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SNOW SPORTS & ACL INJURIES:

an in depth look at this ongoing relationship

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One of the most devastating injuries in sports today is the traumatic rupture of the anterior cruciate ligament, a.k.a. the ACL. While ACL injuries occur in several sports, some of the most common are snow sports, specifically skiing. A serious injury, a torn ACL often requires surgical repair or reconstruction. With a proper understanding of the causes and treatments of an ACL tear, an athlete can be back on his or her skis in the least amount of time possible.

ACL and Snow Sports

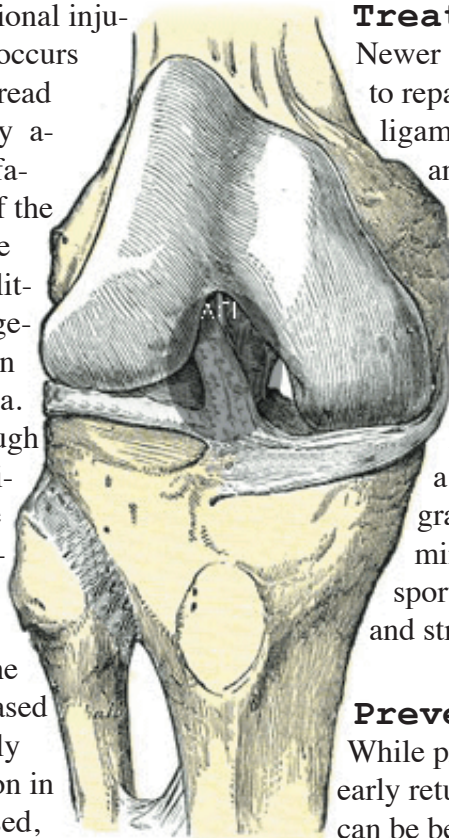
The ACL is the most commonly injured ligament in the knee. ACL injury usually occurs in either a slow twisting fall, a sudden hyperextension, or a sudden hyperflexion as when landing from a jump on flat terrain. Over the last 15 years, ankle sprains and tibia fractures have decreased in snow sports (ie. skiing, snowboarding, etc.), but knee ligament injuries have increased considerably. In fact, nearly 1/4 of all reported skiing injuries involve the knee.

The advent of stiffer boots and improved ski bindings during the 1970s shifted the incidence of skiing injuries

from fractures of the lower leg to rotational injuries of the knee joint. Specifically, this occurs because the bindings were designed to read tension generated in the lower extremity and transferred to the boot binding interface. Release occurred prior to fracture of the bone, as determined by estimates of the skier's height, weight, and level of ability. But no binding measured the forces generated by the femur (the thigh bone) on the ligamentous attachments to the tibia. As the rotational forces increased through the knee, or as hyper-extension or flexion occurred (essentially amputating the ligament), increased numbers of cruciate ligament injuries occurred, even as tibial fractures were declining. In other sports, as the athletes became bigger, the forces from twisting and contact increased but the ligaments did not proportionately increase in strength. Sports participation in younger and older athletes also increased, thus spiking the incidence of ACL tears.

ACL Physiology

The ACL originates from the back of the femur (thigh bone) and inserts on the top of the tibia (shin bone). The ligament is a broad, thick cord the size of a person's index finger. It has long collagen strands woven together in a fashion that permits forces of up to 500 pounds to be exerted prior to rupture. The ligament is crucial for guiding the tibia in a normal path along the end of the femur and maintains joint stability. The ligament has a relatively poor vascular supply and has limited ability to heal a complete tear. Complete ruptures of the ligament produce bleeding in the knee. This is why a swollen knee occurs after an ACL rupture. Once torn, the knee usually becomes unstable. With increasing instability, the shear forces across the top of the tibia increase, the meniscal cartilages tear, and the articular cartilage erodes. This erosion is the degenerative arthritis felt as grinding and pain, particularly with stair climbing, running, or jumping. Those patients who remain athletic have a 75% chance of further damage to one or more of the important cartilage structures within the joint and progressive arthritis.



Treatment

Newer surgical techniques have evolved to repair and reconstruct the torn cruciate ligament, both immediately after rupture, and even years later. Early examination and magnetic resonance imaging (special techniques for producing pictures of the interior structure of the body) produce an accurate diagnosis. Recent data on early return to sports after ligament reconstruction has strengthened the conviction that a carefully guided rehabilitation program can include bicycling and swimming within two weeks of surgery and sports as soon as a full range of motion and strength are achieved.

Prevention

While protection against ligament injury and early return to athletics after ligament surgery can be best achieved by strengthening the muscles around the knee that act as shock absorbers and joint stabilizers, no program will guarantee protection against rupture. Hamstring strength protects the tibia from the anterior translocation that can rupture. For instance, when a skier "catches an edge," the muscular ability to recall the deviant ski is based on the strength of the medial hamstrings. If they are weak, the knee goes into hyperextension, the skier falls, and the "pop and swell" scenario can begin. On the other leg, when the skier "catches an edge," stability is often dependent on the quadriceps and hamstring power for balance on one ski while attempting to reign in the wayward leg. If the quadriceps muscles are weak, the leg wobbles under the unexpected load, twists as the skier falls, and rupture may occur.

Decreases in knee injuries have occurred after specific knee strengthening exercises have been initiated. Such strengthening exercises may include the following:

1 *The Squat*

Closed-chain exercises such as the squat are excellent functional exercises for the quadriceps. Perform sets and reps as described above for the leg press for maximum strength im-

provements.

2 Leg Curl

Leg curls can specifically strengthen the hamstrings in a general manner. Repeat the above sets and reps scheme.

3 Proprioception Exercises

Learning to land with a **soft contact** and bending the knees is an important skill. Another important skill is changing direction and pivoting off one side to move to the other. Again, the movement should be taught with a slightly bent knee to increase stability. These movements can be practiced in order to increase skill levels and sense of joint position to help reduce injury risks.

While there is no way to entirely avoid an ACL injury, learning the best treatments, preventions and the physiology behind ACL injuries, will help in overcoming ACL injuries more rapidly.

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The advertisement features a group of cyclists in various colored jerseys (blue, green, yellow, white) riding their bikes on a road. In the top left corner, there are two award logos: 'TOP 100 RETAILER 2007' from Bicyclesearch.com and 'AMERICA'S BEST BIKE SHOPS' from Michelin Ultra Salutes. Below these is the 'NATIONAL GEOGRAPHIC ADVENTURE' logo, which is part of the National Geographic Adventure Retail Advisory Board. On the right side, the 'ROSWELL BICYCLES' logo is prominently displayed with a silhouette of a cyclist, and the website 'www.roswellbicycles.com' is listed below it. A quote at the bottom right reads: "Georgia's largest professionally staffed bike shop."