Hughston Health Alert

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Inside...

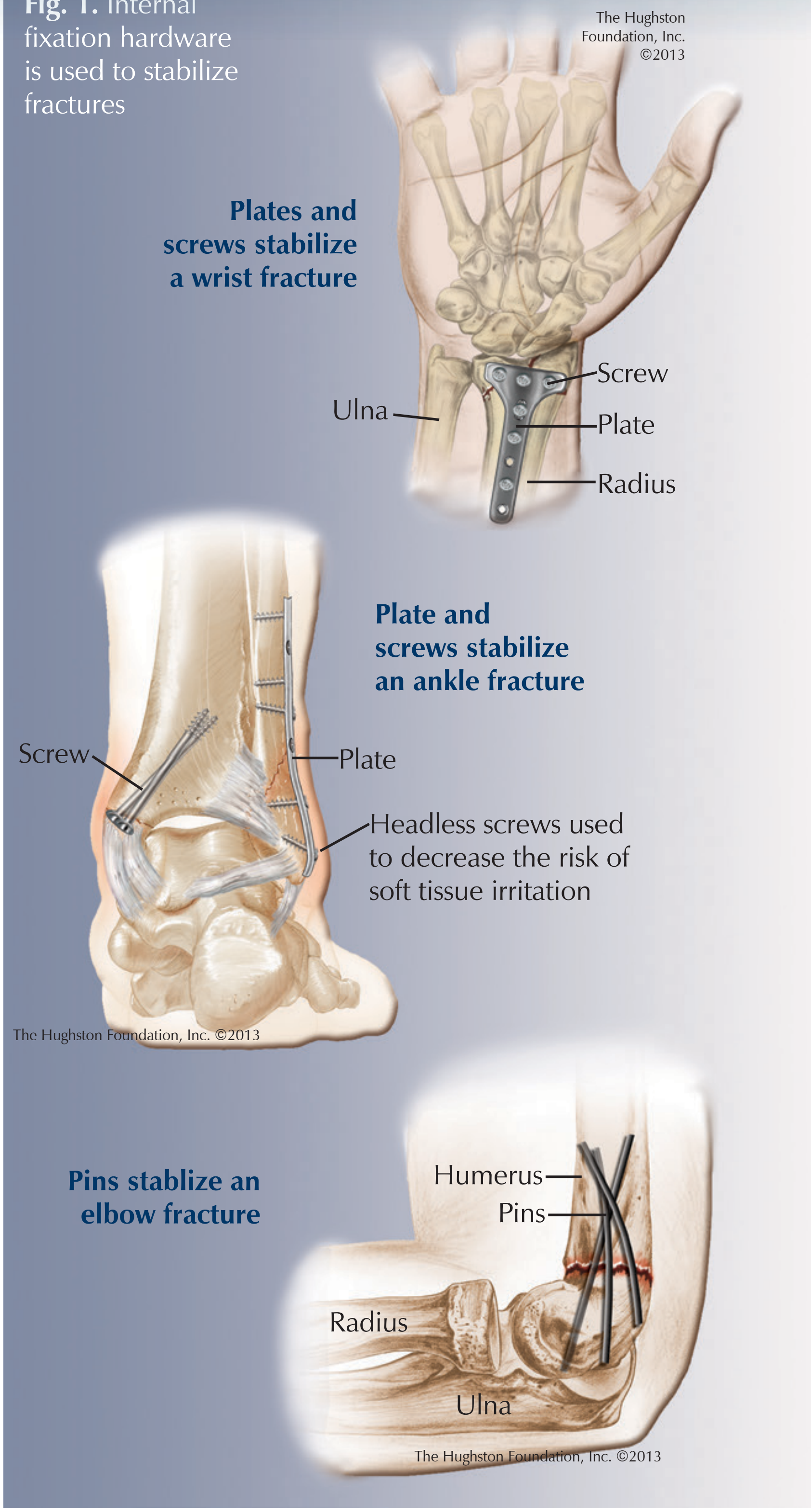
Advances in Orthopaedic Trauma Care

With the many advances that have occurred in orthopaedic trauma care, the days of plaster casts have almost become a thing of the past. Fractures that were typically treated with casts or traction are now treated with surgery, and surgeons who specialize in traumatic injuries use innovative hardware and surgical techniques to improve their patients' outcomes. Today, patients who have traumatic injuries often experience smaller scars, less pain, and shorter hospital stays than patients who had similar injuries 25 years ago.

