Hughston Health Alert

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Inside...

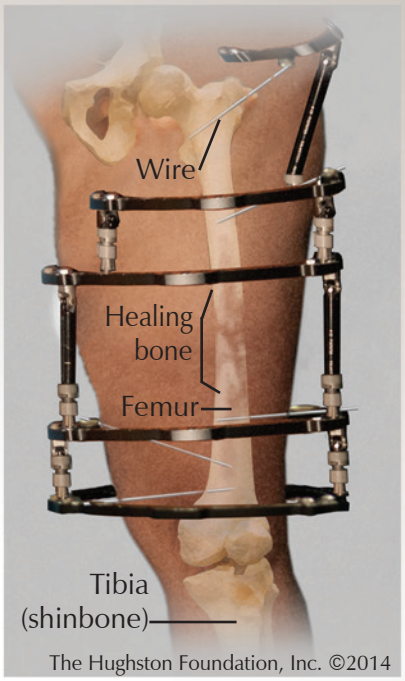
Ilizarov Technique

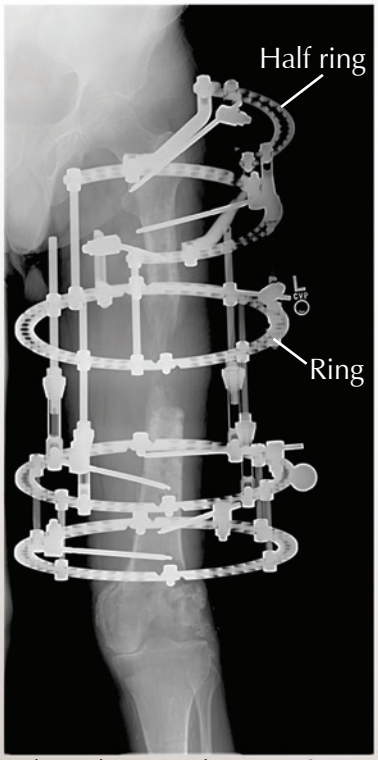
Treatment for patients who have severe fractures, limb deformity, and bone disease can be challenging for orthopedic surgeons. Before the Ilizarov technique was developed, a patient who had a nonunion of a fracture (a fracture that fails to heal) or a malunion (a fracture that heals incorrectly) had little treatment options available, and a patient who had osteomyelitis (a bone infection) or bone cancer often had no choice but to have the affected limb amputated. With the advancement of surgical techniques that use implants to treat fractures and deformities, the Ilizarov technique is used less often today; however, it continues to offer a viable treatment option for some patients.

History of the Ilizarov technique

The Ilizarov technique was developed by Dr. Gavril Ilizarov of the Soviet Union after World War II. Many of his patients suffered with severe fractures from the war and endured lengthy treatments that required casts and traction to support healing bones. During the 1950s, Dr. Ilizarov began working with other general surgeons on the idea of using an external fixator ring and small wires under tension to hold bones in alignment. In addition to developing the hardware, his method of treatment included stabilizing the fracture through fixation, preserving the blood supply to the bone, and early weight bearing and mobilization for the patient. The ability to regenerate bone by distraction, or pulling the fractured bones apart, was discovered after the screws for

An external fixator applied to the thighbone.





a fixator were turned in the opposite direction. The pulling apart instead of pushing together resulted in new bone formation that increased the length of the bone. Dr. Ilizarov's first widely known successful treatment for bone lengthening was in a national ski jumper in 1968. Since then, the Ilizarov technique has been used for the treatment of fractures, limb deformity, limb lengthening, and the treatment of fracture nonunions.

The Ilizarov technique has changed very little over time and has undergone few modifications. The basis of the technique continues to be preservation of the blood supply while correcting the limb alignment, and allowing the patient to place weight on the extremity. The extra effort required for using the Ilizarov technique is often worth the outcome. Often, the correction of a malaligned limb provides a more aesthetic and functional extremity.

Traumatic injuries

The Ilizarov fixator may allow the patient to avoid an amputation after a traumatic injury. The technique often involves small circular rings or half rings placed over the involved extremity. Small thin wires are placed through the bone in several crossing patterns to create tension above and below the area of injury. The tension keeps the bone stable as it heals and allows early weight bearing for the patient. With the current advances in orthopedics, the Ilizarov technique is often used at centers that specialize in trauma and the treatment of limb deformity.

