

Sports Update - The Knee

This month we will review a number of articles in an attempt to answer the following questions:

- Is there evidence to suggest that during a cutting maneuver, the ACL is at risk of damage?
- What are the surgical options and outcomes for patients who fail conservative management of patellar tendinopathy?
- Is there a factor that indicates a longer recovery time for patients with anterior ligament rupture?
- Is there a reason why the medial collateral ligament heals faster than the anterior and posterior cruciate ligaments?

Colby S, Francisco A, Yu B, et al. Electromyographic and kinematic analysis of cutting maneuvers: implication for anterior cruciate ligament injury. *Am J Sports Med* 2000;28(2):234-240.

Anterior cruciate ligament (ACL) damage is a common injury in sports, accounting for 70 percent of all tears. The primary sports that are high-risk include football, skiing, basketball, and soccer. The injury rate is approximately 1 in 3,000 people per year in the general population. Although contact injury is possible, the majority of ACL injuries are non-contact.

Mechanisms with skiing have been divided into basically three common possibilities: (1) when the skier falls backward with the knee flexed and internally rotated; (2) when the skier catches the edge of a ski in the snow; and (3) when the skier takes a hard fall, the boot forces the tibia forward. Non-contact injury in other sports has not been as well-studied.

This study uses surface electromyographic (EMG) and kinematic analysis during cutting maneuvers to determine which muscles contract and what knee flexion angle occurs during the cutting maneuver. Sidestep cutting, cross-cutting, stopping and landing were analyzed. Foot strike for all maneuvers occurred at an average angle of 22 degrees of flexion. The maximum quadriceps muscle activation for all maneuvers was 161 percent. This high level of contraction occurred just before foot strike and peaked in mid-eccentric motion. The level of hamstring muscle activation was minimal, as low as 14 percent. It is proposed that the combination of low hamstring protective contraction and low angle of knee flexion at foot strike and during the eccentric motion, coupled with the massive quadriceps pull forward on the tibia, combine to strain the ACL to the point of tearing or rupture.

Coleman BD, Khan KM, Kiss ZS, et al. Open and arthroscopic patellar tenotomy for chronic patellar tendinopathy: a retrospective outcome study. *Am J Sports Med* 2000;28(2):183-190.

Although patellar tendinitis is often responsive to conservative care, there are some that, with even months to a year of conservative management, fail to respond. Surgery is often the only answer. This study compared the success rate of two approaches using a similar strategy; removal of the abnormal portion of the tendon. One approach was with open surgery, the other arthroscopic.

Interestingly, symptomatic relief was found more in the arthroscopically-treated group: 96 percent compared to the open-surgery group (81 percent). However, more of the open group (54 percent) were successfully able to return to sport compared to the arthroscopic group (48.6 percent). Recovery time (i.e., return to pre-injury status) was on average six months for the arthroscopic group and 10 months for the open group. There were no real statistical differences between the groups. The authors note that only about half of either group were able to return to their previous sporting activity level. This study suggests that the arthroscopic procedure might be as good as the open procedure with the advantage of earlier return to sports activity. Follow-up time in this study was about four years.

Johnson DL, Bealle DP, Brand JC Jr, et al. The effect of a geographic lateral bone bruise on knee inflammation after acute anterior cruciate ligament rupture. *Am J Sports Med* 2000;28(2);152-155.

It has long been recognized that bone damage accompanies most ACL ruptures. Some of these signs are visible radiographically; some are not. On magnetic resonance imaging (MRI), it is common to see a subchondral fracture (geographic bone bruise) of the lateral femoral condyle. This study compared amount and duration of effusion; range of motion, and pain between those patients with an MRI-documented subchondral fracture of the lateral femoral condyle and those without. Patients with the subchondral fracture had an increased size and duration of effusion, and increased number of days required to nonantalgic gait; increased number of days to achieve normal range of motion; and increased pain, when compared to those without the subchondral fracture. The authors suggest the identification of a subchondral fracture may be significant prognostic factor and may factor into timing of surgery.

Cao M, Racic-Stefanovic M, Georgescu HI, et al. Does nitric oxide help explain the differential healing capacity of the anterior cruciate, posterior cruciate, and medial collateral ligaments? *Am J Sports Med* 2000;28(2);176-182.

It has been recognized that the medial collateral ligament (MCL) heals faster and more efficiently than the ACL and PCL. This study supports a new theory that this differential in healing rate is due to nitric oxide synthesis. This study compared the ability of rabbit MCL, PCL, and ACL tissue to synthesize nitric oxide and its effect on healing. Apparently, the ACL and PCL synthesized large amounts of nitric oxide, whereas the MCL produced only modest amounts in response to injury. Nitric oxide (NO) strongly inhibited collagen synthesis for the cruciates but not the MCL. NO appears to:

- inhibit not only collagen synthesis, but also matrix synthesis, prolonging healing time;
- increase and prolong the early inflammatory reaction to injury; and
- prevent cell migration while blocking cell division.

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