CHAPTER – 2

Sports Injuries & Rehabilitation

Sports Injuries & Rehabilitation

Sports injuries can happen at any age. Players can injure themselves at any time. Although injuries do not have to be sports-related in order to be treated in this way. Injuries can happen whilst carrying out a sport or exercise such as a fall, a twist, a sprain, a strain or a tear, or afterwards due to overuse.

The initial phase of an injury is when damaged cells in your body release a chemical that triggers an inflammatory response and we see this in the form of swelling and feel it in the form of heat. The swelling is sent to protect the injured area; however, the swelling can also slow down the healing process. So we aim when injured to bring the swelling down as quickly as possible to speed up recovery.

If a player feels injured himself, there is a simple set of instructions to help immediately after an injury with PRICED-R.

PRICED-R:

- **Prevention**: Prevention of injury is an effort to prevent or reduce the severity of bodily injuries caused by external mechanisms, such as sports or accidents, before they occur. Prevent yourself from getting injured. Because if during play, you have preventive measures in your mind, then you can put yourself safer from injury.

- **Rest**: Reduce your regular activities. If you have injured your foot, ankle or knee, take weight off of it. A support can help. If your right foot or ankle is injured, use the support on the left side. If your left foot or ankle is injured, use the support on the right side.
- **Ice**: Put an ice pack to the injured area for 20 minutes, four to eight times a day. You can use a cold pack or ice bag. You can also use a plastic bag filled with crushed ice and wrapped in a towel. Take the ice off after 20 minutes to avoid cold injury.
- **Compression**: Put even pressure (compression) on the injured area to help reduce swelling. You can use an elastic wrap, special boot, air cast or splint. Ask your doctor which one is best for your injury.
- **Elevation**: Put the injured area on a pillow at a level above your heart to help reduce swelling.
- **Diagnose**: When you get injured, you have to pay special attention to diagnose the injury. See the nature of the injury i.e. tendon, ligament or fracture. When you diagnose the injury, it is easy to treat.

- **Rehabilitation**: Rehabilitation is a key part of treatment. It involves exercises that step by step get the injured area back to normal. Moving the injured area helps it to heal. The sooner this is done, the better. Exercises start by gently moving the injured body part through a range of motions. The next step is to stretch. After a while, weights may be used to strengthen the injured area.

PRICED-R should be carried out a few times a day until the inflammation has completely gone. In addition to using the PRICED-R technique, you should consider treating the injury with anti-inflammatory and pain killers.

Use of a gel/ointment on the injury is sometimes more effective because you are placing it directly on the injured area and not waiting for it to be passed round your blood stream first. By using the gel/ointment, you are encouraged to massage the affected area, which will help to move the fluid from the injured area and reduce swelling.

Once the swelling has stabilized and the PRICED-R treatment is in place regularly, you need to begin to mobilize the injured area as soon as possible. You need to get it moving (gently) to stop the joints and muscles becoming stiff. You will need to build up slowly which takes commitment. If you follow an exercise plan designed for your injury, you will soon find yourself returning to your pre-injury fitness levels. However, this might need to be non-weight bearing stretches to start with and from there the process can build up often very slowly.

Often pain during exercise is caused by working too hard, too quickly or by incorrect biomechanics (doing something in the wrong way). If spotted, pain like this can be quickly stopped with redirection and correct coaching. It is often when we continue to exercise that we then cause an injury. EXERCISE SHOULD NOT HURT!

Or of course injuries can be caused by trips, falls, uneven surfaces or faulty equipment or technique.

If you experience pain when you exercise, get a coach to watch you performing the exercise and they will probably be able to tell you how to do the same exercise in a different way to stop the pain.

Often when we exercise, we find old war wounds (previous injuries that have not healed in the correct way). In these instances, we find that when we exercise it brings on pain for no apparent reason. People generally stop exercising thinking that this type of exercise does not suit them. However, with a good coaching, it is normally possible to do some strengthening and stretching exercises to enable the individual to take up the exercise that they would like. Once again massage can really help to speed up this process.