Limb deformity treatment

For a patient with a malunion or in need of deformity correction, preoperative planning can make the Ilizarov system easier to use during surgery. Using computed tomography (CT) scans of the bone, the ring portion of the fixator can be assembled before surgery and fitted around the patient's leg or arm in clinic. Later, the fixator is sterilized and brought into the operating room. After the surgeon surgically corrects the deformity or fracture alignment, the ring is placed over the extremity and the small wires are attached to the premade ringed device. The nature and complexity of some fractures can prevent the prefabrication of the ring before surgery making it necessary to assemble the device during the surgery.

Limitations

The Ilizarov external fixator can remain in place for weeks or months at a time, allowing the patient joint movement above and below the fixator and to bear weight on the extremity. However, the system does have some limitations for the patient. For example, the rings can be bulky depending on the patient's leg size, making walking difficult. The fixator can also make wearing clothes challenging, especially for people who live in colder climates that require long pants or layers of clothing for warmth. The fixator also requires daily pin care. Depending on how long the fixator remains in place and how well the pin sites are maintained, an infection can occur that requires the patient to take antibiotics. Most people today are intrigued when they see a patient with an Ilizarov fixator in place. Although the fixator can be bulky and require daily care, the fixation device and the Ilizarov technique can be the best option for treatment of certain orthopaedic injuries or deformities. The goal of treatment, no matter what the fixation technique, is to retain as much function as possible and allow the patient to bear weight on the extremity while healing.

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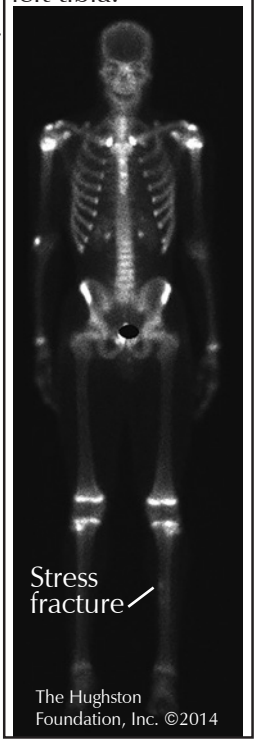
Tibial Stress Fractures

Stress fractures are overuse injuries to bone that result from repeated trauma associated with a recent increase in activity or repeated activity with no rest. Stress fractures that involve the tibia (shinbone) occur frequently in soldiers and athletes who run, jog, and participate in track and field or similar activities.

Stress fractures vs. stress reactions

A stress reaction can occur when there is repetitive stress to an area of bone leading to localized weakness and pain. A stress fracture occurs when these repetitive stresses cause the bone to fatigue and crack. Unlike acute fractures which are generally seen on routine x-rays, stress fractures are often very subtle or not revealed on plain x-rays. Most acute fractures are caused by a traumatic event, such as a fall or direct contact to bones. Stress fractures slowly develop following repeated trauma to bone from activities, such as marching or running. Whereas acute fractures usually require some form of immobilization in a cast or orthotic to heal, stress fractures often heal with reduced activity.

Fig. 1. Full-body bone scan shows stress fracture in left tibia.



Who is at risk for a stress fracture?

Stress fractures in athletes occur in about equal proportions in male and female athletes and are common among physically active people of all

ages. However, females who report menstrual irregularities and athletes associated with the so-called female athlete triad—consisting of amenorrhea (absence of menstrual periods), eating disorders, and decreased bone density—are at an increased risk. Biomechanical factors associated with multiple stress fractures include a high longitudinal arch of the foot, unequal leg length, a narrow tibia, excessive hip external rotation, and excessive forefoot varus (flatfoot).

How are tibial stress fracture diagnosed?

Most patients experience mid- to low-anterior shin pain that occurs initially toward the end of sporting activities. The pain progresses to the point that it occurs earlier during athletic activities and eventually becomes painful while simply walking. Your physician will examine the site where pain is present, take your health history, record your risk factors, such as a recent change or increase in activity, and order an x-ray. The physical examination often reveals tender soft tissues and swelling at the fracture site. Provocative tests that deliberately induce symptoms, such as running, jumping, or climbing stairs, often reproduce the pain. Examination usually reveals nontender knee and ankle joints with full range of motion. A bone scan or magnetic resonance imaging (MRI) may be requested if the x-ray appears normal, because a stress fracture can be difficult to see on an x-ray, especially early on. A bone scan shows where in the body there is an increase or decrease in bone growth. These tests help confirm suspected stress fractures that are not seen on a plain x-ray. Bone scanning is performed by injecting a small amount of radioactive material, commonly known as a radiotracer, into a vein. The patient returns 3 to 4 hours later and full-body images are taken (**Fig. 1**). In an area where fractures are present, an increased amount of the radiotracer will be absorbed and seen as a bright spot on the bone scan as shown in the magnified portion of the scan in **Fig. 2**. Common areas that will always look bright are growth plates in adolescents.

