



Hughston Health Alert

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35th Anniversary

HUGHSTON HEALTH ALERT

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Vestibular Rehabilitation

If you sometimes feel dizzy or lose your balance, your doctor may have referred you to a therapist for vestibular rehabilitation. For some, an episode of dizziness comes and goes, but for many, it is a chronic problem that doesn't go away. If this is a persistent concern for you, vestibular rehabilitation may help (**Box 1**).

The vestibular system controls your balance

To keep your balance, your brain uses the signals from your eyes to see where you are, your proprioception (the sensors in your muscles and joints) to feel where you are, and your vestibular organs (the balance organs in your inner ears) to sense when your head moves. The vestibular system internally tells the brain where your head is oriented in space.

Balance is a complex system that begins in your inner ear (**Fig. 1**). In addition to hearing, your inner ear controls your equilibrium by serving as a sensory organ for your orientation and head movement. You have small balance organs within the inner ear that work with your visual system, which is processed by your brain to give you a sense of your body's position. These systems help keep objects from blurring when you move your head. You also have sensory receptors in your skin, joints, and muscles that send balance-related signals to your brain. Your brain receives information from these different body systems all at once.



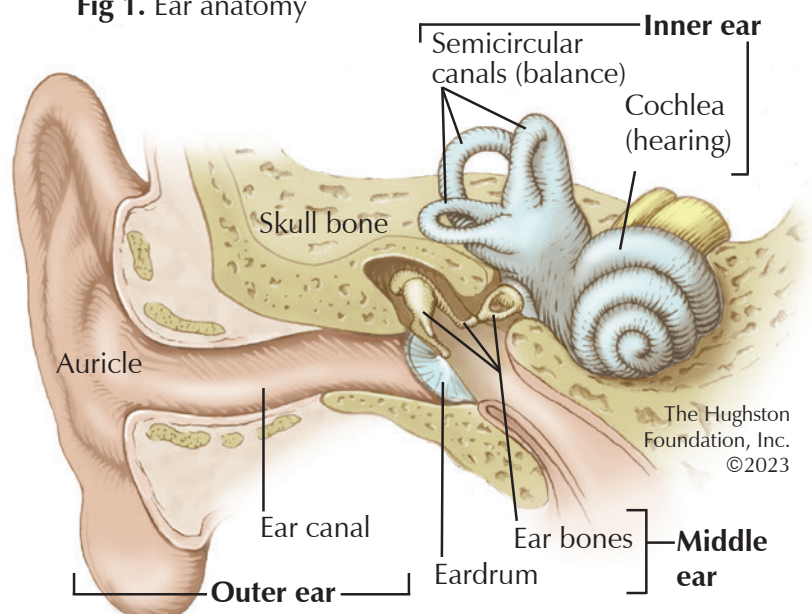
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Box 1. Some causes of dizziness and balance disorders:

- | | |
|-------------|------------------------------|
| Head injury | Stroke |
| Medications | Low blood pressure |
| Age | Ear infection |
| Neck injury | Upper respiratory infections |

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Fig 1. Ear anatomy



If changes in the inner ear occur—for example, aging, illnesses, infection, or trauma—one or several components of this system may not work properly, causing you to suffer from loss of balance. Concussion, blows to the head or ear, and whiplash are frequent causes of balance disorder and dizziness. Illness, such as ear infections, upper respiratory infections, stroke, and low blood pressure can also lead to vestibular disorders (**Box 1**).

Is there a cure?

For most people who have a vestibular disorder the problem is permanent because your body is limited in its ability to repair damage to the vestibular organs. The good news is that your body often compensates for a vestibular problem by retraining the part of the brain that interprets balance; therefore, treatment can help reduce the symptoms and improve your balance. Some of the recalibration can happen naturally, but for many, vestibular rehabilitation is necessary to avoid symptoms and a risk of injury.

Aging doesn't make it easier

Older people are more likely to experience a balance disorder because as you get older, a collection of problems can affect your balance. Declining hearing and vision, cataracts, muscle weakness, or other health problems like diabetes and blood pressure can contribute to a balance disorder.

