THE SAN DIEGO KNEE CLINIC

THE KNEE AND RUNNING

ARTICLE III: TENDON INJURIES, BURSITIS

We will be offering counseling on diet and exercise. If interested, please contact my office and schedule a medically supervised *Health and Orthopedic Fitness* assessment appointment which will include a spine and joint health assessment evaluation. This assessment will not be covered by health insurance.

G. Charles Roland, M.D.
Director of The San Diego Knee Clinic
Orthopedic, Arthroscopic and Reconstructive Surgery
Diplomate of the American Board of Orthopedic Surgeons
Fellow of the American Academy of Orthopedic Surgeons
San Diego Knee & Sports Medicine Fellowship

I have previously discussed "runner's knee," ligaments, and meniscus injuries. In this article, I will discuss the problem of tendon injuries, tendonitis, and bursitis.

Tendons connect muscles to bones. There are numerous tendons about the knee (Lui, 2010). In the back of the knees, these tendons are commonly referred to as "the hamstrings," (Figure 1). There are four inner hamstrings that pull (flex) backward and internally rotate the tibia (the large inner bone below the knee joint). These are the 1) semimembranosis, 2) sartorius, 3) gracilis, and 4) semitendonosis.

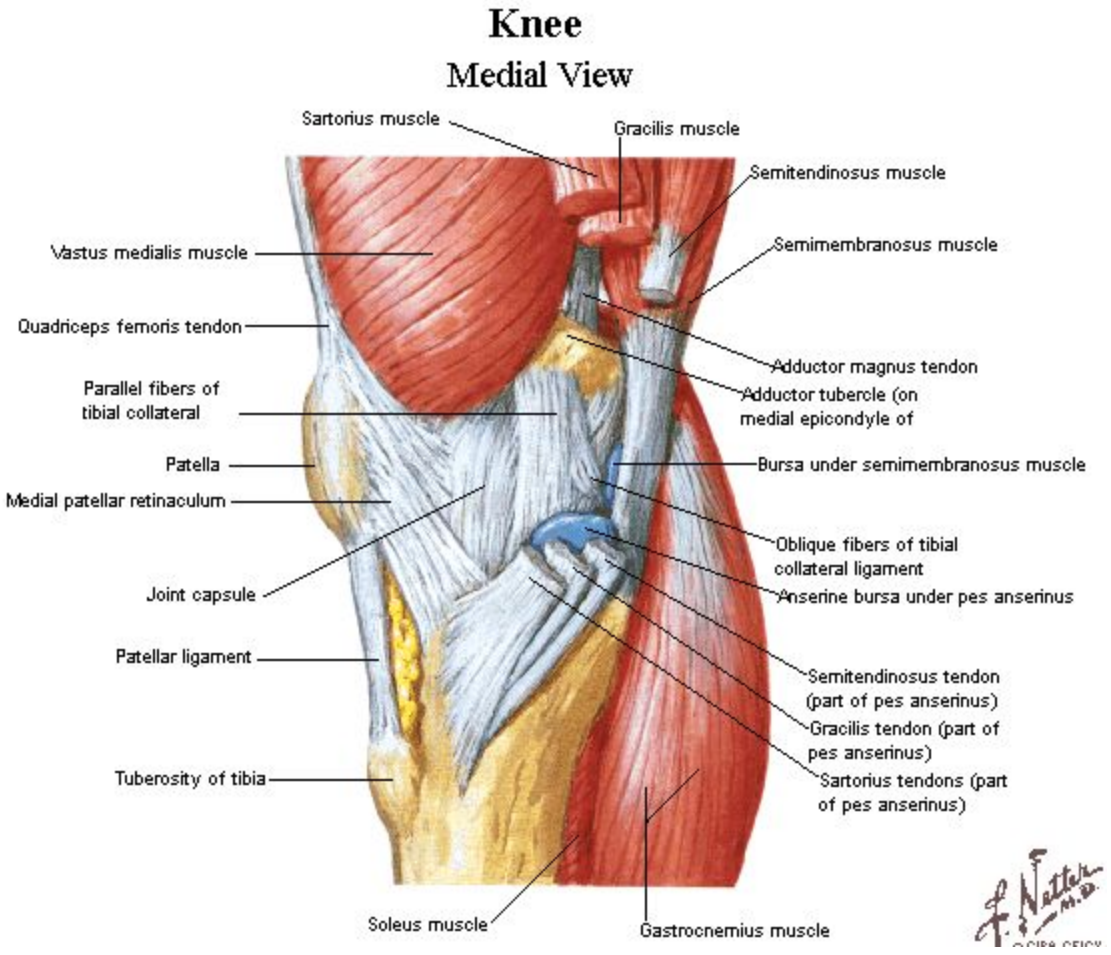

Figure 1. Knee Anatomy. Top Right: Semimembranosis, Sartorius, Gracilis, and Semitendonosis.