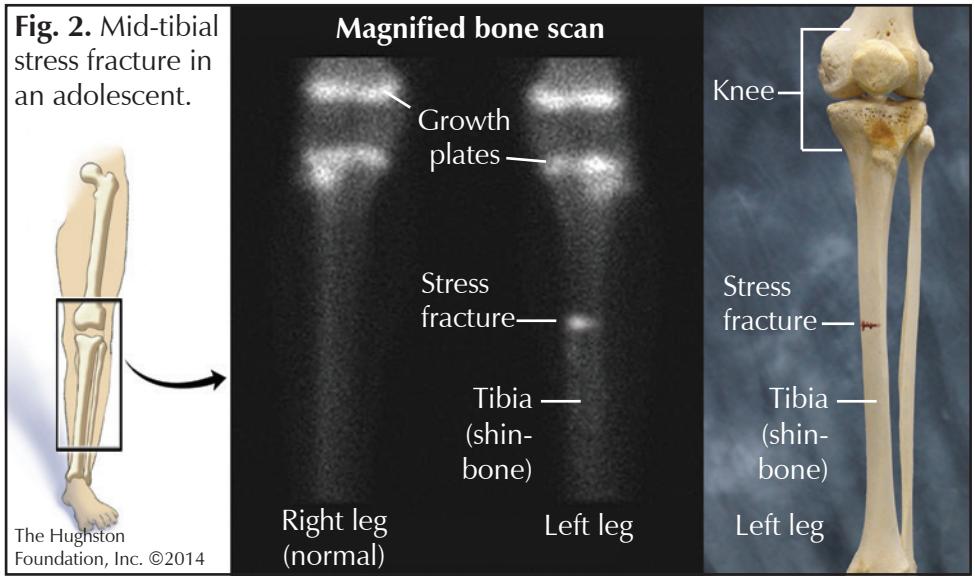


Fig. 2. Mid-tibial stress fracture in an adolescent.

Types of stress fractures

Posteromedial tibial stress fractures are on the compression side of the tibia, which causes them to be more common; however, they are often treated with rest and activity modification and an early return to sport is often possible. Anterior mid-tibial stress fractures often require prolonged nonoperative treatment and can progress to nonunion or even complete fractures. Anterior mid-tibial stress fractures are on the tension side of the tibia, which increases the osteoclastic activity (bone resorption, or breaking down of bone) in the area. With less bone building and the lack of muscle and tendon support at the anterior mid-tibia, nonoperative treatment is likely to be unsuccessful. Prolonged nonoperative treatment, a persistently painful incomplete fracture, or a complete fracture can end an athlete's career.

How do you treat a tibial stress fracture?

Nonoperative treatment often involves nonweightbearing, rest, avoiding activities that cause the symptoms, and using a cast or walking boot. Often, your doctor will recommend physical therapy and pain medications.

The earlier you see your doctor, the sooner you can return to activity. Delaying treatment often results in further injury to the fracture and a longer treatment time. For nonunions or stress fractures that do not heal, surgical treatment can require an implant, such as a nail or a locking plate with screws, and a bone graft to stimulate bone healing.

How can I prevent a stress fracture?

Bones can adapt to repetitive stress but extreme stress, repeated too often, can overwhelm the bone's ability to adapt. You can prevent a stress fracture by following a training program that slowly increases in intensity and allows time for your body to recover by taking periodic rest days. If you want to work out or participate in sports daily, try cross-training, or alternating your workout routine or sport, to avoid stressing the same bones, muscles, ligaments, and tendons every day.

If you have a tibial stress fracture, give your bone time to heal. Stop the activity until you no longer experience pain. Once you restart your activity, begin slowly or you risk injuring your tibia again. While increasing your activity level, make sure you take rest days between your active days. Doing too much, too fast only gets you back to where you started—dealing with a painful fracture.

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Manipulation of the Frozen Shoulder

CURRENT RESEARCH AT THE HUGHSTON FOUNDATION

The old adage, "a picture is worth a thousand words," is under investigation at the Hughston Foundation. We are currently performing a clinical study with patients who suffer from adhesive capsulitis, or the so-called frozen shoulder.