The natural aging process can affect your senses and the brain's ability to interpret them, resulting in a slower reaction. For example, you may not respond fast enough to catch yourself if you trip on something or be able to keep your balance on uneven ground or rough terrain. A persistent sense of imbalance, or what some might call “a loss of surefootedness,” can cause a fear of falling as well.

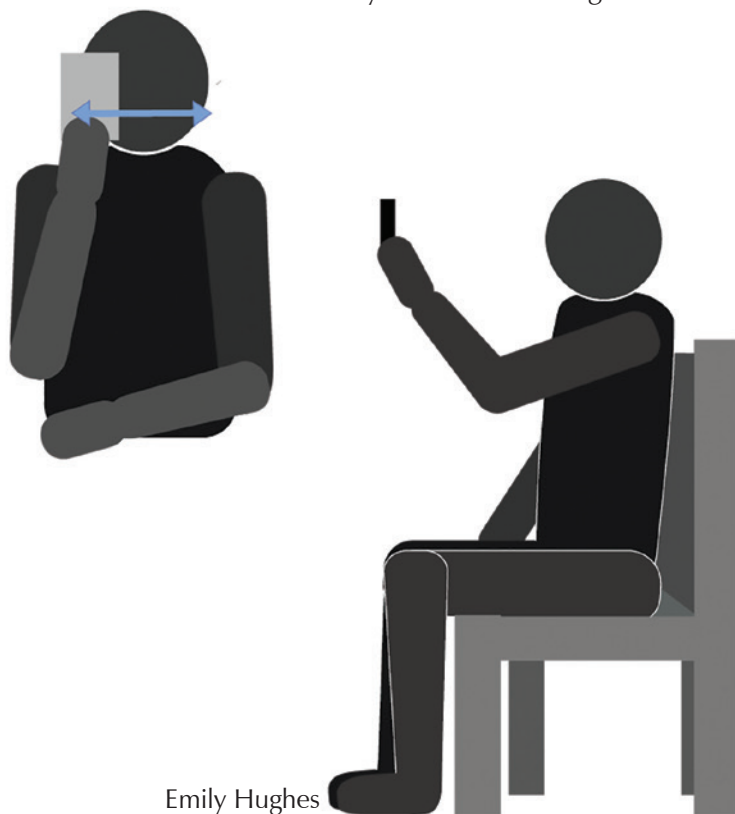
Box 2. Balance disorders are difficult to diagnose, so you should discuss your symptoms with your physician.

Let your doctor know if:

- You feel unsteady
- You sometimes feel as if the room is spinning around you
- You feel as if you're moving when you know you are standing or sitting still
- You lose your balance and fall
- You feel as if you're falling
- You feel lightheaded, or as if you might faint
- Your vision becomes blurred
- You sometimes feel disoriented, losing your sense of time or place

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Fig. 2. Visual tracking exercise. Individual holds a card at eye level and moves it side-to-side while tracking with their eyes but not moving their head.



Emily Hughes
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How is this problem diagnosed?

The first step to improving your balance is to see your doctor for a physical exam and diagnosis (**Box 2**). Your doctor can assess whether your symptoms are from a serious problem, such as a blood or heart condition or if it is a vestibular problem. If an inner ear disorder is likely, your doctor may refer you to a specialist, such as an otolaryngologist (a doctor with expertise in the ear, nose, and throat). You may receive a hearing test, a balance test, and possibly an imaging study of your brain, such as a magnetic resonance imaging (MRI) scan.

History of vestibular rehabilitation

Although vestibular rehabilitation has only recently gained wide attention, the concept of head movement and coordinated eye exercises as a treatment for vestibular disorders is actually over 80 years old. As far back as the mid 1940's, a British otolaryngologist name Sir Terence Edward Cawthorne observed that some patients improved or recovered sooner from dizziness after performing rapid head movements. In cooperation with a physiotherapist named Cooksey, they developed a regime of exercises to help reduce dizziness and restore balance. With some modifications, physical therapists continue to use the Cawthorne-Cooksey exercises today (**Fig. 2**).

How vestibular rehabilitation exercises help

Unfortunately, your body is limited in its ability to repair damage to the vestibular organs. However, some of the recalibration can happen naturally, but the recovery process can be accelerated and the degree of recovery increased by regularly practicing specific exercises. The exercises include eye, head, and body movements to stimulate your balance system. They are simple and designed so you can do them under the supervision of a therapist and at home.

