

TerranearPMC Safety Share

Week of May 14, 2012- The Knee, ACL and Other Components

It seems a bit all too commonplace these days when we hear about an athlete that is out for the season due to a torn ACL. ACL?! The anterior cruciate ligament – that's why we say ACL. The ACL is an extremely strong ligament located in the knee. And as the purpose of all ligaments, it stabilizes joints and connects bones together. Yes, ligaments connect bones together – bones don't snap together like Legos, Lincoln logs or tinker toys. In the case of the ACL, it is the knee that is stabilized and helps connect the two leg bones, femur (aka thigh bone) and tibia (lower leg). Working in tandem with the ACL, is the posterior cruciate ligament – abbreviated, you guessed it – PCL. These terms originate from Latin; anterior and posterior meaning front and back, respectively and cruciate, meaning cross-shaped.

Because of its design to stabilize and being very strong, the ACL restrains excessive forward movement of the tibia in relation to the femur, while limiting rotational movements of the knee. Therefore, the ACL can be torn when overstretched due to sudden stops or when the knee gets twisted (as what happened to Derrick Rose of the Chicago Bulls), or when the front of the knee encounters a force or "blow" (as what happened to Mariano Rivera of the NY Yankees). The extent of the tear can be a partial or a complete tear. Individuals experiencing a tear to the ACL may or may not feel a pop at the time of the injury. Often, but not always, depending on a person's activity level, a torn ACL needs to be fixed. Unfortunately a simple repair by suturing the torn ligament together again is not effective. A successful repair involves completely replacing the torn ligaments.

In addition to being the connective region for the femur and tibia, the knee is the connection for the fibula (calf bone) and patella (kneecap). Ensuring a strong connection between the femur and tibia and fibula, two other ligaments, the lateral collateral ligament (LCL – towards the side of the body) and medial collateral ligament (MCL – towards the middle of the body) play an important role.

Instrumental in making the knees function with the smoothness and intricacy necessary that humans have had over the centuries is cartilage. Cartilage is made up of collagen (gelatin, a main component in many foods, such as Jell-O, is hydrolyzed collagen). Cartilage of the knee is located in the contact surfaces of the patella, femur and tibia, anatomically and is known as articular cartilage. Another type of cartilage associated with the knee is meniscal - it protects the articular cartilage and separates the bones of the knee. It is a spongy shock absorber which acts to disperse the weight of the body and reduce friction during movement. This is the cartilage referred to when you hear "torn cartilage; the meniscus is commonly torn in twisting injuries.

Our knees support us at work as well as in general life activities. In some occupations, worn or tired knees become the limiting factors in determining whether an employee can remain on that job. The extent of the problem is significant in terms of disability and workers' compensation costs.

Most knee injuries can be broadly classified as traumatic (acute) or overuse (cumulative). Traumatic injuries include those resulting from a single incident, such as a fall, impact, or severe twisting, and damage the bones, tendons, ligaments, etc. Overuse injuries develop over time as a result of repeated or sustained actions, or wear and tear. These injuries often affect the bursa (thin-membrane sacs containing synovial fluid) and cartilage, along with the tendons and ligaments.

Aside from immediate impact, acute scenarios, certain progressive ailments such as osteoarthritis, infections of the various knee components, excess weight (obesity), and the aging process may also contribute to knee ailments.

Several work practices may be used to reduce worker exposure to the knee and its components. These include: .

- Work positioning – using the ergonomic approach of 'fitting the task to the worker' (raise work up off of the floor, where possible, to eliminate kneeling or squatting).
- Sit rather than kneel or squat - where possible, to reduce direct pressure on the knees and stress on the tendons and ligaments. Consider the use of a rolling stool instead of crawling where movement is required.
- Supports - use chairs or specialized kneeling supports to distribute the worker's weight across a broader area (shins, thighs, chest, etc.), reducing direct pressure on the knees.
- Evaluate lifting tasks – many risk factors for manual lifting are also risk factors for knee injuries. Improvements made to lifting tasks may pay dividends in the prevention of knee injuries as well.
- Avoid shocks transmitted to the knee caused by jumping off of trucks, using the knee as a hammer, etc. Provide and use ladders for access and task specific tools for applying impact.
- Avoid sudden twisting, stopping, or changing of direction when walking. These motions are associated with high risks of knee damage in the work place, just as they are in high-risk sports such as football, basketball, and skiing.

Personnel protective equipment can also be used to help reduce the wear and tear we may place on our knees.

- Wear kneepads, or use portable cushions, to pad, insulate, and distribute pressure across a broader portion of the knee. This is especially true on hard or irregular surfaces, cold surfaces, or where hard or sharp items might dig into the knees.
- Regularly clean work clothes and PPE - skin irritations on the knee leading to inflammation and infection of the cartilage and bursa were noted in one major study as a significant factor. The study suggested that workers who use kneepads on a regular basis have multiple pairs to allow for cleaning and drying time between uses.
- Walking and sustained standing on hard surfaces transmits shocks through the knees. Selection of quality footwear and insoles, or anti-fatigue matting, can cushion these shocks. Supportive footwear is also important to reduce the risk of twisting a knee due to a slip, when climbing, or when walking on uneven surfaces.

Other things that can be done to protect our knees include:

- Move and change postures frequently – static postures, including kneeling or sitting for long periods, or the sustained operation of foot pedals, decrease blood and nutrient flow to the tendons, ligaments, cartilage, and bursa.
- Exercise to maintain the condition of leg muscles, tendons, and ligaments that stabilize the knee, reducing the risks of twisting or misalignment. Conditioning exercises also improve joint flexibility, strength, and range of motion.
- Reduce excess weight - improvements in overall health will be noted in addition to reducing wear and direct impact on the supporting knee joints with every step.

A notable finding is that women are three times more likely to have an ACL injury than men due to variations of hormone levels and greater ligament strength in men than in women. Most importantly, there is substantial difference in neuromuscular coordination and control in landing—women have less hip and knee flexion. Women also have wider Q- angles (the angle at which the femur meets the tibia) than men, and this combined with their weakened hip strength makes females more prone to an ACL tear.

"We make a living by what we get. We make a life by what we give. "

Winston Churchill