# Athletes With Smaller ACLs May Be More Susceptible To Injury

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(PhysOrg.com) -- A study comparing images of the knees in people who did and didn't have previous injuries to the anterior cruciate ligament suggests that people who tore their ACLs are more likely to have a smaller ligament than do similarly sized people who have never injured a knee.

Researchers calculated the total volume of the ligaments based on magnetic resonance images of human knees. The ACLs among those with previous injuries were, on average, about 10 percent smaller than were ACLs among those without an injury.

In those with previous injuries, the uninjured ACL in the opposite knee was measured for the study. Their ligaments were compared to the ACLs in uninjured people of similar height and weight.

Those who had torn their ACLs had experienced noncontact injuries, meaning the injury occurred during some sort of movement of the body rather than because of a blow to the knee.

Researchers caution that the retrospective study does not mean that a smaller ACL will necessarily result in injury. Instead, they say the research offers more clues about the variety of factors - such as activity level, neuromuscular coordination, gender and muscle strength - that appear to be contributors to ACL injury.

In this group of participants, weight was the strongest predictor of ACL

volume.

“If you compared two people of the same weight, based on our data set, we would expect the injured person had the smaller ACL,” said Ajit Chaudhari, assistant professor of orthopedics at Ohio State University and lead author of the study.

Knowing that the knee’s anatomy can influence susceptibility should help researchers who are trying to figure out why ACL injuries occur and who is most likely to experience these injuries, Chaudhari said. Most study results guide the assignment of a percentage of risk to one or more factors associated with torn ACLs, but to date no research had looked solely at the size of the ligament in injured and non-injured knees.

The research is published in a recent issue of the *American Journal of Sports Medicine*.

The anterior cruciate ligament, responsible for rotational stability in the knee, is located behind the kneecap and is one of four ligaments that join the thigh and shin bones. Noncontact tears of the ACL tend to occur in athletes when they pivot, stop quickly or land from a jump. Previous research suggests that college-age women athletes are at three- to 10-times higher risk of tearing their ACLs than their male counterparts, depending on the activity, but scientists have not determined why this is.

“Comparisons of the volumes of ACLs between men and women have been done, which have suggested that ACL volume may matter. Studies have also found that female ACLs had fewer fibers than male ACLs that were tested. But even with those findings, any differences between males and females could be a coincidence. There are so many variables that interact that you can’t really tell what’s causative unless you compare people who have had an injury to those who haven’t had an injury,” said

Chaudhari, also director of Ohio State's Sports Biomechanics Laboratory.

He and colleagues took MR images of the knees of 54 participants, who were divided into two groups. Volunteers with previous injuries were matched with uninjured participants of the same age, gender, height and weight.

The previously injured participants' healthy knees were imaged for the study. Chaudhari said the fibers of a torn ACL tend to fray like a rope, meaning the volume of injured ACLs could not be measured in a meaningful way. Chaudhari recently presented related research that indicated that there is no significant difference in the size of two ACLs in the same body.

Researchers used the MR images to determine the outline of each ACL under the guidance of an orthopedic surgeon experienced in operating on injured knees. They validated this method of determining ACL volume by practicing the measurement technique on five pig knees obtained from a butcher.

Of the 27 injured participants, 16 had smaller ACLs than their matched controls. Overall, the injured group had an average ACL volume of 1,921 cubic millimeters, while the control group had an average volume of 2,151 cubic millimeters.

In this group of participants, weight and height were strongly correlated as potential variables affecting the size of the ligament.

Chaudhari said that based on what is currently known about the fibrous makeup of the ligament, it's no surprise that a smaller ACL is more susceptible to injury.

“If you have a weaker ACL, it’s more likely to tear if all other factors are equal,” he said. “If being larger in size means the ACL has more fibers, then that would make it stronger. If the individual building blocks are of similar strength, then it comes down to how much total tissue there is.”

It’s too soon to consider knee imaging as a way to screen potential athletes, Chaudhari said, because of the high expense and the fact that knowing the size of the ACL still doesn’t tell the whole story of how the knee will react to activity.

“I would certainly not say in any way, shape or form that people should start using ACL size as a determinant of whether they should play any sport,” he said.

But what it does tell researchers is that there might be more than one way to go about trying to prevent knee ligament injuries. While many prevention efforts focus on the strength of muscles surrounding the knee, Chaudhari and other researchers hope to study whether the ACL itself can be made stronger, or larger, or both, while a child is still growing and developing.

Provided by The Ohio State University (news : web)