What can you expect?

Vestibular rehabilitation exercises will make you feel slightly dizzy while you are doing them, which is why you need a trained therapist to help you. The dizziness you feel is normal and it is a sign that your brain needs practice making the movements to help recalibrate your balance system. If the balance exercises make you feel extremely dizzy and unwell, then your therapist may instruct you in exercises that are easier or slower.

Meeting with your therapist

A therapist who specializes in vestibular rehabilitation develops an individualized treatment plan based on your symptoms and needs. At your initial appointment, your therapist will evaluate your condition and help you set realistic goals to improve your symptoms (**Box 3**). Among the different types of vestibular rehabilitation exercises, your therapist will determine which is best for you.

What are the exercises?

Your exercise-based program will help you improve balance and reduce dizziness. Here are the different types of exercises that your physical therapist may use:

- **Adaptation exercises** improve your balance system by resetting how your brain controls your eye movements in response to your balance organs.
- **Habituation exercises** involve repeating movements to reduce symptoms.
- **Proprioception exercises** focus on detection of movement and body position, which are important cues for maintaining your balance.
- **Substitution exercises** help with discovering the strongest and weakest part of your balance system and relying more on the areas that can help you regain function.
- **Canalith repositioning** is a maneuver performed by a trained therapist who gently repositions crystals in the inner ear that have become dislodged and float within the ear canal.

Box 3. Does this sometimes happen to you?

Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do you have a feeling of movement, spinning, or falling when you move your head rapidly?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do you have trouble or are you uncomfortable trying to move in the dark?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do your feet tend to go in a direction other than what you want?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do you have a sense of unsteadiness?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do you have a fear of falling or stumbling?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Does looking at moving objects make you queasy?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do you have trouble keeping your balance as you walk on different surfaces?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	Do you feel like you are drifting or being pulled to one side while walking?

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*If you answered YES to one or more of these questions, you should consider an evaluation.

Therapy includes practical solutions to improve your life

For older adults, or if you have balance problems, you will work on practical solutions to help with walking on uneven surfaces, moving unencumbered on ramps, climbing stairs, and how to move safely in the dark. Fall prevention, movement coordination, and participation in everyday activities are major areas you will work toward improving. You may have 2 to 3 sessions for an hour each week for 8 to 12 weeks. As you progress, you will be given more exercises to perform at home to help you improve.

A specialized rehabilitation therapist can give you a set of head, body, and eye exercises to help reduce dizziness and nausea. The duration of your treatment, depends on the diagnosis and clinical symptoms you experience. Some patients may only need 8 to 10 visits while other may require sessions for 3 to 4 months.

Get back on your feet

Unfortunately, many people adopt a sedentary life to avoid bringing on a dizzy spell or imbalance episode. Fear from falling can keep you inactive, resulting in decreased stamina, flexibility, and muscle strength, which also causes joint stiffness and other aches and pains. Vestibular rehabilitation can help you avoid these problems through proven treatment strategies that get you back on your feet and living your life again.

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Total Knee Arthroplasty:

QUESTIONS FOR A SPECIALIST

We are seeing a steady increase in the prevalence of knee arthritis affecting adults in the United States. In fact, more than 10% of men and women over the age of 60 have symptomatic arthritis, which likely arises from an increase in the population's age and adults who are more active. Unfortunately, the pain and instability of knee arthritis can greatly affect your quality of life and overall mobility.

When the symptoms first begin, patients often use braces and over-the-counter pain relieving creams and medications; however, as arthritis advances, symptoms can become unresponsive. Your physician may recommend physical therapy or intra-articular