Famous Sports Injuries

"Sports injuries" are the injuries that happened when playing sports or exercising. Some are from accidents. Others can result from poor training practices or improper gear. Some people get injured when they are not in proper condition. Not warming up or stretching enough before you play or exercise can also lead to injuries. The most common sports injuries are:

- Ankle injuries
- Knee Injuries
- Shoulder Injuries
- Elbow Injuries
- Muscular Injuries
- Tendon Injuries
- Fractures
- Dislocations
- Famous Game Injuries
    i) Athletic Injuries
    ii) Soccer Injuries
    iii) Tennis Elbow

Ankle Injuries

Ankle Sprain

Sprained ankles are the most frequent type of musculoskeletal injury. Ankle sprains are common sports injuries but also happen during everyday activities. An unnatural twisting motion of the ankle joint can happen when the foot is planted awkwardly, when the ground is uneven or when an unusual amount of force is applied to the joint.

The ankle joint is made up of three bones:

- **The Tibia**: the major bone of the lower leg. It bears most of the body's weight. Its bottom portion forms the medial malleolus, the inside bump of the ankle.

- **The Fibula**: the smaller of the two bones in the lower leg. Its lower end forms the lateral malleolus, the outer bump of the ankle.
- **The Talus**: the top bone of the foot.

Tendons connect muscles to bones:

- Several muscles control motion at the ankle. Each has a tendon connecting it to one or more of the bones of the foot.
- Tendons can be stretched or torn when the joint is subjected to greater than normal stress. Chronic inflammation of a stretched or torn tendon is called tendinitis.
- Tendons also can be pulled off the bone, called an avulsion injury.

Ligaments provide connection between bones:

- The ankle has three bones that come together to form the joint, so it has many ligaments holding it together. Stress on these ligaments can cause them to stretch or tear.
- The most commonly injured ligament is the anterior talofibular ligament that connects the front part of the fibula to the talus bone on the front-outer part of the ankle joint.

Anatomy of an Ankle Sprain

An ankle sprain is an injury to one or more of the ligaments that hold the bones of the ankle together. Chronic ankle laxity (ankle instability) occurs when these ligaments fail to heal or heal loosely.

The most common type of ankle sprain is an inversion injury (lateral ankle injury) or simply put, it is when both the foot and ankle turn in toward the center of body. This inward rolling motion damages the lateral ligaments (i.e. anterior talofibular, the calcaneofibular, and in rare cases, the posterior talofibular ligaments). Ligaments are bands of fibrous tissue that connect bone to bone.

Less common are injuries affecting the ligaments of the inner ankle (medial ankle sprains) and syndesmotic sprains (i.e. ligament between tibia and fibula, the two leg bones). This injury is more commonly found among athletes participating in contact sports.

The severity of an ankle sprain depends on how much damage it does and how unstable the joint becomes. It is important to note that the more severe the sprain, the longer the recovery.

Causes of Ankle Sprain

Ligaments are injured when a greater than normal stretching force is applied to them. This happens most commonly when the foot is turned inward or inverted. This kind of injury can happen in the following ways:

- Awkwardly planting the foot when running, stepping up or down, or during simple tasks such as getting out of bed.
- Stepping on a surface that is irregular, such as stepping in a hole.
- Team events when one player steps on another player (A common example is a basketball and football players whose go up for a rebound or heading in air and comes down on top of another player's foot. This can cause the rebounder's foot to roll inward.)
- Inversion injuries, in which the foot rolls inward, are more common than aversion injuries (also referred to as a high ankle sprain), in which the foot twists outward.

Signs and Symptoms of Ankle Sprain

Tissue injury and inflammation occur when an ankle is sprained. Blood vessels become "leaky" and allow fluid to ooze into the soft tissue surrounding the joint. White blood cells responsible for inflammation migrate to the area, and blood flow increases. The following are signs and symptoms of inflammation:

- **Swelling**: Due to increased fluid in the tissue, this is sometimes severe.
- **Pain**: The nerves are more sensitive. The joint hurts and may vibrate. The pain can worsen when the sore area is pressed or the foot moves in certain directions (depending upon which ligament is involved) and during walking or standing.
- **Redness and warmth**: caused by increased blood flow to the area.

Diagnosis of Ankle Sprain

The doctor will perform a physical exam to see if a fracture or other serious injury has happened that requires immediate care.

- The examination should check that the nerves or arteries to the foot have not been injured and that the knee or the rest of the leg is not involved.
    - The doctor will handle and move the foot and ankle to determine what bony areas are involved.
    - The Achilles tendon will be checked for signs of rupture.
- X-rays are often needed to confirm if a fracture is present. In some cases of fracture, a CT scan may be needed.

Treatment of Ankle Sprain

Care can help reduce pain and aid healing. Because most of the pain is caused by inflammation, the goal is to reduce and prevent inflammation.