Orthopaedic traumatology

An orthopaedic trauma program brings together a team of specialists to treat patients who have severe musculoskeletal injuries and related complications. Orthopaedic traumatologists are adept at treating patients who have suffered multiple injuries, such as fractures, soft tissue injuries, and injuries that occur around a joint. Often with trauma patients, the treatment for any one problem can conflict with that for another, and life threatening injuries may preclude addressing all of the patient's problems at once. The presence of multiple injuries can also increase the risk of metabolic complications, such as blood clots, fat embolism, or

Fig. 1. Internal fixation hardware is used to stabilize fractures



compartment syndrome. Orthopaedic traumatologists must know not only what to do, but in what order to do it. Often, traumatologists must determine which treatment to put on hold and how to handle the problems that can arise from delaying treatment, and they must know how to anticipate and prevent complications. Orthopaedic traumatologists are also skilled at treating patients who have complicated fractures—nonunions (fractures that do not heal), malunions (fractures that do not heal in a normal position), or fractures of the pelvis and acetabulum (hip)—that can become sources of musculoskeletal abnormalities. They may also need to treat patients who develop osteomyelitis (infection of the bone).

Technological developments

Internal and external fixation of fractures has helped to improve patient outcomes significantly. Nails, pins, plates, rods, screws, and wires are types of hardware typically used to stabilize, or "fix," a fracture (**Fig. 1**). Over the past 25 years, the technology involving this hardware has evolved, as well. As a result, new materials, such as stainless steel, cobalt, and titanium, are durable, strong enough to support bone, and rarely cause an allergic reaction. Technical advances using locked plating and percutaneous reduction techniques make it possible to use less invasive surgical techniques. For example, femur (thighbone) fractures can be repaired through smaller incisions or can often be done using percutaneous (through the skin) pin fixation.

Plates are internal splints that come in various sizes and shapes for stabilizing different bones in the body. With locking plate technology, screws gain purchase, or hold, in the bone and lock into the plate. The technique provides a fixed angle construction that improves stability and rigid fixation, which is optimal for bone healing and is particularly important in patients who have fragile bones.

The newer headless screws allow surgeons to place screws into joint surfaces without the worry of the head of the screw causing damage to the joint. They can be advantageous when placed into bones that don't have a lot of soft tissue coverage, such as those in the feet and hands. The technique decreases the likelihood of soft tissue irritation and lessens the need for hardware removal.

Other advances, such as nailing systems with distal locking screws, have expanded the treatment for the nailing of fractures of long bones (**Fig. 2**). This means that fractures that were typically fixed using a large incision can now be stabilized with an intramedullary nail through multiple small incisions. Another innovation in the treatment of these types of fractures is the use of the Reamer/Irrigator/Aspirator (RIA). This new technique is used to remove autograft bone (from one's own body) from the intramedullary canal (the marrow cavity) of long bones. The tissue can then be used to augment fractures that have bone loss and to eliminate the need to take bone from the pelvis, which can be very painful.

Products, such as bone morphogenetic proteins (BMP) are growth factors that can influence fracture healing. Now available in an injectable form, BMP further facilitates percutaneous fixation by providing a better environment for fracture healing.

What is on the horizon for orthopaedic trauma care?

In the future, we will continue to see improvements in minimally invasive procedures and an increase in robotics technology used in the operating room. Some types of knee and hip replacement surgeries using robotics technology are already being offered.

Continued research is needed to limit disability from a wide variety of conditions, including posttraumatic arthritis; therefore, another area to watch includes advancements in cartilage regeneration using stem cell therapy. The newest research gaining media attention is 3D printing cartilage, which uses a printer to create cartilage fibers. It is too early to rule on the new technologies, but cartilage regeneration is certainly an area to watch.