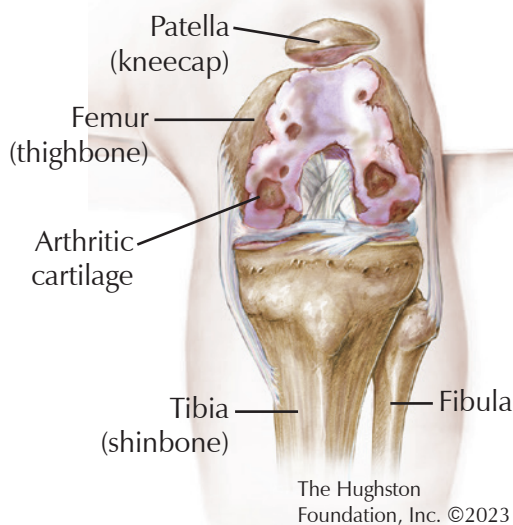
(inside the joint) steroid injections. If these nonoperative treatments fail, your doctor may recommend total knee replacement. Researchers project that by the year 2030 surgeons will perform approximately 1.2 million total knee arthroplasty (replacement) (TKA) procedures each year.

What types of arthritis affect the knee?

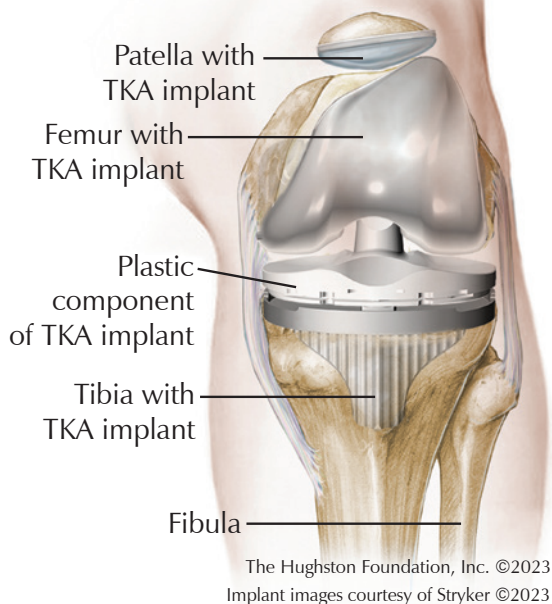
There are 3 major types of arthritis that doctors see in the knee: primary osteoarthritis (OA) (**Fig. 1**), post-traumatic osteoarthritis, and inflammatory arthritis. Primary osteoarthritis is the most common type of arthritis orthopaedic surgeons treat because it results from normal wear and tear on joints and may have a genetic component.

Fig. 1. Total knee arthroplasty (TKA)

Anterior (front view) of bent knee with osteoarthritis arthritis



Anterior (front view) of bent knee with TKA implant



Post-traumatic osteoarthritis, which results from an injury to the knee that occurred years prior, can be from sports, trauma, or infection that damaged the surrounding ligaments (tissue that connects bones) or cartilage (hard slippery tissues that cover the ends of bones) that over time has led to deterioration of the joint. Another common type of arthritis, inflammatory arthritis, is seen in patients who have autoimmune disorders (the body's immune system attacks healthy tissue, including joints), such as rheumatoid arthritis or psoriatic arthritis. A rheumatologist often manages these types of arthritis with medications. Despite the treatment, unfortunately the result is often joint destruction and an eventual need for knee replacement.

Why does my knee hurt?

There are several reasons why knee arthritis can cause pain. In the early stages, the cartilage of the joint begins to degenerate, leading to inflammation within the joint, which produces enzymes that trigger pain receptors. As the cartilage continues to wear, the space within the joint reduces allowing the bones to move closer together. As the joint space narrows, the supporting ligaments loosen and the knee becomes unstable. With activity, this instability causes the ligaments to stretch and activates the pain fibers around the knee. In the last stages of arthritis, the cartilage can completely wear away producing bone-on-bone contact. The mechanical grinding of bone against bone causes significant pain and loss of function.

What are the nonoperative treatments for knee arthritis?

Although treatment recommendations depend on the severity of your symptoms, all patients warrant an attempt at nonoperative care. You should take simple measures first, including changes in activities and maintaining a healthy weight. For active patients, changing workout routines that lessen the impact on your knees may be beneficial, such as substituting higher impact exercises with low-impact aerobics. Physical therapy for lower leg muscle strengthening can help with mild to moderate knee arthritis as increasing muscle strength can compensate for the deteriorating knee joint and associated instability. At the same time, over-the-counter and prescription anti-inflammatory medications including ibuprofen, naproxen sodium, diclofenac, meloxicam, and celecoxib can relieve some of the discomfort. Acetaminophen is also an effective pain reliever with fewer gastrointestinal side effects than anti-inflammatories.

