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Concepts and Controversy in Stem Cell Treatment

Most recent advances in bones and diseases are in the field of stem cell treatment and research. The goal is to find natural factors that help treat injured tissue, bone or cartilage. Finding the factors that aid in cartilage regeneration and differentiation is complicated. Steroid injections, prolotherapy and hyaluronic acid do not repair or regenerate cartilage. However, they probably have some short-term positive effects.

The use of mesenchymal stem cells is the hallmark of recent advances in orthopaedics this century. They are probably capable of healing the injured part of the body and generating new cartilage or bone. It's important to understand that we aren't referring to embryonic stem cells or cloning. We are referring to autologous adult mesenchymal stem cells. They are taken from the patient and returned to the same patient. They can make patients who are paralyzed walk and make patients who have a disability run. However, the use of stem cells is not without controversy or roadblocks.

First, there are no major prospective randomized studies that show stem cell techniques are superior. There are studies that show the technique works, but none that shows it is superior to current methods of treatment. Stem cell advocates feel that stems cells taken from a patient's own marrow are superior to any foreign material injected into the body; but, this does seem like a valid argument.

The Technique

Stem cells are taken from the marrow by needle aspiration of the pelvic bone. This is slightly painful, so a local anesthesia is used for best results. A sufficient number of stem cells is crucial for success. After the marrow is obtained, it is placed into a centrifuge to separate good cells and layers. Some doctors then filter the layers and inject the desired layers, but the concentration is not very high. This method is still called stem cell treatment. Some centers keep the stem cells in an incubator

for several days and count them to see if they reach a sufficient number prior to injections. In our opinion, the best technique is to place the stem cells in an incubator so they may grow and expand.

Growing seeds of hope, however, is not easy because special treatment is required. A special lab with the highest level of sterility is needed so the cells do not become contaminated. A special team is also needed to work with the stem cells so there will be no short- or long-term adverse effects. It is better to utilize treatment that does not have any negative side effects.

These cells are capable of copying and dividing to reach sufficient numbers within two weeks. If there are some leftover stem cells, they can be frozen. It's very rare that one aspirate sample will not be enough for treatment and will need to be taken again.

Most of these seeds of hope are delivered by injection utilizing blind, fluoroscopy or ultrasound-guided (most suitable) techniques. The patient may require more than one procedure.

There are no serious complications related to adult stem cell use. If the procedure does not work, operative techniques can be employed, such as replacement of the joint. Some patients are interested in trying stem cells to avoid surgical intervention. However, insurance does not currently pay for the procedure, and the process is costly. Labs must meet strict federal safety guidelines and pass many safety checks.

While growing the small miracles is not easy, once these cells are injected, they can differentiate into the desired cells. They can be tissue cells, bone cells or cartilage cells based on the signal given to them. They operate like construction workers to repair damaged tissue. It's an interesting concept, and we look forward to possibly utilizing this technique to help patients and provide the best care possible. The use of adult stem cells in medicine is being taught in course at universities across the country. There is no way of avoiding integration of this concept in our daily practice of medicine. ■

Ankle Sprains

Ankle sprains are among the most common injuries in orthopaedics. In fact, estimates suggest that approximately 25,000 people experience ankle sprains each day. An ankle sprain occurs when a ligament in the ankle is forced to stretch beyond its normal range of motion.