We no longer put trauma patients in plaster casts for long periods of time or place them in traction for days before surgically treating their injuries. We can now stabilize complex fractures with less soft tissue damage and shorter hospital stays. Advances in orthopaedic trauma care and the accompanying improvements in technology have improved patients' experiences, leaving them with smaller scars, improved fixation, less pain, and a faster recovery.

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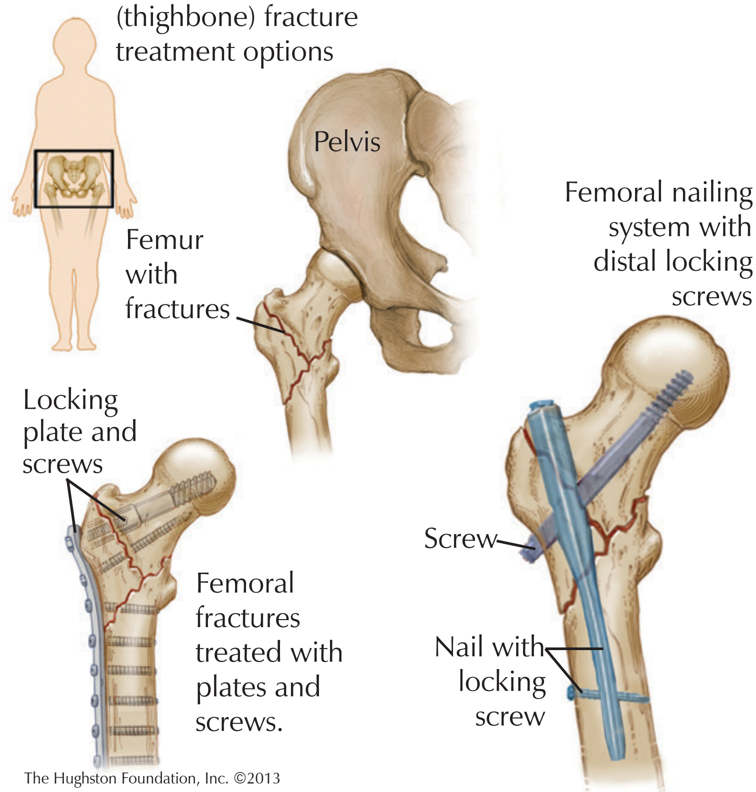
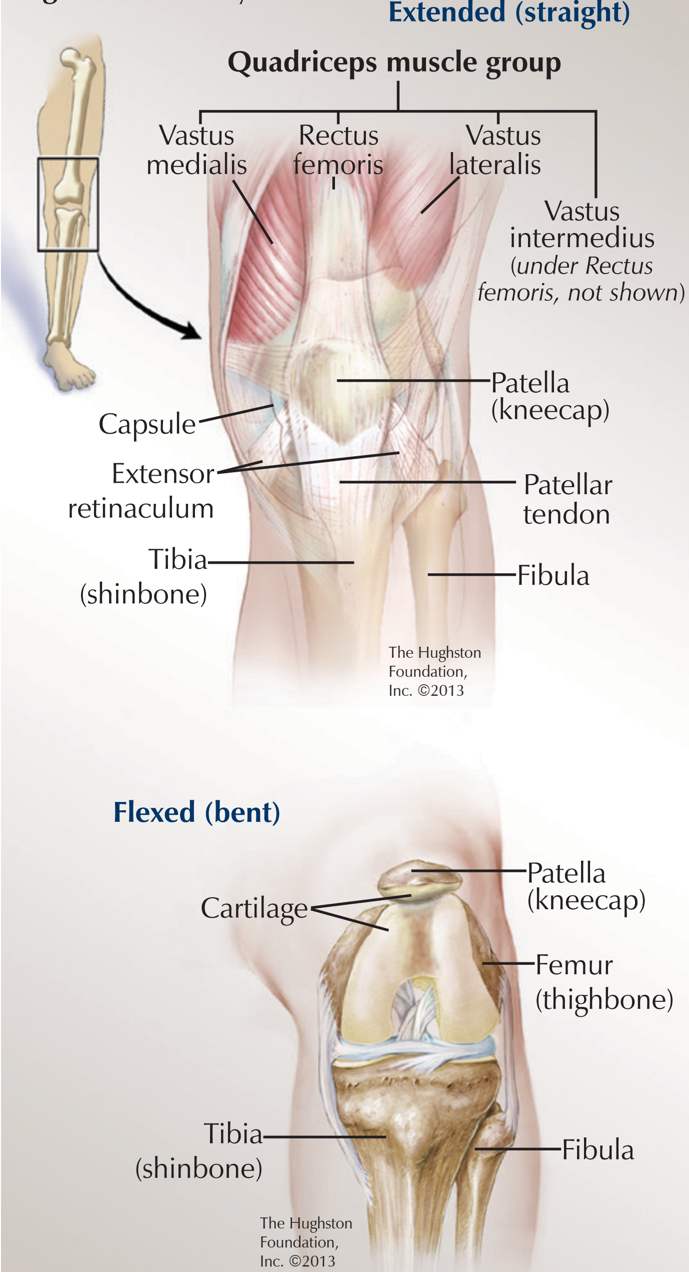
Fig. 2. Femoral (thighbone) fracture treatment options