Remember always PRICED-R: prevention, rest, ice, compression, elevation, diagnose and rehabilitation.

- **Prevention**: Prevention of injury is an effort to prevent or reduce the severity of bodily injuries caused by external mechanisms, such as ankle sprain, before it occurs. Prevent yourself from getting injured. Because if during play, you have preventive measures in your mind, then you can put yourself safer from injury.
- **Rest**: Reduce your regular activities. If you have injured your foot, ankle, or knee, take weight off of it. A support can help. If your right foot or ankle is injured, use the support on the left side. If your left foot or ankle is injured, use the support on the right side.
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- **Diagnose**: When you get injured, you have to pay special attention to diagnose the injury. See the nature of the injury i.e. tendon, ligament or fracture. When you diagnose the injury, it is easy to treat.
- **Rehabilitation**: Rehabilitation is a key part of treatment. It involves exercises that step by step get the injured area back to normal. Moving the injured area helps it to heal. The sooner this is done, the better. Exercises start by gently moving the injured body part through a range of motions. The next step is to stretch. After a while, weights may be used to strengthen the injured area.

Prevention of Ankle Sprain

Ankle sprain prevention can be as simple as wearing the right shoes or as complicated as balance training for athletes.

- **Wear proper shoes for the activity**. Always wear stable shoes that give your ankle proper support. High-top basketball shoes are a good choice. (High heels or platform shoes are not the best choice if you are trying to prevent an ankle sprain.)
- **Keep the ankles strong and flexible**. Consult with the doctor or physical therapist for strengthening exercises.
- When participating in a sport, consider having a weak **ankle taped**, as taping offers extra support. If you have repeated sprains, wearing an ankle brace while playing may help.
- Make sure a playing field (or home environment) is **clear of any holes** or obstacles to help avoid injury.
- If you have **flat feet or bunions**, consult a podiatrist as these conditions could lead to balance problems or instability of the ankle.

Knee Injury

The size, lack of stability and forward prominence of the knee make it prone to injury. It is a complex pivot joint which allows free flexion and some rotation in flexion.

Knee is a key joint in human body. Mostly the human body moves with knee joint. Knee joint performs a key role in walking, jumping and running in individuals as sprints, jumps and throws and team sports as football, basketball and hockey. If it is not treated in time it can create a lot of complications in an athlete's career.

Anatomy of Knee

While there are four bones that come together at the knee, only the **femur** (thigh bone) and the **tibia** (shin bone) form the joint itself. The head of the **fibula** (strut bone on the outside of the leg) provides some stability, and the patella (kneecap) helps within joint and muscle function. Movement and weight-bearing occur where the ends of the femur called the femoral condyles match up with the top flat surfaces of the **tibia** (tibial plateaus).

There are two major muscle groups that are balanced and allow movement to knee joint. When **quadriceps** muscles on the front of the thigh contract, the knee extends or straightens. **Hamstring** muscles on the back of the thigh flex or bend the knee when they contract. The muscles cross the knee joint and are attached to the **tibia** by **tendons**. The quadriceps tendon is a little special in that it contains the patella within it. The **patella** allows the quadriceps muscle/tendon unit to work more efficiently. This tendon is renamed the **patellar tendon** in the area below the kneecap to its attachment to the **tibia**.

The stability of the knee joint is maintained by **four ligaments**, thick bands of tissue that stabilize the joint. The **medial collateral ligament** (MCL) and **lateral collateral ligament** (LCL) are on the sides of the knee and prevent the joint from sliding sideways. The **anterior cruciate ligament** (ACL) and **posterior cruciate ligament** (PCL) form an "X" on the inside of the knee and prevent the knee from sliding back and forth. These limitations on knee movement allow the knee to concentrate the forces of the muscles on flexion and extension.

Inside the knee, there are two shock-absorbing pieces of **cartilage** called **menisci** (singular meniscus) that sit on the top surface of the tibia. The menisci allow the femoral condyle to move on the tibial surface without friction, preventing the bones from rubbing on each other. Without the menisci, the friction of bone on bone would cause inflammation.

Bursas, surround the knee joint, are fluid-filled sacs that cushion the knee during its range of motion. In the front of the knee, there is a bursa between the skin and the kneecap called the pre-patellar bursa and another above the kneecap called the suprapatellar bursa.

