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Article Citation:
Gregory D. Myer, Kevin R. Ford, Jon G. Divine, Eric J. Wall, Leamor Kahanov, Timothy E. Hewett (*2009*) Longitudinal Assessment of Noncontact Anterior Cruciate Ligament Injury Risk Factors During Maturation in a Female Athlete: A Case Report. Journal of Athletic Training: January/February 2009, Vol. 44, No. 1, pp. 101-109.

doi: 10.4085/1062-6050-44.1.101

Case Reports

Longitudinal Assessment of Noncontact Anterior Cruciate Ligament Injury Risk Factors During Maturation in a Female Athlete: A Case Report

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Abstract

Objective: To present a unique case of a young pubertal female athlete who was prospectively monitored for previously identified anterior cruciate ligament (ACL) injury risk factors for 3 years before sustaining an ACL injury.

Background: In prospective studies, previous investigators have examined cross-sectional measures of anatomic, hormonal, and biomechanical risk factors for ACL injury in young female athletes. In this report, we offer a longitudinal example of measured risk factors as the participant matured.

Differential Diagnosis: Partial or complete tear of the ACL.

Measurements: The participant was identified from a cohort monitored from 2002 until 2007. No injury prevention training or intervention was included during this time in the study cohort.

Findings: The injury occurred in the year after the third assessment during the athlete's club basketball season. Knee examination, magnetic resonance imaging findings, and arthroscopic evaluation confirmed a complete ACL rupture. The athlete was early pubertal in year 1 of the study and pubertal during the next 2 years; menarche occurred at age 12 years. At the time of injury, she was 14.25 years old and postpubertal, with closing femoral and tibial physes. For each of the 3 years before injury, she demonstrated incremental increases in height, body mass index, and anterior knee laxity. She also displayed decreased hip abduction and knee flexor strength, concomitant with increased knee abduction loads, after each year of growth.

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Available Issues

Journal Information

Print ISSN	1062-6050
eISSN	1938-162X
Frequency	Bimonthly:
	January/February
	March/April
	May/June
	July/August
	September/October
	November/December

Conclusions: During puberty, the participant increased body mass and height of the center of mass without matching increases in hip and knee strength. The lack of strength and neuromuscular adaptation to match the increased demands of her pubertal stature may underlie the increased knee abduction loads measured at each annual visit and may have predisposed her to increased risk of ACL injury.

Keywords: knee injuries, neuromuscular adaptations, lower extremity injuries, anterior cruciate ligament injury mechanisms, high-risk athletes, female athlete triad, neuromuscular spurt

Gregory D. Myer, MS, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. Kevin R. Ford, MS, contributed to acquisition and analysis and interpretation of the data and critical revision and final approval of the article. Jon G. Divine, MD, and Eric J. Wall, MD, contributed to analysis and interpretation of the data and critical revision and final approval of the article. Leamor Kahanov, EdD, ATC, and Timothy E. Hewett, PhD, contributed to conception and design, analysis and interpretation of the data, and critical revision and final approval of the article.

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