Patellar Dislocations

Dislocation of the patella (kneecap) accounts for approximately 3% of all knee injuries. Patellar dislocations occur in 6 out of every 100,000 people and for teenagers, the frequency increases to 29 out of every 100,000. After nonsurgical treatment of a patellar dislocation, your chances of having a second dislocation are between 15% and 71%. If you have a second dislocation, you have a 50% chance of recurring dislocations. Often, this type of injury results in knee instability and physical limitations. More than 20% of military personnel with patellar instability cannot return to full duty, and 55% of athletes with patellar instability do not return to sports after a single dislocation.

Fig. Knee anatomy



The patellofemoral joint

The quadriceps muscle group (rectus femoris, vastus medialis, vastus intermedius, and vastus lateralis) act together to extend (straighten) the knee and to control the side-to-side movement of the patella (**Fig.**). Cartilage on the undersurface of the patella is the thickest of any found in the body. Acting as a cushion, the thick joint cartilage absorbs shock in the knee—the greatest weight-bearing joint in the body.

The entire knee joint is covered by thick, fibrous tissue, called the capsule. The capsule contains a lining called the synovium, which produces fluid to lubricate the joint and reduce friction and wear. The outer layers of the capsule are included in the extensor retinaculum, which is formed by tendon-like sheets that continue from the quadriceps muscle to the tibia (shinbone) on either side of the patella. This fibrous tissue contains the ligaments, which further stabilize the patella and help prevent abnormal movement. The muscles and ligaments work together in a balanced fashion to maintain normal patellar motion as the knee flexes and extends. If the muscle forces are unbalanced, or if a ligament or the retinaculum is torn, the patella can become dislocated or slip and move abnormally.

Joint laxity can be a contributing factor in patellar instability. If you can touch your thumb to your forearm or if your elbows hyperextend, you may have joint laxity. Other signs of patellar instability can be anterior knee pain that increases with deep knee bends or while going up or down stairs. If your kneecap has ever popped out of place (moving to either side), then you have already experienced a dislocation. For some people, a dislocated patella can spontaneously return to the normal position, but for others it can remain dislocated and require medical care to put it back in place. Gender, leg anatomy, or weakness or tightness of muscles and ligaments are risk factors for patellar instability.

Risk factors for patellar instability

- Teenager
- Woman (large quadriceps muscle angle)
- Generalized joint laxity
- Genu valgum (knock knees)
- Foot pronation
- Weak core strength (lumbar-pelvic-abdominal)
- Weak quadriceps muscle
- Tight iliotibial band
- Rotational malalignment of legs:
    - External tibial torsion
    - Excess femoral anteversion
- Bony abnormalities at the knee
- Patella alta
- Hypoplastic lateral trochlea

Treatment

If you have pain in the front of your knee, have ever had your kneecap dislocate, or your joints are loose, you should be evaluated by a doctor who specializes in joint instability. The evaluation can include a physical exam to assess the strength and flexibility of your leg and pelvis. Your doctor will likely order x-rays or a computed tomography (CT) scan to evaluate the bony structures of your knee. Untreated patellar instability can lead to activity limitation, chronic pain, and injury to the cartilage that can cause arthritis. Cartilage injuries are difficult to treat, especially in young people; therefore, the focus should be on prevention by addressing the unstable kneecap early.

