ankle arthroscopy have improved the ability to explore the talo-fibular groove and lateral ligament complex, thus providing new insight into the pathophysiology of ALAIS by demonstrating the key role for ATFL lesions and shedding light on the concept of rotational micro-instability. This new knowledge has directly affected the therapeutic strategy by supporting the addition of ATFL repair procedures (as appropriate for the observed lesions) in addition to antero-lateral synovectomy. Prospective multicentre studies are under way with the goal of gaining further knowledge about ALAIS and rotational ankle micro-instability and of obtaining details on outcomes.

Disclosure of interest

Dr Thomas Bauer MD PhD is a paid consultant for Arthrex. Dr Stephane Guillo is a paid consultant for ZIMMER-BIOMET. The other authors declare that they have no competing interest.

References