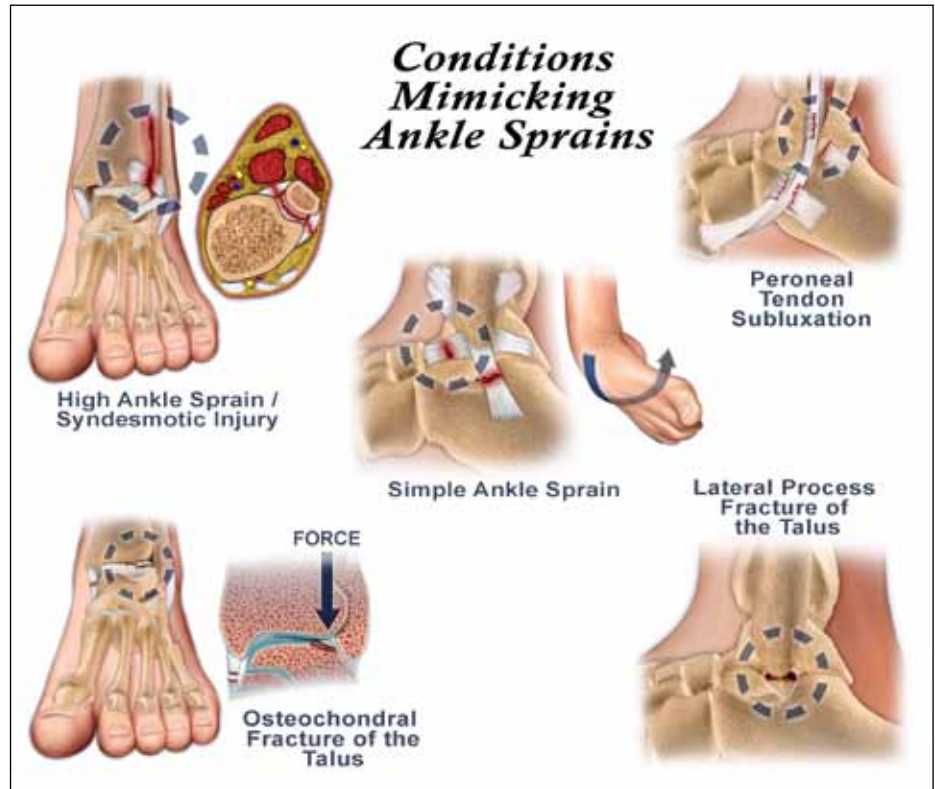
The ankle joint is composed of three bones: the tibia, the fibula and the talus. Ligaments hold these bones together in position. Ligaments stretch during movement and provide stability to the joint. There are sets of three ligaments responsible for holding the ankle together: the lateral ligament complex, the syndesmosis and the deltoid ligament on the medial side. The lateral ligament complex is the most common injured ligament, accounting for roughly 85-90 percent of all ankle sprains. Injuries to the syndesmosis, also referred to as high ankle sprains, account for 10 percent of ankle sprains, while medial ankle sprains account for less than 1 percent.

Ankle sprains are typically caused by one of the following:

- Twisting, rolling or turning beyond normal ankle motions
- Excessive force transmitted upon landing
- Planting the foot unevenly on a surface

Patients with an ankle sprain will likely present with symptoms including: swelling, pain, redness and warmth in the foot. Physicians will perform a thorough history and physical examination. Here, physicians will look for tenderness and swelling and check a patient's range of motion. X-rays may be ordered to rule out fractures. Moreover, an MRI may be ordered if the physician is concerned about severe injury to the ligaments. It's important to accurately diagnose an ankle sprain, as they may mimic other complicated injuries including:

- Ankle fractures, syndesmotom injuries or high ankle sprains diagnosed with stress views or a CT scan
- Stress fractures diagnosed with a bone scan or an MRI
- Osteochondral fractures or osteochondritis of the talar dome or tibial plafond
- Subluxation or dislocation of the peroneal tendons diagnosed through clinical examination supplemented by MRI
- Sprains of the subtalar joint or midfoot injuries, such as dorsal calcaneocuboid ligament sprains
- Anterior process of the calcaneus
- Lateral process fractures of the talus



The severity of an ankle sprain is determined by the amount of force on the ligament and is identified through three grades. Grade I sprains are characterized by slight stretching and damage to some fibers of the ligament. There is usually minimal tenderness and swelling, and it can be treated with rest. Grade II sprains are characterized by a partial tear of the ligament. Patients with a Grade II sprain will present with moderate tenderness and swelling, decreased range of motion and possible instability. In addition to immobilization with a splint, physical therapy is necessary to increase range of motion and strength. Grade III ankle sprains are characterized by a complete tear of the ligament. Patients will present with significant swelling, tenderness and instability. Immobilization will again be needed along with a longer stint of physical therapy for range of motion and strengthening. Although rare, surgical intervention may be needed for grade III ankle sprains that don't respond to conservative treatment. In these cases, physicians may either perform ankle arthroscopy or reconstruction.

Following an ankle sprain injury, there is a gradual process toward recovery. First, it's imperative to rest and protect the ankle to reduce swelling. Second, range of motion, strengthening and flexibility should be addressed. Third, there should be a gradual return to activity.

To lessen the risk of developing an ankle sprain, it's important to properly warm up and stretch. In addition, it is helpful to wear properly fitting shoes and be mindful of walking, running or working surfaces. ■

Shin Splints

For serious athletes, weekend warriors or simply someone trying to stay in shape, shin splints are a common injury. Also known as medial tibial stress syndrome, shin splints are characterized by pain along the tibia (shin bone) caused by inflammation of the muscles, tendons and connective tissues surrounding the tibia. Shin splints develop along the medial edge of the shin anywhere from a few inches above the ankle to halfway up the shin.