What is frozen shoulder?

The bones, ligaments, and tendons that make up your shoulder joint are encased in a capsule of connective tissue (**Fig. 1**). Frozen shoulder occurs when the capsule thickens and tightens around the shoulder joint, restricting a full range of motion. Frozen shoulder can result from an injury to your shoulder, or it can start from a simple flare-up of pain and inflammation to the shoulder.

Symptoms and nonsurgical treatment

Symptoms of limited motion, pain, and stiffness often begin gradually and worsen over time. The pain can become worse at night, disrupting sleep, and it can become difficult to reach overhead or scratch your back. Activities of daily living, such as washing or brushing your hair or operating your vehicle, can become difficult. The condition can be treated successfully with physical therapy and anti-inflammatory medication; however, if your shoulder does not respond to nonsurgical treatment, a surgical procedure to regain full range of motion may be necessary.

Manipulation

During surgery, your shoulder is manipulated, or moved into its full range of motion. There is often a tearing of either the capsule or capsule adhesions that is both felt and heard by the surgeon as the arm is moved through its full range of motion. After the shoulder's range of motion has been improved in all directions, you can be discharged with a treatment plan of medication and physical therapy. A successful outcome depends greatly on physical therapy to maintain the newly achieved range of motion. Depending on your shoulder's response to treatment, frozen shoulder can take from 2 to 18 months to resolve.

Fig. 1. Normal shoulder anatomy.

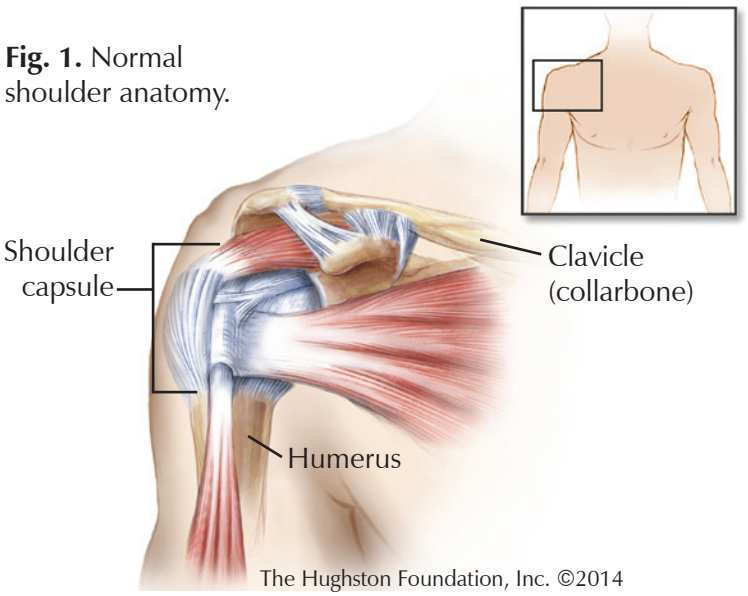

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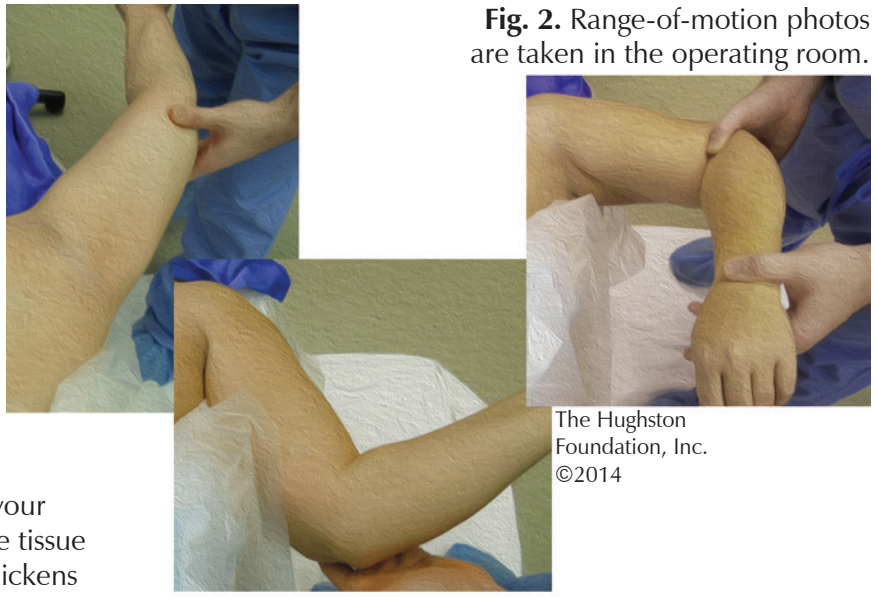
Fig. 2. Range-of-motion photos are taken in the operating room.