Often, surgical treatment is recommended after nonsurgical methods fail, after multiple dislocations, when a dislocated kneecap remains dislocated, or when loose bony fragments are present in the joint after a dislocation. Because the causes of patellar instability are many, there is no single surgical procedure to fix the problem. When deciding on surgery for patellar instability, your surgeon will address the underlying cause, as well as correct the dislocation. Surgical treatment of a dislocating patella can include repairing or reconstructing torn ligaments, correction of leg or kneecap malalignment, cartilage stimulation, removal of loose bone fragments from the knee, or putting the kneecap back in place.

Prevention

Just as there are many causes for patellar instability, there are a number of techniques to help prevent dislocation of the kneecap. Stretching and strengthening the lower extremity is the key to preventing patellar instability. Physical therapy can be prescribed to strengthen your core and quadriceps muscles. Stretching of the iliotibial band and the ligaments around the knee is important, as well. Some patellar stabilizing braces are effective in decreasing pain and protecting against dislocation, and a physical therapist can demonstrate kneecap taping techniques to help stabilize the patella. Pronation (the foot turns up and in toward the body) of the foot during walking and running can lead to knee problems and increase the risk of patellar dislocation. For patients who have this risk factor, orthotics are recommended to help align the foot and support the leg.

If you have pain in the front of your knee or a loose kneecap, you should see a doctor to identify any malalignment or anatomic risk factors for patellar instability.

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Rehabilitation after Your Rotator Cuff Surgery

Rotator cuff repair surgery can be performed arthroscopically or through an open incision; however, repairing the damaged tissue is only half the battle. Physical therapy is the other half necessary for a successful outcome after your surgery. Rehabilitation of the rotator cuff often progresses in 3 phases that have specific exercises and goals that must be reached to progress to the next phase.

Phase 1

The major goal for phase 1 is to protect the repaired tendon while tendon-to-bone healing occurs; therefore, you will limit the use of your arm by using a sling for the first 6 weeks after surgery. Some early motion is important after rotator cuff repair, but unrestricted motion can endanger the success of the procedure. Initially, you will be limited to pendulum, elbow and wrist range of motion, and grip strengthening exercises (**Fig. 1**). Passive range-of-motion exercises—a therapist moves your arm for you—are started during week 1 and continued for 6 weeks. Heat will be applied using a heating pad before physical therapy, and ice is applied after your therapy session. You will see a physical therapist once or twice per week to monitor the progress of healing and to reinforce the use of proper exercise techniques. Depending on your progress, after 6 weeks, your sling can be removed and the rehabilitation program advanced to the next phase.

Fig. 1. Sample exercise in Phase 1: tendon healing to protect the repair while maximizing passive range of motion

Pendulum exercise: Support yourself on a stable structure. Bend at the waist and let your affected arm hang straight and relax completely. Gently rotate your entire arm in small circles going in both directions.

Elbow bend: Relax your affected arm by your side. Bending only at the elbow, (be sure to not move the shoulder) raise your arm up and down.

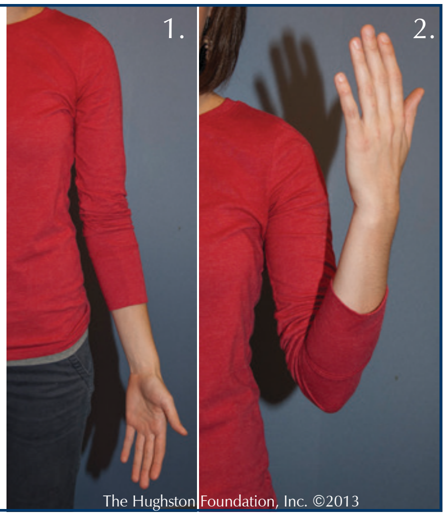
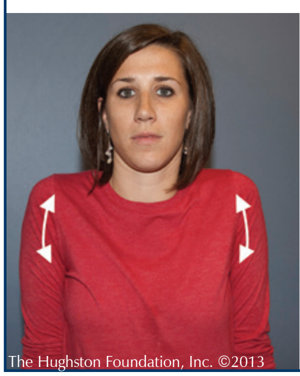


Table step-away: Start with your affected arm bent, level, and supported in front of you. Take one step back and slightly bend at your waist. Keep your arm resting on the support; return to the start position.