Shin splints can develop for several different reasons. First, changes in exercise regimen or physical activity such as running longer distances or increasing exercise frequency can cause shin splints. Other causes include: running in worn-out footwear, running on uneven surfaces, running downhill or activities with frequent starts and stops. Shin splints are often seen in people with flat arches and in runners, especially when beginning a training program.

Patients with shin splints will present with symptoms including:

- Tenderness along the tibia
- Soreness
- Swelling
- Pain along the inner part of the lower leg

To diagnose shin splints, doctors will perform a thorough history and physical examination. Diagnostic examinations using X-ray and MRI may be utilized to rule out other conditions. With similar symptoms, doctors should rule out the following injuries:



- Stress fractures: tiny cracks in the bone caused by overuse; stress fractures can be diagnosed with a bone scan or an MRI.
- Tendonitis can be diagnosed with an MRI, especially if a partial tendon tear is suspected.
- Chronic compartment syndrome, which is the swelling of the muscle within the muscles tight compartment after exertion. Muscle swelling can increase pressure in the compartment, restricting adequate blood flow to the muscle. To gauge chronic compartment syndrome, doctors will measure compartment pressure following exercise.
- Deep vein thrombosis (DVT): inflammation of a vein with clot formation

Shin splints are treated conservatively utilizing a combination of the following:

- Rest
- Ice
- Elevating the extremity
- Anti-inflammatory medications
- Arch supports

There are ways to minimize the risk of developing shin splints. First, it's important to stretch and strengthen calf muscles. In addition, it's important to identify training variables such as intensity, surface, training volume, workout type and hills. ■

Stress Fractures of the Sacrum

The sacrum is the large triangular-shaped bone at the base of the spine connecting and providing stability to the pelvis. When the sacrum is overused, the surrounding muscles become fatigued and transfer excess stress directly to the bone. This repetitive load directly to the bone causes tiny cracks in the sacrum known as stress fractures. While the majority of stress fractures occur in the lower extremities, sacral fractures persist and account for roughly 1-7 percent of reported stress fractures.

There are several causes related to sacral stress fractures. Overuse and repetitive loading are the most common causes of sacral fractures. However, sacral fractures can also result from conditions affecting bone density such as osteoporosis.

Running long distances and increasing the intensity of work out regimens are risk factors for developing sacral stress fractures. In addition, diagnosis of lower bone mineral density, blood work, a history of osteoporosis and weight-bearing activities such as weight lifting are risk factors.

Patients with sacral stress fractures will likely present with the following symptoms:

- Pain in the lower back, hip or pelvis
- Tenderness in the lower back
- Swelling in the lower back
- Pain to the buttocks or groin
- Increased pain with working out

To diagnose sacral stress fractures, physicians will complete a thorough patient history and physical examination. The physician will look for tenderness with palpation over the sacroiliac joint and lower back. Physicians will also identify pain and restricted range of motion.

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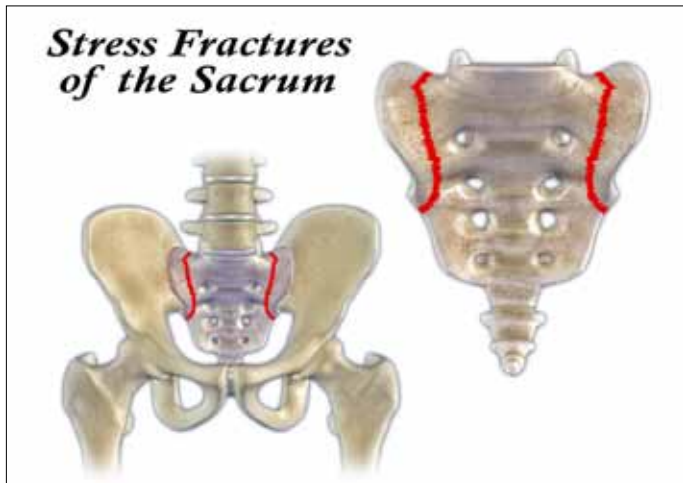


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X-rays, MRI, CT (especially coronal views) and bone scans may also be ordered to confirm the diagnosis or rule out other injuries.

Sacral stress fractures, due to the location and the symptoms, can mimic sciatica. This refers to pain, weakness, numbness or tingling in the leg caused by compression or injury to the sciatic nerve.

Sacral stress fractures are usually treated conservatively with rest and pain medication. Complete healing for sacral stress fractures may take up to nine months. During this time, patients ease back in to physical activity so as to avoid late displacement and possible malunion. In rare occasions, surgical intervention may be needed, whereby screws are inserted into the sacrum or cement is injected into the sacrum. ■



Stress fractures of the sacrum may not be seen on x-ray so a CT scan is often utilized to confirm the diagnosis.

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