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Our research

Currently, at the Hughston Foundation, we are researching ways to improve the gain and the rate of improvement after a shoulder manipulation has been performed. Often, after manipulation of the capsule, the shoulder remains painful during movement through its full range of motion. However, if you do not move the shoulder despite the pain it can become stiff again. We hypothesized that a visual aid could help you to see what to expect from your shoulder. As part of the research study, a photograph is taken after surgical manipulation to show the shoulder's full range of motion (**Fig. 2**). Later, you are shown the photograph of the improved range of motion. The photograph provides a goal for you to work toward despite the pain. With the visual aid, you can take greater ownership of your progress knowing that you can achieve the range of motion attained through surgery. Without the photograph as evidence, it can be difficult for you to appreciate your true limits, especially when pain is a factor.

Although the study remains ongoing, evidence appears to demonstrate that improvements can be made with a little self motivation in the form of a photograph. Like a motivational poster in a gym, the photograph can be worth more than a thousand words on the road to recovery.

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Venous Thoracic Outlet Syndrome in Athletes

Venous thoracic outlet syndrome, or Paget Schroetter syndrome, is rare in the general population; however, seasoned athletes can experience the symptoms of this condition after strenuous activity. The syndrome occurs primarily in athletes or active people who repetitively use their upper body for sport or work. The thoracic outlet, located between your clavicle (collarbone) and your first rib, is a narrow passageway crowded with blood vessels, muscles, and nerves (**Fig. 1**). The collarbone can apply pressure on the nerves and blood vessels, causing a thrombosis, or blood clot. Venous thoracic outlet syndrome often affects young male athletes in the dominant arm or shoulder who play baseball, football, basketball, or wrestling. A blood clot can occur in the thoracic outlet in a healthy athlete who has no previous injury, no history of circulatory problems, or other upper extremity problems (**Fig. 2**).

Symptoms

If the subclavian and axillary veins become blocked by a clot, the athlete often complains of shoulder, neck, or arm pain. In addition to pain after strenuous activity, swelling and discoloration of the arm or hand can occur, and the patient can experience neurologic symptoms, such as numbness and tingling in the arm, hand, and fingers. The symptoms can be misdiagnosed as a shoulder muscle strain or tear because range of motion can become limited and overhead activity can be difficult. Thoracic outlet syndrome is a serious, life-threatening condition because the clot can travel to the heart or lungs and interfere with circulation or breathing. A definitive diagnosis can be achieved with an arteriorgram/venogram, an x-ray that uses dye to monitor blood flow.

Treatment

Treatment for venous thoracic outlet syndrome often depends upon the severity of the clot. If you have this condition, your physician can give you medications to help dissolve the clot or a surgeon can perform a surgical procedure to remove it. Your physician can also prescribe a nonsurgical approach that consists of cardiovascular exercise, stretching, isometrics, and range of motion in the upper extremity to resolve the compression. Your surgeon can perform thoracic outlet decompression surgery to remove the rib and musculature that caused the compression, as well (**Fig. 3**).

Venous thoracic outlet syndrome may be more prevalent now because athletes engage in sports at a younger age and remain active throughout adulthood. As a result, they are more prone to repetitive injuries of the upper extremity. An increase in the level of play and competition may also play a part in the increase of overuse injuries. Athletic trainers and other healthcare professionals should become familiar with the symptoms of this serious condition, because it can become life threatening.