Shoulder blades squeeze: Relax your shoulders. Making sure that you do not raise your shoulders, squeeze your shoulder blades together and then release.



Shoulder shrugs: Gently raise and lower both shoulders.

Table rotation: Start with your arm bent, level, and supported at your side. Rotate your body back. Keep your arm resting on the support; return to the start position.

Phase 2

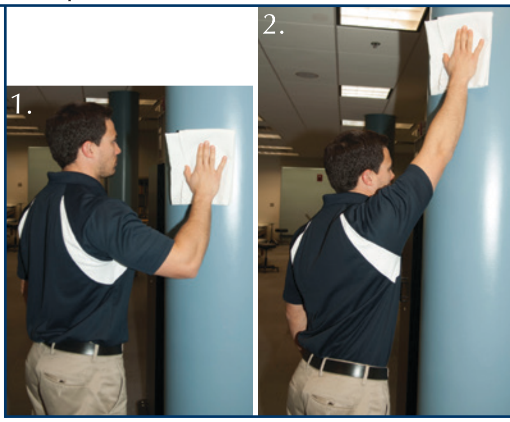
During the second phase, you will work closely with your physical therapist to achieve normal range of motion (**Fig. 2**). You and your physical therapist work together, but you are expected to do home exercises on a daily basis, as well. Progressive range-of-motion exercises that include light passive stretching and active range of motion exercises are continued for 6 to 12 weeks. After rotator cuff repair, it often takes 10 to 12 weeks to reach normal range of motion.

Fig. 2. Sample exercises in Phase 2: active range of motion to restore full motion and resume normal daily activities

Bent arm raises: Support your arm with a towel placed just above your elbow. Raise your forearm to 90° and return to start position.

Fig. 2 (continued).

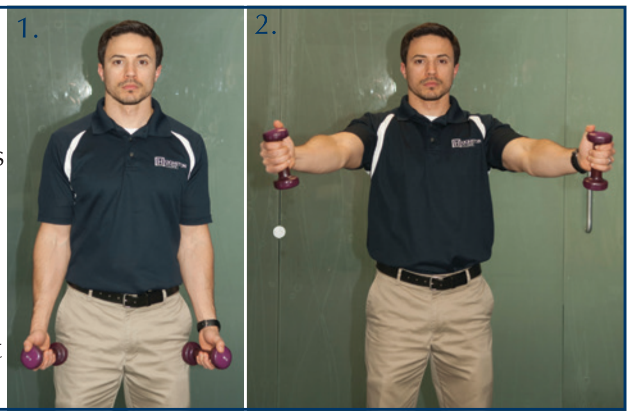
Reclined arm raise: Sitting in a reclined position, start with both arms out in front of you holding a straight object. Raise both arms over head and return to the start position.



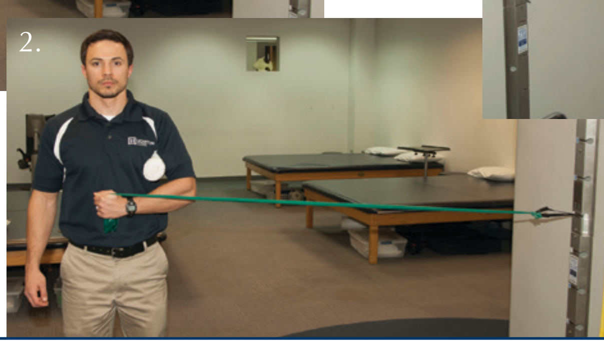
Wall climb: Use a piece of cloth to help your hand slide on the wall. Start with your affected arm bent at 90° and parallel to your shoulder. Slide your hand up the wall and return to start position.