Additionally, knee braces can help with mild

to moderate arthritis and they range from inexpensive compression sleeves to medical-grade hinged devices. Knee braces provide added stability for deteriorating knee cartilage, as well as increase sensory feedback, known as proprioception, on the knee's position in space. This feedback helps with knee stability, which subsequently reduces pain.

Furthermore, intra-articular injections are a successful nonoperative treatment option performed by orthopaedic physicians. Most injections consist of a combination of local anesthetics and corticosteroid. These types of injections reduce inflammation within the joint leading to pain reduction. Viscosupplementation (a gel-like fluid, consisting of hyaluronic acid) is another injection option that may provide significant relief. These injections add lubrication to the joint for decreased pain with movement and some studies have indicated they may also have the added benefit of anti-inflammatory properties.

Who is a candidate for a total knee replacement?

Surgeons consider total knee arthroplasty for patients who have end-stage arthritis of the joint. Usually, patients who have had at least 6 months or more of symptoms and have failed to have significant relief with nonoperative treatments including medications, injections, physical therapy, and activity modifications are candidates for knee replacement. The patient's radiographs (x-rays) usually show bone-on-bone contact between the femur (thighbone) and tibia (shinbone). Some patients, especially those with inflammatory arthritis, may not progress to end-stage arthritis before the pain becomes severe enough for knee replacement.

Total knee replacement is a major surgery; therefore, the patient must be healthy enough to undergo the surgery and complete postoperative rehabilitation. To prepare for knee replacement, your primary care provider will complete a physical to ensure that you are healthy enough for surgery and will usually order a chest x-ray, electrocardiogram (EKG) of your heart, and basic blood work. Patients who have medical conditions may need clearance from specialists, such as a pulmonologist

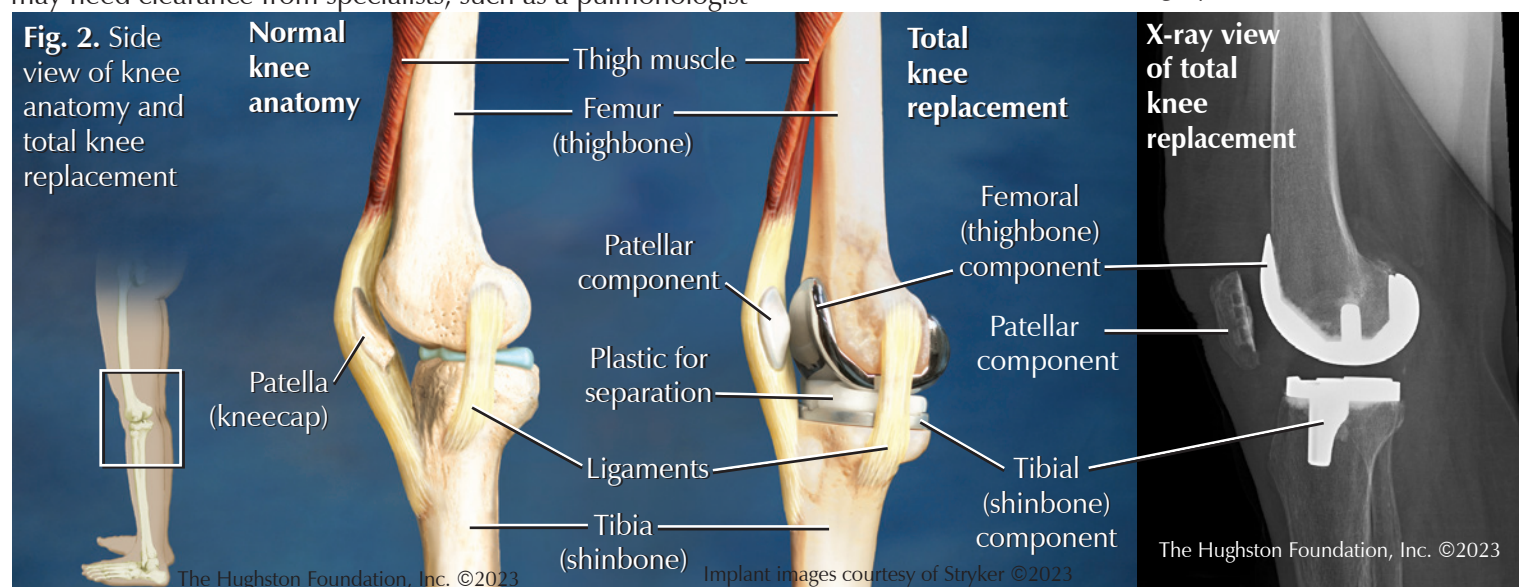
(respiratory specialist) or cardiologist (heart doctor).