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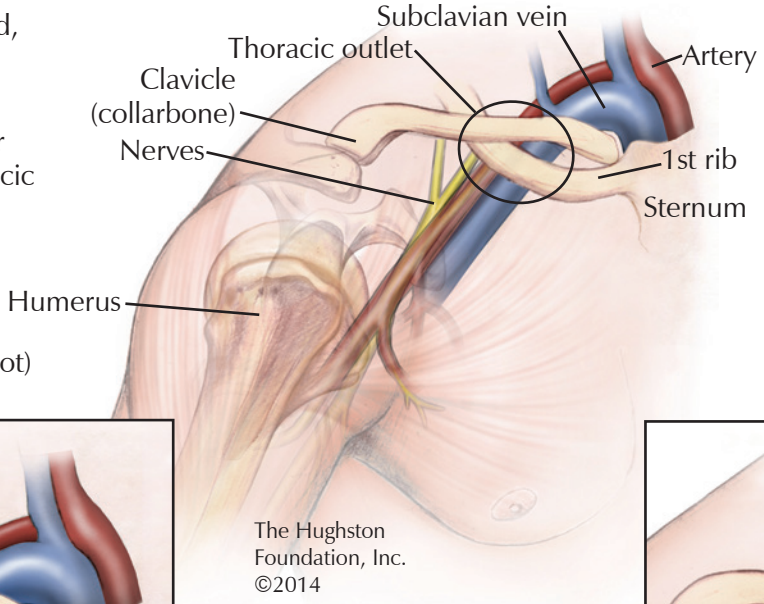


Fig. 1. Normal shoulder anatomy showing thoracic outlet structures.

Fig. 2. Thrombosis (blood clot) within the thoracic outlet.

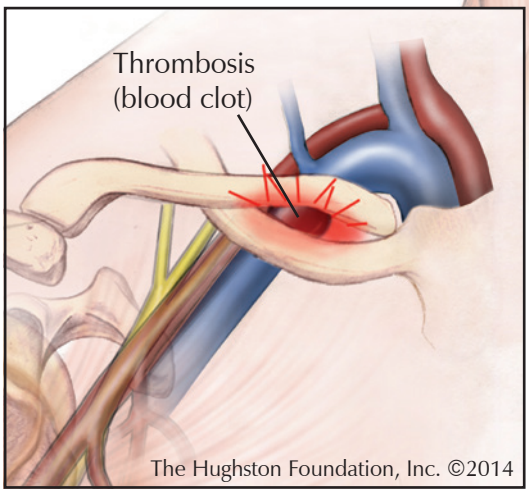
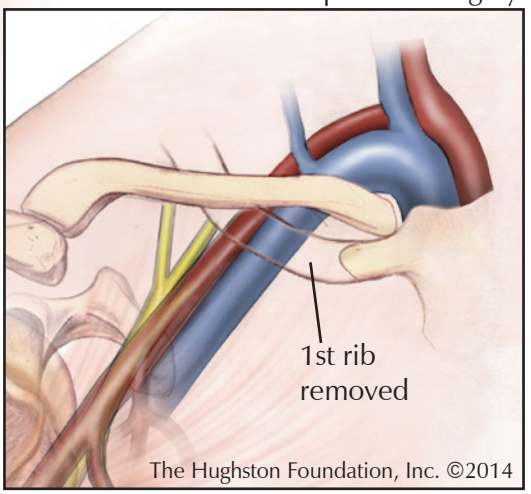


Fig. 3. Thoracic outlet decompression surgery.



Can Pain Management Help Your Chronic Pain?

The medical specialty of pain management focuses on eliminating or reducing chronic pain to help you experience a better quality of life. Before starting treatment, the pain management physician will give you a complete physical examination, review your medical history, and, if necessary, complete additional testing to diagnose the source of your pain. Once the source is identified, a pain clinic uses an interdisciplinary approach to design and implement a treatment plan that helps you actively participate in managing your pain.

Painful syndromes

- Arthritic conditions that affect the joints
- Carpal tunnel syndrome
- Facet joint arthritis
- Failed back surgery syndrome
- Neuropathy, or nerve-related pain, such as radiculopathy
- Phantom limb pain
- Reflex sympathetic dystrophy/complex regional pain syndrome (RSD/CRPS)
- Spinal stenosis

Pharmaceutical treatments

Nonnarcotic and narcotic medications can be used effectively to manage pain. Nonnarcotic medications include nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin, ibuprophen, or naproxen; muscle relaxants, antiseizure medications, such as gabapentin (Neurontin®); and antidepressants, such as duloxetine (Cymbalta®). The medications help to reduce pain related to inflammation, muscle tightness or spasms, and nerve-related pain, often experienced as numbness, tingling, and burning.

Using narcotic-based medications in the management of acute or chronic pain requires you to enter into a narcotic agreement. To receive controlled medications, you agree to use the medications as prescribed, to not take any controlled medications from any other physician while under the care of the pain specialist, to not use any illicit substances, and to undergo random and routine urine drug testing. Your use of these narcotic drugs can be monitored by counting the pills at each appointment. If you violate the agreement or develop an addictive behavior, you will no longer receive narcotic-based medications. You may be referred to an addiction specialist for detoxification.