Fig. 3. Sample exercises in Phase 3: strengthening to restore strength, coordination, and endurance

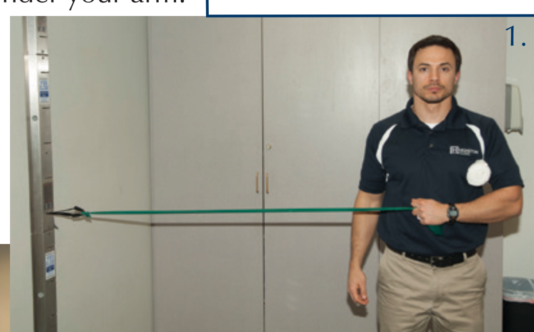
Forward elevation: Start with light weights in both hands and arms at your side. Raise arms to shoulder height and return to start position.



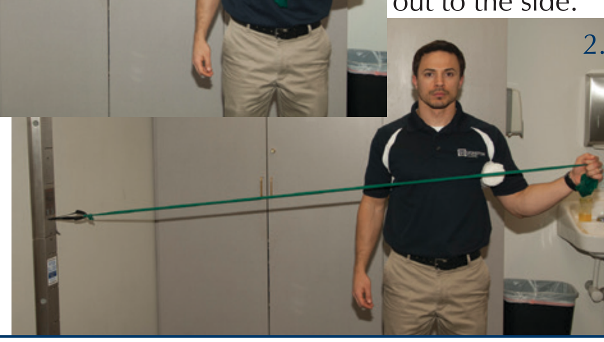
Internal (A) and external (B) rotation: Bend and support your affected arm with a towel placed under your arm.



A) Start with arm bent and relaxed out to the side. Pulling the band, rotate your bent arm across the front of your body.



B) Start with your arm bent and relaxed over your body. Pulling the band, rotate your arm out to the side.



Phase 3

Once you regain normal range of motion in your shoulder, shoulder strengthening can begin (**Fig. 3**). You will advance strengthening exercises, as tolerated, using isometrics, bands, and light weights. If you play a sport, your physical therapist will work with you on sport-specific training to retrain your muscles and shoulder for golf, tennis, swimming, and other sports that require throwing or overhead motion. Often, patients achieve functional range of motion and adequate strength by 4 to 6 months after surgery.

Successful physical therapy

The results of physical therapy are greatly improved when an experienced physical therapist, who is familiar with the rehabilitation protocol, is combined with a patient who does the home exercises and is motivated to improve. Often, the surgeon tailors the rehabilitation to the type of tear or to how the injury was repaired. Surgeons often work with physical therapists who are familiar with their rehabilitation protocols or have a standard protocol they can give to a physical therapist.

Surgery is half the battle in repairing a rotator cuff tear, but the battle that wins the war is physical therapy. After your rotator cuff surgery, if you follow your surgeon's advice and the instructions of your physical therapist, you will get your life back and there's a good chance that you can return to your sport.