The latter three muscles are referred to as the *pes anserinus* which is latin for "goose's foot." These muscles spread out on the inside of the tibia. The outer hamstring is the

biceps femoris, which also pulls (flexes) the knee backwards. Other tendons commonly injured about the knee include quadricep tendon, patellar tendon, the iliotibial band, and the popliteus.

The quadricep muscles and patellar tendon are in front of the knee and are responsible for straightening or extending the knee joint (Chatra, 2012). The iliotibial band is on the outside of the knee and rotates the tibia externally and backwards. The small popliteus muscle is located in the back of the knee and is responsible for twisting the femur on the tibia.

These muscles are commonly injured in their muscular substance, the junction of the tendon and muscle, or in the substance of the tendon. Pain over a tendon is usually secondary to a tear in the substance of the tendon. Pain over the muscle is usually a tear of the muscle fibers (Phisitkul, 2006). The repair time is faster for partial muscle tears as compared to partial tendon tears. Complete tears of both muscle and tendon may never heal unless surgery is performed.

The runner with pain about the knee must first realize from where the pain emanates. We have already discussed ligament and meniscus problems in Article II.

If the runner has pain in the region of the tendon or muscle while running, he must decide whether to stop, slow down, or proceed at his pace. In my opinion, if the pain is very slight, then the runner should slow his pace until either the pain accentuates or disappears. If the pain is persistent over a few minutes, or intensifies, then a runner should stop and walk. If the pain disappears with walking, then the runner can restart running. If the pain returns and is persistent, then I recommend to stop running, walk home, apply ice, and rest. Running may be resumed the next day. If the pain persists, then stop and rest. If the pain is recurrent or worsening, then see your physician. You may have a tear of a tendon. If a tear is diagnosed, rest is the cure (Rutland, 2010). Usually the healing period is one to three months and is dependant on the degree of injury. Alternative gentle exercise programs are permitted when the acute pain subsides, usually within a few days. Swimming is the first choice, and if pain is produced during swimming then limited strokes are permitted. These strokes include floating on the

back and arm stroking only, or floating with gentle slow leg flutter kicks. Most strokes are permitted as long as there is no or very little pain.

Specifically, hamstring tears can be very resistant to healing but usually involve the muscle and not the tendon. Occasionally a period of three to six months is required until recovery is complete. Surgery is performed for complete tears that produce chronic pain in a small number of cases.

Partial tears of the patellar and quadriceps tendons are initially treated with rest and occasionally a brace to keep the knee straight (Sharma, 2016). Rest is the main treatment. Occasionally the (tendon) tear is severe and surgery is required to repair the tear. A cast is worn for four to six weeks after surgery. A strengthening program is begun, and it usually takes at least three to six months to return to running. The patellar tendon can be very resistant to healing and a condition called “jumper’s knee” occasionally arises. Runners can also have this condition. A partial tear with pain is usually located at the junction of the patellar tendon and the kneecap. This is a difficult injury to heal because the tendon is constantly under stress with normal knee motion and especially with running. Surgery in this condition is not always successful but requires surgically creating a new junction at the interface between the tendon and the bone.

Tendon pain has usually been thought to represent “tendonitis” or inflammation of the tendon (Chernev, 2014). Pure inflammation without a tear of the tendon is a rare phenomena. Inflammation of the sheath surrounding the tendon is called tenosynovitis or stenosing tenovaginitis. This is a distinctly different entity from a tendon tear. It is also a moderately common problem. Treatment is ice, rest, and anti-inflammatories. Surgery is performed in resistant cases, and the sheath is released or removed.

In runners, the iliotibial band is probably the most common tendon injured or source of tendon pain at the knee. “Iliotibial band syndrome” denotes pain at the outside (lateral) aspect of the knee (Beals, 2013). It must be differentiated from a torn meniscus or strained lateral ligament. Be careful with pain in this region as severe cases can be very resistant to treatment. Thus, while running, if pain starts in this region and is

persistent, stop. You may have “iliotibial band syndrome.” Tenderness noted at the lateral joint can extend proximally up the lateral thigh for several inches. Rest, ice, and oral anti-inflammatories are usually given, as this is the one tendon that indeed may commonly represent a true tendonitis phenomena. This is because the iliotibial band may be excessively rubbing on the lateral femur causing friction, a wear and tear problem, or inflammation. If resting for a few weeks does not produce relief then steroid application, either topically or by injection is begun and usually eliminates the problem. Surgery is rarely performed. Arthroscopy is occasionally required to rule out a meniscus tear.