Commonly prescribed narcotic classes

Class II:

- Hydrocodone with acetaminophen
- Morphine
- Fentanyl
- Oxycodone
- Meperidine
- Hydromorphone
- Tapentadol
- Oxymorphone
- Methadone

Class III:

- Codeine with acetaminophen

Nonpharmaceutical treatments

Nonpharmaceutical treatments, such as physical therapy, interventional injection therapy, acupuncture, psychological counseling, and cognitive behavior therapy can be effective in managing pain. Physical therapy reduces pain by using therapeutic exercises and modalities to strengthen specific muscle groups. During therapy, you can learn beneficial exercises that you can continue to do at home. Interventional injection therapy can include sacroiliac joint injections, epidural steroid injections (**Fig. 1**), facet joint blocks (**Fig. 2**), selective nerve root blocks (**Fig. 3**), and sympathetic ganglion blocks. X-ray guidance is used to assist in accurate needle placement to deliver medication to a painful area, often adjacent to or within the spinal canal. Acupuncture, which is among the oldest pain-relieving practices in the world, stimulates specific points in the body by inserting small needles through the skin. The theory is that the treatment regulates the flow of

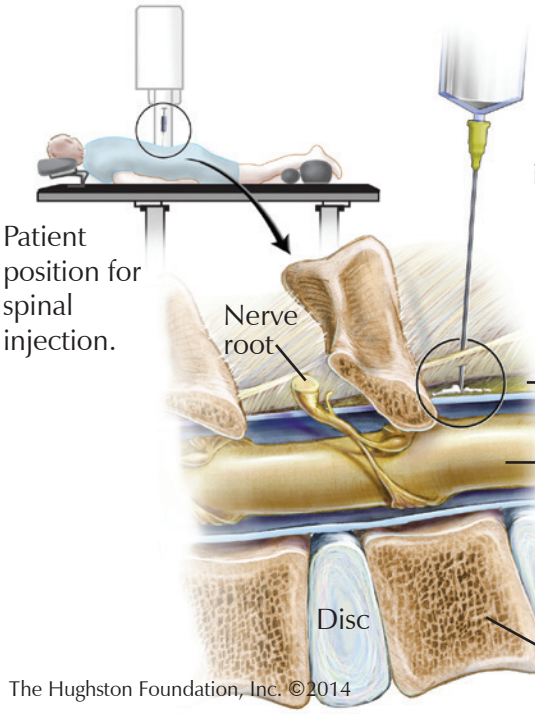
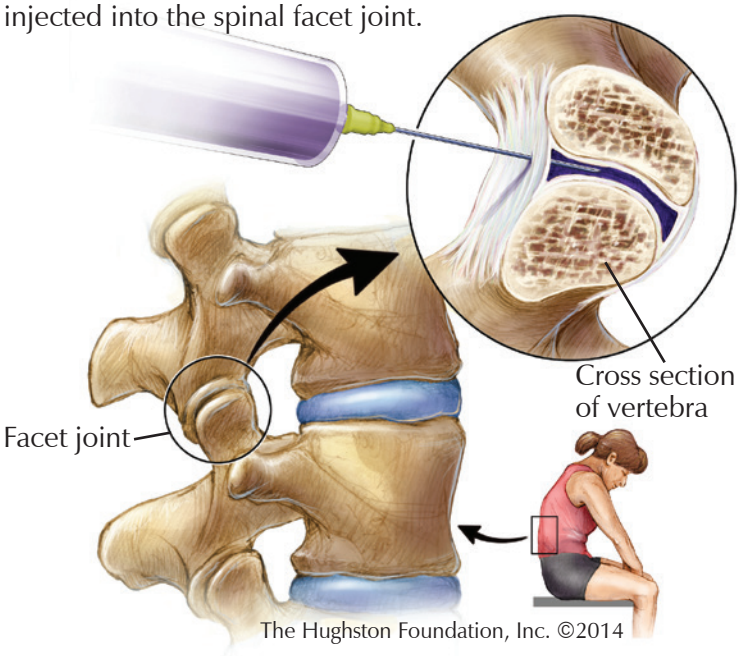


Fig.1 . Epidural injection: the steroid medication is injected into the epidural space.

Fig. 2. Steroid medication is injected into the spinal facet joint.



qi (vital energy) along the pathways known as meridians. Psychological counseling focuses on helping patients deal with the emotional aspect associated with chronic pain and helps to develop different nonpharmacological coping mechanisms. Cognitive behavior therapy is a treatment to help you cope with your pain by changing how you think about it. The treatment can be effective because how you think about your pain can affect how you feel.

