3-D technology puts young athletes with ACL tears back in game

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(PhysOrg.com) -- New technology has made it possible for surgeons to reconstruct Anterior Cruciate Ligament (ACL) tears in young athletes without disturbing the growth plate.

Working with Dr. John Xerogeanes, chief of the Emory Sports Medicine Center, Allen Tannenbaum, the Julian Hightower professor of bioengineering at the Georgia Institute of Technology, has developed 3-D MRI technology that allows surgeons to pre-operatively plan and perform anatomic ACL surgery.

Tannenbaum and student researchers in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University created the 3-D MRI technology that allows the surgeon to see from one point of the knee to another during ligament replacement. All of the medical imaging processing and algorithmic work was done through Tannenbaum's Minerva Research Group at Georgia Tech.

"The development of this interactive computer software allows much safer repair of the ACL in young athletes with a much smaller chance of complications," Tannenbaum said. "It is an excellent example of how 3-D MRI data, in conjunction with state-of-the-art image processing, can help the practicing sports surgeon in a key image-guided surgery and surgical planning task."

The ACL is one of the four major ligaments in the knee, and ACL tears are one of the most common injuries in children who participate in

contact sports such as football, basketball, soccer and gymnastics.

Traditional treatment for ACL injuries in kids has been rehabilitation, wearing a brace and staying out of athletics until the child stops growing - usually in the mid-teens - and ACL reconstruction surgery can safely be performed.

“The problem with doing surgery on a young child is that if you damage the growth plate, you can cause a growth disturbance,” said Xerogeanes, an associate professor in the Department of Orthopaedics at Emory University School of Medicine.

The ACL is like a rubber band that attaches at two points to stabilize the knee. In order to replace the ligament, surgeons create a tunnel in the upper and lower knee bones, slide the new ACL between those two tunnels and attach it to both ends. The new ligament is typically taken from either a hamstring tendon or allograft tissue, which is donor material.

Prior to using the 3-D MRI technology, ACL operations were conducted with extensive use of X-rays in the operating room and left too much to chance when working around growth plates, researchers said.

With this new technology, surgeons can actually see from one point to the other on either side of the knee and can correctly position the tunnels where they will place the new ligament. The surgery can be done in less time than the traditional surgery and with complete confidence that the growth plates in young patients will not be damaged.

Kids who undergo this type of operation will still have at least one year of recovery time, Xerogeanes said. The good news is that it does allow them to eventually pursue normal activity.

Xerogeanes and his colleagues at Emory are performing the anatomic ACL reconstruction technique on adult patients as well as pediatric patients. He hopes that another advantage of this new anatomical procedure will be that it helps prevent re-injury in the future for all athletes who have suffered from ACL tears.

Provided by Georgia Institute of Technology