Bursitis is also an affliction seen in the runner. Medically, bursitis is an inflammation or swelling of the normal bursa about the knee. There are several bursa in the region of the knee. Bursa are lubricated sacs about the knee that help cut down friction. If a bursa is irritated by repetitive friction from a pumping motion of the knee or from external trauma, it swells and becomes red and very painful. The most common bursae involved are the patellar tendon bursae (Figure 2): (1) prepatellar, (2) infrapatellar, and the (3) deep infrapatellar.

Figure 2. Knee Anatomy: Prepatellar, Infrapatellar, Deep Infrapatellar.

Other so-called swellings about the knee bursae are usually purely traumatic in origin. They are a result of direct trauma and bleeding under the skin. The body attempts to absorb the blood and forms a fibrous sac around the blood; in the process, an extraneous bursa is formed. These bursa are called hemorrhagic bursa.

The inflammatory bursae can be very resistant to treatment, as are the hemorrhagic bursae. If there is no history of direct trauma, then swelling can be a sign

of a cyst or tumor. Thus, the runner should have any swelling about the knee evaluated by a physician.

When a runner develops a bursitis it is usually very painful and can become chronic with repetitive use. The initial treatment is rest and anti-inflammatory treatment including pills, ultrasound, and occasionally a knee brace to keep the leg straight. With moderate to largely swollen bursa, needle aspiration to remove fluid with a steroid injection to the bursa is performed. Steroid medicine injected into a bursa is permissible (Nepple, 2009), however rupture of the tendon can occur if the injection is placed too near or within the substance of the tendon. Also some bursae are infected by bacteria and antibiotics are required. Steroids are not given in infected cases. If the bursa swelling and pain persists after multiple aspirations and injections, a surgical excision is required. If surgery is performed, then a cast or splint is usually worn for two to three weeks, followed by a rehabilitation period of several weeks.

Occasionally a lower extremity biomechanical problem is the source of the problem—a short leg, a flat foot, or even excessively rotated hips. While we cannot change Mother Nature, we can modify the mechanics in an attempt to alleviate the problem.

Needless to say, so called tendonitis, tendon tears, and bursitis about the knee are serious problems for the runner (Houghton, 2007). Pain over tendons should not be taken lightly. If pain develops while running in the region of a tendon and is moderate to severe, stop running and start walking. If the pain persists and is moderate to severe, do not resume running until you are pain free or your physician gives his approval. If there is swelling about the knee, see your physician to rule out a more serious problem. When returning to running, start easy and build your mileage up gradually over a several week period. If your medical problem is recurrent, then a thorough lower extremity exam, including a running analysis, should be performed. Appropriate footwear is mandatory, as is a reasonable training program.

REFERENCES:

Beals, C., et al, *A Review of Treatments for Iliotibial Band Syndrome in the Athletic Population.* Journal of Sports Medicine. 2013; 6. Web. https://www.hindawi.com/journals/jsm/2013/367169/

Chatra, PS. *Bursae around the Knee Joints.* Indian Journal of Radiology and Imaging. 2012. 22(1): 27-30. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3354353/

Chernev, I., et al. *Total Knee Arthroplasty Complicated by Partial Quadriceps Tendon Rupture: A Case Report.* Journal of Medical Cases. 2014; 5(1): 18-20. Web. http://www.journalmc.org/index.php/JMC/article/view/1603/959

Houghton, KM. *Review for the generalist: evaluation of anterior knee pain.* Pediatric Rheumatology. 2007; 5:8. Web. https://ped-rheum.biomedcentral.com/articles/10.1186/1546-0096-5-8

Lui, PP., et al. *Biology and augmentation of tendon-bone insertion repair.* Journal of Orthopaedic Surgery and Research. 2010. 5; 59. Web. http://josr-online.biomedcentral.com/articles/10.1186/1749-799X-5-59

Nepple, JJ., *Soft Tissue Injections in the Athlete,* Sports Health, 2009; 1(5): 396-404. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445176/

Phisitkul, P., et al. *MCL Injuries of the Knee: Current Concepts Review.* Iowa Orthopaedic Journal. 2006; 26: 77-90. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1888587/