How is a total knee arthroplasty performed?

Total knee replacement is performed through an incision about 6 to 8 inches in length in the front of the knee. The surgeon can perform the surgery using general anesthesia or spinal anesthesia and a local nerve block (injection) for postoperative pain control. Surgery typically lasts about an hour and involves removing part of the end of the thighbone and top of the shinbone. The surgeon then covers the surfaces with properly sized metal implants and inserts a piece of medical grade plastic in between (**Fig. 2**). The surgeon closes the incision in layers and covers the wound with a sterile dressing. Patients who are otherwise healthy and are able to ambulate can go home the same day, but some people may require a 1- to 2-night stay in the hospital for proper pain control and physical therapy.

Is there a preferred technique or method?

Although numerous companies make knee replacement implants, studies do not show that any particular device is superior to any other. Most orthopaedic surgeons use a few implant companies that they are familiar and comfortable with. Surgeons often secure the implants to the bone with a specialized bone cement. This is a grout-like material that the doctor mixes in the operating room and places on the bone along with the implant. The surgeon then holds the new parts in place while the cement hardens. A newer technique for implants does not involve cement. These types of implants have a specialized coating on the underside that contacts the bone. This coating allows the bone to grow onto the implant providing a secure fit to the bone end. No current studies show that any type of implant fixation is superior to the other. Other exciting technologies deal with how the surgeon cuts the bone during surgery. Your surgeon may discuss methods, such as computer assisted navigation, custom cutting guides, as well as robotic assisted surgery. These are all new



technologies that may offer advantages over conventional surgery; however, the approach or method is often your surgeon's preference and what is best for you.

What happens after surgery?

Physical therapy is the most important part of recovery and begins on the day of surgery. Therapy starts with walking and bending the knee to maintain range of motion. Patients must begin moving the knee right away to prevent stiffness. The therapist can help with maintaining motion and instructing patients on exercises. This motion will be uncomfortable at first but tends to get better over the first few weeks of recovery. You will have multiple therapy visits each week and patients are to perform exercises at home as well. Although patients may need a walking aid such as a rolling walker or cane, within the first few weeks, most patients can ambulate without assistance by their 6 weeks follow-up appointment.

What are some potential complications?

The most dreaded complication following knee replacement is infection. For this reason, your surgeon will prescribe a dose of antibiotics before the procedure and usually at least 1 or 2 doses after surgery to reduce your risk of infection. Should an infection arise, treatment ranges from oral antibiotics if it is localized to the skin, or you may need further surgery for cleaning the joint if the infection appears to be around the implant components.

Additionally, blood clots can form in the leg after a knee replacement because of the surgery and decreased activity. For that reason, your doctor may place you on a blood thinner for up to 6 weeks after surgery. If you have few risk factors and are relatively healthy, you may only need aspirin. If you have a few medical problems or a history of previous blood clots, your doctor may prescribe a stronger blood thinner medication or an injection.

Stiffness is also a feared complication. This is why physical therapists stress early and frequent motion during rehabilitation. If stiffness persists and limits function, a return to the operating room for a manipulation may be necessary to regain motion. After the manipulation, the patient will restart an aggressive physical therapy regimen. The best way to prevent complications is to follow the postoperative instructions provided by your orthopaedic surgeon.

What are the outcomes of knee replacement?

