Conventional Thought On ACL Injuries Challenged

Landing from a jump can cause a non-contact anterior cruciate ligament (ACL) injury, but evidence presented at the Orthopaedic Research Society 2012 Annual Meeting demonstrates that the injury mechanism that causes that ACL injury involves a combination of factors rather than a single factor as some have claimed. Many hold the view that an athlete ruptures the ACL via a single plane motion - the tibia moving forward due to a large quadriceps contraction.

According to Timothy E. Hewett, PhD, FACSM, Director of Research, Ohio State University Sports Health and Performance Institute and Cincinnati Children's Sports Medicine Biodynamics Center, that injury occurs due to a tri-planar multi-dimensional combination of factors. "Sometimes in science we have a lot of clinical expertise and a lot of engineering expertise but we don't have what I call 'common sense-pertise'."

"Is it just anterior translation that strains and tears the ACL? Is it just knee abduction or that inward motion that tears the ACL? Is it just internal rotation that tears the ACL? Our study demonstrates that each one of these factors can strain the ACL. But it is the combination of anterior translation, abduction and internal rotation that likely ruptures the ACL," Dr. Hewett stated. Contrary to conventional thought, his study demonstrated abduction strained the ACL more than anterior translation; internal rotation was equal to that of anterior translation.

The researchers also had a novel finding about internal rotation torque. "We showed abduction increased the load on the ACL just as much as anterior translation did. Internal rotation increased load just as much as anterior translation did. But most importantly, when all three are combined, there was an additive effect in all three planes," he explained.

Dr. Hewett and his colleagues conducted simulated jump landings on nineteen models. There was an 89.5 percent rate of ACL failures using a custom designed drop-stand. The models were divided into two loading groups: without anterior shear and with anterior shear. They tested the effects of anterior tibial shear, abduction and internal rotation under dynamic axial loading on ACL biomechanics. They found that single-axis abduction increased average ACL strain from 5.8 to 9.8 percent. In both groups, the addition of abduction or internal rotation increased ACL loading—with abduction loading the ACL more than internal rotation.

Under axial impact, the combination of abduction, internal rotation and anterior shear the average ACL strain significantly increased. "Data from this study indicates that the most critical dynamic condition that leads to ACL failure is a combination of anterior shear, abduction and internal rotation under axial impact," Dr. Hewett concluded.

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