Rutland, M., et al., *Evidence-Supported Rehabilitation of Patellar Tendinopathy.* North American Journal of Sports Physical Therapy. 2010; 5(3): 166-178. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2971642/

Sharma, G., et al, *Quadriceps Tendon Rupture and Contralateral Patella Tendon Avulsion Post Primary Bilateral Total Knee Arthroplasty: A Case Report.* Reconstructive Review. Official Journal of Joint Implant Surgery and Research Foundation. 2016; 6(2): 2331-2262. Web. https://reconstructivereview.org/ojs/index.php/rr/article/view/145/176

Lamo-Espinosa, J. M., Mora, G., Blanco, J. F., Granero-Moltó, F., Nuñez-Córdoba, J. M. Sánchez-Echenique, C., Bondía8, J. M., Aquerreta, J.D., Andreu, E. J., Ornilla9, E., Villarón, E. M. Valentí-Azcárate, A., Sánchez-Guijo, F., Consuelo del Cañizo, M., Valentí-Nin, J. R., and Prósper, F. *Intra-articular injection of two different doses of autologous bone marrow mesenchymal stem cells versus hyaluronic acid in the treatment of knee osteoarthritis: multicenter randomized controlled clinical trial (phase I/II).* Journal of Translational Medicine. (2016) 14:246. Web.https://translational-medicine.biomedcentral.com/articles/10.1186/s12967-016-0998-2

Gupta, P.K., Das, A.K., Chullikana, A., Majumdar, A.S. *Mesenchymal stem cells for cartilage repair in osteoarthritis.* Stem Cell Research and Therapy. 2012. 3:25. Web. https://www.ncbi.nlm.nih.gov/pubmed/22776206

Boswell SG, Cole BJ, Sundman EA, KAras V., *Fortier LA Platelet-rich plasma. A milieu of bioactive factors*. Arthroscopy 2012;28:429-439.

De Chou, E.S., Boisrenoult, P., Beaufils, P., *Platelet-rich plasma for open meniscal repair in young patients: Any benefit?* Knee Surgery, Sports Traumatology, Arthroscopy. (2015) 23: 51. doi:10.1007/s00167-014-3417-3

Ishida K., Kuroda R., Miwa M. *The regenerative effects of platelet-rich plasma on meniscal cells in vitro and its in vivo application with biodegradable gelatin hydrogel*. Tissue Eng. 2007;13:1103-1112. Web.

Lubkowska, A., Dolegowska, B., Banfi, G. *Growth factor content in PRP and their applicability in medicine.* J Biol Regul Homeost Agents. 2012 Apr-Jun;26(2 Suppl 1):3S-22S. Web. https://www.ncbi.nlm.nih.gov/pubmed/23648195

Mehta, S., Watson, JT. *Platelet-rich concentrate: Basic science and clinical applications.* J Orthop Trauma 2008; 22:432-438.

Griffin, J.W., et al. *Platelet-rich Plasma in Meniscal Repair: Does Augmentation Improve Surgical Outcomes?* Clinical Orthopedics and Related Research. 2015. 472: 1665-1672.

Blanke, F., *Percutaneous injections of Platelet Rich Plasma for treatment of intrasubstance meniscal lesions.* Muscles, Ligaments and Tendons Journal 2015;5 (3):162-166

McArthur, BA., et al. *Long term safety, efficacy, and patient acceptability of hyaluronic acid injection in patients with painful osteoarthritis of the knee.* Patient Prefer Adherence 2012; 6: 905-910. Web.

Sarabi, Z.S., Afshari, J.T., Ghassemi, A., Yaghobi, M., *Mesenchymal stem cell and osteoarthritis: a literature review.* Reviews in Clinical Medicine. 2016; Vol 3 (No 2). 84-86. Web. http://rcm.mums.ac.ir/article_6830_900.html

Trigkillidas, D., Anand, A. *The effectiveness of hyaluronic acid intra-articular injections in managing osteoarthritic knee pain.* 2013. Annals of The Royal College of Surgeons of England. 95: 545-551. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4311527/pdf/rcse9508-545.pdf

Uth, K., Trifonov, D. *Stem cell application for osteoarthritis in the knee joint: A minireview.* World Journal of Stem Cells. 2016. 6(5): 629-636. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4178263/

Wyles, C.C., Houdek, M.T., Behfar, A., Sierra, R.J. *Mesenchymal stem cell therapy for osteoarthritis: current perspectives.* Stem Cells and Cloning: Advances and Applications 2015:8 117–124. Web. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4559256/