The vast majority of patients have significant improvements in pain and function following total knee arthroplasty. Recovery can vary but most patients have improvement with decreased pain at 6 weeks after surgery. With proper therapy and activity, improvements in pains and function will continue for 6 months to 1 year after surgery. You may experience occasional aches and pain around the knee implant with weather changes and increased activity. The hope is that only over-the-counter pain medications are necessary to control these minor aches and pains. Active patients can often return to recreational activities without restriction; however, you must take care to avoid excessive strain on the joint, which can affect its longevity.

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Hallux Rigidus

In 1888, British surgeon J.M. Cotterill was first to describe hallux rigidus as an osteoarthritic condition of the metatarsophalangeal joint of the great toe. Today, orthopaedists recognize this condition as the most common form of osteoarthritis (a type of joint disease that results from the breakdown of joint cartilage and underlying bone) in the foot. It affects roughly 2.5% of all people over the age of 50, is more common in females, and can involve both the left and right great toes. Besides arthritis, the causes of hallux rigidus include previous injury, trauma, and various deformities of the great toe, including bunion, hypermobility of the metatarsophalangeal joint, and avascular necrosis.

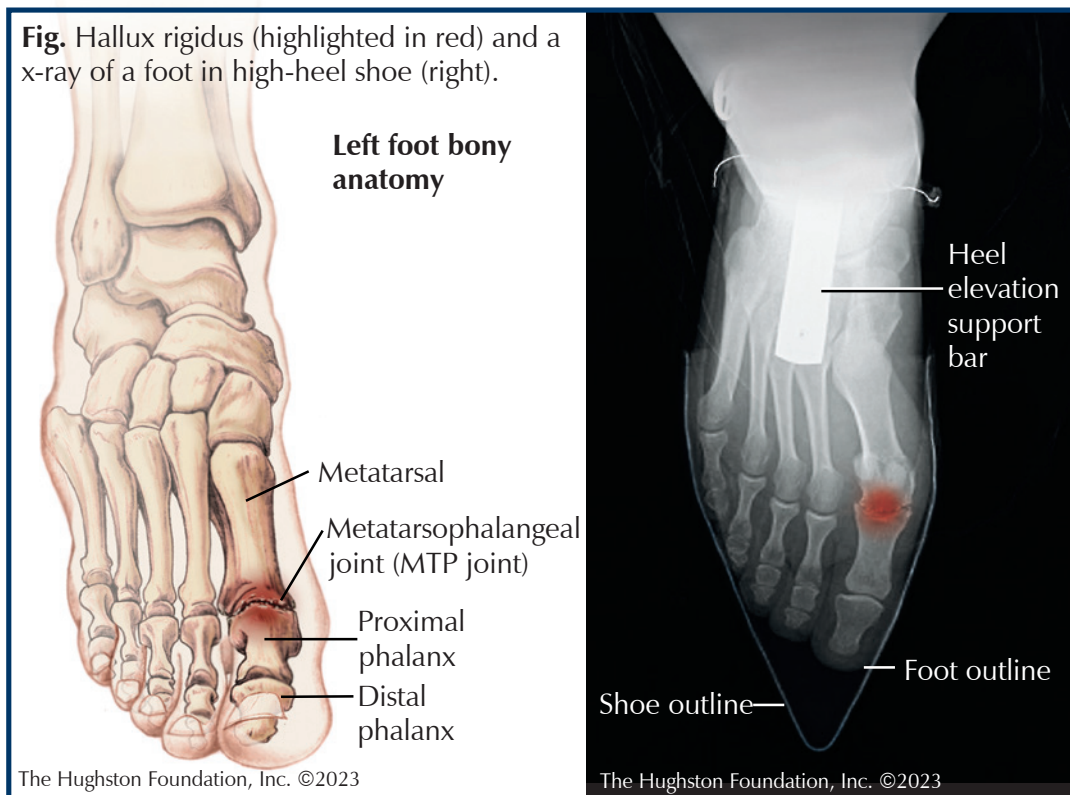
Anatomy

Three bones of the foot, the metatarsal, proximal phalanx, and the distal phalanx, form the great toe. The space between the metatarsal and the proximal phalanx is the first metatarsophalangeal joint, which healthcare professionals often call the MTP joint (**Fig.**). This joint consisting of articular cartilage (smooth tissue that covers the ends of bones) and synovial fluid (reduces friction between articular cartilage in a synovial joint) allows significant motion of the great toe. The MTP joint is also surrounded by ligaments (tissues connecting bones), a joint capsule (a dense fibrous connective tissue), and small muscles, and tendons (tissues connecting muscles to bones) that allow the great toe to move up and down. In patients who have hallux rigidus, the articular cartilage of the joint wears down causing each bone to rub together during movement. Physicians often describe this as “bone on bone” osteoarthritis. As the joint space narrows, the joint becomes stiff or rigid. The process also leads to contracture (permanent tightening) of the surrounding soft tissues.

