Genes May Explain Higher ACL Injuries In Girls

It's well known that female athletes suffer up to eight times more painful, season-ending anterior cruciate ligament (ACL) injuries than their male counterparts. Now researchers from Akron Children's Hospital and the University of Akron believe genes may explain the difference.

Their study, presented at the annual meeting of the American Academy of Orthopedic Surgeons, identified differences in genetic material of ACL tissue of young men and women.

The research team, led by Dr. Kerwyn Jones, chairman of orthopedics at Akron Children's Hospital, and William Landis, PhD, the G. Stafford Whitby professor of polymer science at the University of Akron, obtained a biopsy of normally discarded ruptured ACL tissue during surgery from seven male and female athletes. Biopsies underwent microscopic and gene microarray analysis.

The focus narrowed to three genes not found on the X- or Y-chromosomes. The differences in expression of each of these genes result in differences in their counterpart proteins. These proteins could significantly weaken the structure of the ligament in the female compared to male athletes.

"We were a bit surprised by the findings," said Dr. Jones. "We didn't anticipate the genes specific to the structure of ACL tissues could affect the strength and integrity of the ACL."

In trying to explain the higher rates of ACL injuries for girls and women, other hypotheses have pointed to differences in bone structure and mechanics. Girls tend to be more knock-kneed and land jumps with their knees straighter and closer together. An additional consideration may be hormonal differences since ligaments are more lax during menstruation.

"We can't change genes," said Dr. Jones, "but we can help girls strengthen their core and improve their technique. Prevention programs have been proven to reduce the number of ACL injuries and we can and should introduce them to all female athletes starting in middle school."

The research could also have implications beyond ACL injuries.

"The findings open up the possibility that genetic differences between men and women exist for other tissues in the body, potentially making one gender more susceptive to certain illnesses or injuries than the other," Dr. Landis said. "It could extend to aging, to the predisposition for cancer – all kinds of areas."

According to the American Academy of Orthopedic Surgeons, about 200,000 ACL injuries occur annually, with about half requiring surgery.

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