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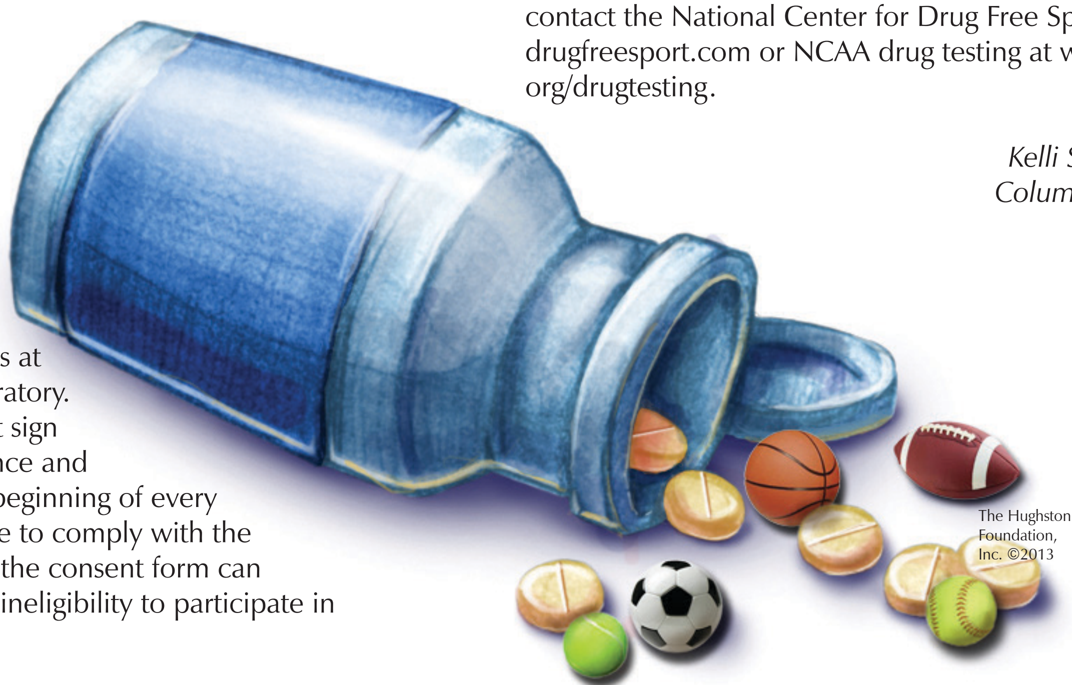
NCAA Drug Testing

The National Collegiate Athletic Association (NCAA) bans the use of specific performance enhancing and street drugs to protect the health and safety of student athletes and to protect the integrity of college sports by encouraging fair play. The NCAA and its member schools share the responsibility of testing and educating student-athletes to prevent drug use. The NCAA drug testing program began in 1986, and it has been evolving ever since. There are more than 400,000 student-athletes who participate in the NCAA drug testing program in 23 sports at 1,000 member institutions.

How is the student-athlete tested?

Student-athletes are selected randomly or by place, finish, position, or time of play, and they can be tested before, during, or after their competitive seasons. The testing process involves collection of a urine specimen and analysis at an independent laboratory. Student-athletes must sign the NCAA's Compliance and Consent form at the beginning of every academic year. Failure to comply with the NCAA by not signing the consent form can result in the athlete's ineligibility to participate in any athletic event.



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What drugs are banned?

The NCAA bans 8 different classes of drugs: 1) stimulants; 2) anabolic agents; 3) substances for specific sports, such as alcohol and beta blockers for rifle shooting only; 4) diuretics and other urine manipulators; 5) street drugs; 6) peptide hormones and analogues; 7) anti-estrogens; and 8) beta2-agonists. Athletes who have a medical history indicating a need for the banned substances may use them once an exception request is reviewed and approved by the NCAA Executive Committee. The most common exceptions are beta2-agonists used for the treatment of exercise-induced asthma. If a student-athlete is taking any of these medications, the team physician, coach, and athletic trainer should be notified, and the medication should be recorded in advance of play and submitted to the executive committee in a timely manner.

Before a student-athlete takes any nutritional or dietary supplement, the NCAA suggests that it should be reviewed by the team physician or athletic department staff. Dietary supplements are not well regulated and can cause positive drug test results. If the athlete tests positive, he or she will lose eligibility to play. Ignorance of the supplement's content is no excuse.

What happens if you test positive?

Testing positive for a street drug or any of the banned drugs for the first time will result in ineligibility to play for 1 full calendar year from the time of the positive test. Testing positive a second time for a street drug will result in another full year of ineligibility. Testing positive a second time for a non-street drug will result in removal of all eligibility. Before returning to play, the athlete must test negative for all substances.

For more information about NCAA drug testing, contact the National Center for Drug Free Sport at www.drugfreesport.com or NCAA drug testing at www.NCAA.org/drugtesting.

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Commonly banned substances

Class of drugs	Examples
1) Stimulants	Adderall, Caffeine, Ephedra, and Taurine
2) Anabolic agents	Testosterone
4) Diuretics	Bumetanide, Chlorothiazide, Furosemide, Probenecid, and Spironolactone (canrenone)
5) Street drugs	Marijuana, Heroin, and Spice
6) Peptide hormones	Human growth hormone

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