A specialized procedure called radiofrequency ablations can help patients who suffer with painful arthritic conditions of the entire spine. The procedure eases back pain related to facet joint arthritis and sacroiliac (SI) joint pain by using thermal energy to produce a lesion along a specific nerve. The procedure can also be used to reduce pain associated with knee osteoarthritis, rib pain related to herpes zoster (shingles), and peripheral nerve disorders. Pain relief can last from 6 months to 60 months.

Neuroaugmentation, or spinal cord stimulation, is a specialized procedure used in managing patients who have not responded to nonoperative management of axial and radicular pain. Often, candidates for the procedure have undergone surgery but continue to have persistent pain in the neck or back with associated numbness and tingling in the arms or legs. A patient can have anatomical causes for neck pain or low back pain that are not shown on x-rays or magnetic resonance imaging (MRI). During the procedure, a small electrode is guided with the assistance of fluoroscopy into the epidural space of the spine. The electrode sends out a small electrical signal to reduce painful nerve impulses into the central nervous system. Patients undergo a period of trial stimulation to ensure the device provides reduction in pain and improve the desired functional ability. The trial procedure usually lasts between 3 to 7 days. Spinal cord stimulation has an additional benefit of reducing a patient's dependence on narcotic medications. Neuroaugmentation can also be used to assist in the management of pain due to peripheral nerve disorders.

Few painful conditions require immediate attention for good results; however, one such condition, reflex sympathetic dystrophy (RSD) responds best to treatment in the early stages rather than later. Often with RSD, a portion of the central nervous system, the sympathetic system, allows uninterrupted pain to flow along the involved limb resulting in temperature changes, burning, tingling pain, and skin discoloration. If left untreated, the condition results in significant loss of use of the affected limb. Antiseizure medications, tricyclic antidepressants, and specific narcotic medications can be used to reduce the pain associated with this disorder. The fastest way to alleviate pain associated with RSD is by performing a series of sympathetic chain blocks using anesthetics. Once pain has been controlled, occupational and physical therapies play a significant role in helping to restore function.

Pain management physicians treat a broad array of medical conditions. Often, they collaborate with other specialists to manage difficult injuries or conditions, such as crush injuries, amputations, and bone malignancies. Pain management uses a multidisciplinary approach to achieve the best results; which means treating the biological, psychological, and social problems associated with pain. If you experience chronic pain, talk to your physician to see if a pain management specialist can help.

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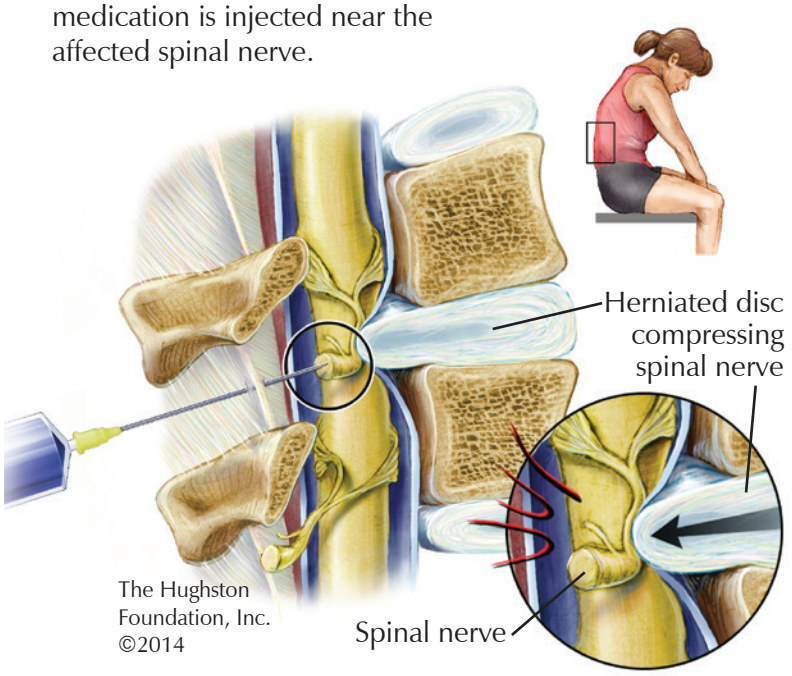
Fig. 3. Selective nerve root block: medication is injected near the affected spinal nerve.



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