Evaluation and diagnosis

Patients who have hallux rigidus present with painful and limited range of motion at the MTP joint of the great toe. On physical examination, the orthopaedist may find the MTP joint swollen and enlarged with bone spurs at the metatarsal head. In moderate to severe cases, patients may alter gait patterns to compensate for their pain and stiffness, especially since walking or increasing physical activity can elicit the symptoms. Patients frequently complain of difficulty wearing high-heeled shoes and joint stiffness. (**Fig.**)

Fig. Hallux rigidus (highlighted in red) and a x-ray of a foot in high-heel shoe (right).



The diagnostic imaging of choice is weight bearing radiographs (x-rays) of the foot. Depending on the severity of disease, the x-rays can demonstrate joint space narrowing, subchondral sclerosis (hardening of bone), deformity of the metatarsal head, and osteophytes (bony projections, or bone spurs) surrounding the joint.

Treatment

Nonsurgical treatment for hallux rigidus is often the first option offered to patients. The treatment consists of activity modification, shoe modifications, and anti-inflammatory medicines. Generally, your orthopaedist will recommend a variety of shoe modifications including a Morton's extension orthotic, rocker bottom stiff soled athletic shoe, or shoes with high and wide toe boxes to take the pressure off the dorsal aspect of the joint. In conjunction with shoe modifications, your doctor may prescribe nonsteroidal anti-inflammatory medicines such as ibuprofen or naproxen to help decrease swelling and pain. Additionally, your physician can recommend a corticosteroid injection into the arthritic joint space to help with pain and swelling.

Unfortunately, 2 out of 3 patients who have moderate to severe disease will fail conservative treatment. After more than 6 months of nonsurgical treatment without results, your orthopaedist may recommend surgical management as your next option. Although there are numerous surgical treatments published in the medical literature, most orthopaedists focus on 3 procedures.

The first treatment, known as a cheilectomy, is ideal for patients who have mild to moderate arthritis and pain during the extremes of motion. Cheilectomy involves

removing bone spurs from the metatarsal head and removal of about 30% of the articular surface. Overall, a review of the medical literature on the procedure shows satisfaction rates of 88% to 95% with an increase in range of motion by approximately 20 degrees.

An arthrodesis or fusion of the MTP joint is the most common procedure performed for the condition and represents the current gold standard for managing severe hallux rigidus. Arthrodesis involves removing the remaining articular cartilage of the MTP joint and fusing the proximal phalanx to the metatarsal to form a single bone. Often, surgeons use a metal plate and screws to hold the fusion together. The current medical literature reports

significantly high patient satisfaction scores, pain relief, and durability for the procedure. One study published in *Foot and Ankle International* reports the activity levels of patients after undergoing MTP arthrodesis. The study showed that preoperative activities were reestablished in 92% of patients who hiked, 80% who played golf, 75% who jogged, and 75% who played tennis.

Lastly, researchers and surgeons have developed newer orthopaedic technology regarding joint replacement surgery and synthetic cartilage. Many companies have advertised implants to replace the MTP joint of the great toe in order to preserve range of motion and provide pain relief. Medical device manufacturers make the implants from a variety of materials including metal or plastic or a combination of both. Short term studies have reported good outcomes with these implants; however, long term studies have reported high rates of implant removal and complications. Thus, orthopaedic surgeons offer this surgical option only when the patient meets strict criteria.

Seek treatment early

The management of hallux rigidus varies from conservative treatment to surgical options depending on disease severity. The key to a good outcome is to seek treatment early in the process. If you begin to experience pain and swelling and find it difficult to bend your big toe, see your orthopaedist. There are treatment options available to help relieve pain and get you back on your feet.

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