Iran J Public Health, Vol. 53, No.4, Apr 2024, pp.967-968

Letter to the Editor

Morphological Changes in Adolescent Athletes with Chronic Ankle Instability

Sang-Hyup Song [1], Namwoong Kim [2], *Jupil Ko [2]

1. *Department of Sports Health Care, Dankook University, Cheonan, Republic of Korea*
2. *Division of Health and Kinesiology, Incheon National University, Incheon, Republic of Korea*

***Corresponding Author:** Email: jupilko@gmail.com

(Received 14 Jan 2024; accepted 25 Jan 2024)

Dear Editor-in-Chief

Lateral ankle sprains (LAS) are one of the most common musculoskeletal injuries in the physically active population (1). LAS may result in a great deal of time lost, functional limitations, and long-term musculoskeletal issues such as chronic ankle instability (CAI). Approximately 40% of individuals who suffered an initial LAS will experience symptomatic CAI (2). One of the most typical symptoms of CAI is recurrent ankle sprain. This may result in mechanical joint laxity due to morphological changes in the ligaments in the ankle joint (3).

The anterior talofibular ligament (ATFL) is the most commonly injured ligament in the ankle joint caused by LAS. A previous study claimed that the ATFL in individuals with CAI was thicker than individuals without CAI due to scar tissue around the damaged ATFL (3). Although the ligament was thickened after an LAS, the load-bearing capacity of the ligament was decreased by 60% (4). The thickened ligament caused by severe damage may lead to ankle instability including decreased postural stability in individuals with CAI (3). Therefore, it is important to exam the morphological change in the ATFL to individualize each proper rehabilitation process as it likely first develops. However, most previous studies to date have focused on college-age athletes and adults even though the rate of recurrent LAS and persistent symptoms of CAI was higher in adolescent populations than in college-age and adult populations (5, 6).

To date, various methods including musculoskeletal ultrasound, radiographic, magnetic resonance imaging (MRI), and arthroscopy have been used to assess morphological changes in the ligamentous structures of the ankle joint (3, 6). Musculoskeletal ultrasound (MSUS), portable hand-held, would be reliable and cost-efficient alternative methods to provide real-time images of the internal structure for clinicians (7).

In this study, 40 adolescent participants (twenty with a history of unilateral LAS, and twenty with no history of LAS) were recruited through the Seoul Physical Education High School. All students were elite athletes, and participated based on the inclusion and exclusion criteria of the International Ankle Consortium (IAC) (8). All participants were informed about the procedure and signed the consent form, which was approved by the Institutional Review Board of Incheon National University (#7007971-202104-009). Participants were classified into two groups, either the CAI or the control group, based on the results from the Korean version of the Cumberland Ankle Instability Tool (CAIT-K) (the CAI group ≤

25; the control group ≥ 29) and the Korean version of the Identification Functional Ankle Instability (IdFAI-K) (the CAI group ≥ 11; the control group ≤ 10) (9, 10). The thickness of ATFL was measured using MSUS by a single examiner, who was blinded to the group. An image of ATFL was obtained using the Lumify™ ultrasound system (Philips Healthcare, Eindhoven, Netherlands) with a frequency of 12 MHz (3). The transducer of MSUS was placed between the anterior edge of the lateral malleolus and the neck of the talus to measure the thickness of the ATFL using the pre-installed function of the MSUS device (3).

The thickness of the ATFL showed a statistically significant difference between the CAI and the control group ($p < 0.0001$). The ligament thickness in the CAI group (mean [M]: 0.38 cm; standard deviation [SD]: 0.05) was greater than the control group (M: 0.12 cm; SD: 0.02).

The results of the current study indicate that the ATFL was thicker in individuals who experienced an initial LAS in adolescence. Our finding highlighted that an initial LAS could be causative of morphological changes in the ATFL, which may lead to compromised joint stability and early CAI symptoms in adolescence. Therefore, clinicians need to particularly focus on rehabilitation and prevention when individuals experience the initial LAS in adolescence to ease the symptoms of CAI throughout life. Additionally, further study needs to investigate the timeline for changing morphological characteristics after an initial LAS because the exact timeline of CAI development in adolescents and youth populations is unclear.

Acknowledgements

This research was supported by the Incheon National University Research Grant in 2019 (#2019-0176).

Conflict of Interest

The authors declare that there is no conflict of interests.

References

1. Doherty C, Delahunt E, Caulfield B, Hertel J, Ryan J, Bleakley C (2014). The Incidence and Prevalence of Ankle Sprain Injury: A Systematic Review and Meta-Analysis of Prospective Epidemiological Studies. *Sports Med*, 44 (1): 123-40.
2. Hiller CE, Kilbreath SL, Refshauge KM (2011). Chronic ankle instability: evolution of the model. *J Athl Train*, 46 (2): 133-41.
3. Liu K, Gustavsen G, Royer T, Wikstrom EA, Glutting J, Kaminski TW (2015). Increased ligament thickness in previously sprained ankles as measured by musculoskeletal ultrasound. *J Athl Train*, 50 (2): 193-8.
4. Frank C, Amiel D, Woo SL, Akeson W (1985). Normal ligament properties and ligament healing. *Clin Orthop Relat Res,* (196): 15-25.
5. Mandarakas M, Pourkazemi F, Sman A, Burns J, Hiller CE (2014). Systematic review of chronic ankle instability in children. *J Foot Ankle Res,* 7 (1): 21-31.
6. Liu W, Li H, Hua YH (2017). Quantitative magnetic resonance imaging (MRI) analysis of anterior talofibular ligament in lateral chronic ankle instability ankles pre- and postoperatively. *BMC Musculoskelet Disord,* 18: 397.
7. Nofsinger C, Konin JG (2009). Diagnostic Ultrasound in Sports Medicine Current Concepts and Advances. *Sports Med Arthrosc Rev,* 17 (1): 25-30.
8. Gribble PA, Delahunt E, Bleakley C, et al (2014). Selection criteria for patients with chronic ankle instability in controlled research: a position statement of the International Ankle Consortium. *J Orthop Sports Phys Ther,* 43 (8): 585-91.
9. Ko J, Rosen AB, Brown CN (2015). Cross-cultural adaptation and validation of the korean version of the cumberland ankle instability tool. *Int J Sports Phys Ther.* 10 (7): 1007-14.
10. Ko J, Rosen AB, Brown CN (2018). Cross-cultural adaptation, reliability, and validation of the Korean version of the identification functional ankle instability (IdFAI). *Disabil Rehabil*, 40 (26): 3185-3190.