Each part of the anatomy needs to function properly for the knee to work. Acute injury or trauma as well as chronic overuse both cause inflammation and its accompanying symptoms of pain, swelling, redness, and warmth.

Causes of Knee Injuries

While direct blows to the knee will occur, the knee is more susceptible to twisting or stretching injuries, taking the joint through a greater range of motion than it can tolerate.

If the knee is stressed from a specific direction, then the ligament trying to hold it in place against that force can tear. Ligament stretching or tears are called sprains. These sprains are graded as first, second or third degree based upon how much damage has occurred. **Grade-One** sprains stretch the ligament but do not tear the fibers; **Grade-Two** sprains partially tear the fibers, but the ligament remains intact; and **Grade-Three** tears completely disrupt the ligament.

Twisting injuries to the knee put stress on the cartilage or meniscus and can pinch it between the tibial surface and the edges of the femoral condyle, causing tears.

Injuries of the muscles and tendons surrounding the knee are caused by acute hyperflexion or hyperextension of the knee or by overuse. These injuries are called strains. Strains are graded similarly to sprains, with first-degree strains stretching muscle or tendon fibers but not tearing them, second-degree strains

partially tearing the muscle tendon unit, and third-degree strains completely tearing it.

There can be inflammation of the bursas (known as bursitis) of the knee that can occur because of direct blows or chronic use and abuse.

Acute knee injuries fall into two groups; those where there is almost immediate swelling in the joint associated with the inability to bend the knee and bear weight, and those in which there is discomfort and perhaps localized pain to one side of the knee, but with minimal swelling and minimal effects on walking.

Signs and Symptoms of Knee Injury

Acute knee injuries can cause pain and swelling with difficulty bending the knee and weight-bearing. If the swelling occurs immediately, it may suggest a ligament tear or fracture. If the swelling arises over a period of many hours, meniscal or cartilage injuries may be the cause. However, injuries to the knee may involve more than one structure and the symptoms may not present classically.

Longer-term symptoms that point to knee problems will include pain and swelling in addition to other complaints. Inflammation in the joint may be caused by even minor activity. Swelling may be intermittent, brought on by activity, and may gradually resolve as the inflammation decreases.

Pain too may come and go and may not occur right away with activity but might be delayed as the inflammation develops. Pain can also be felt with specific activities. Pain while climbing stairs is a symptom of meniscus injury, where the cartilage is being pinched in the joint as it narrows with bending. Pain with walking down stairs suggests patellar pain, where the kneecap is being forced onto the femur.

Giving way or a feeling of instability of the knee, or popping or grinding in the knee is associated with cartilage or meniscus tears. “Locking” is the term used when the knee joint refuses to completely straighten, and this is almost always due to torn cartilage. In this situation, the torn piece of cartilage folds upon itself and does not allow the knee to extend.

Diagnosis of Knee Injuries

The initial evaluation by the physician will begin with a medical history. Whether the evaluation is occurring immediately after the injury or weeks later, the physician may ask about the mechanism of injury to help isolate what structures in the knee might be damaged. Is the injury due to a direct blow that might suggest a fracture or contusion (bruise)? Was it a twisting injury that

causes a cartilage or meniscus tear? Was there an injury associated with a planted foot to place stress and potentially tear a ligament?

Further questions will address other symptoms. Was swelling present, and if so, did it occur right away or was it delayed by hours? Did the injury prevent weight-bearing or walking? Does going up or down steps cause pain? Is there associated hip or ankle pain?

Physical examination of the knee begins with inspection, in which the physician will look at the bones and make certain they are where they belong. With fractures of the kneecap or patellar tendon injuries, the kneecap can slide high out of position. Also, patellar dislocations, where the kneecap slides to the outside or lateral part of the knee, are easily evident on inspection. Looking at how the knee is held is also important. If the knee is held slightly flexed, it can be a clue that there is fluid in the joint space, since joint space is maximal at 15 degrees of flexion.

Palpation (feeling) is the next part of the exam and knowing the anatomy, the physician can feel where any pain might exist and correlate that to the underlying structures like ligaments or muscle-insertion points. Palpation over the joint line, the space between the bones in the front part of the knee, can uncover fluid or tenderness associated with a meniscus injury. This is also the part of the exam when the ligaments are stressed to make certain that they are intact. Sometimes, the physician will also exert stress on the uninjured knee to see how loose or tight the normal ligaments are as a comparison. Finally, the blood supply and nerve supply to the leg and foot will be assessed.

Sometimes X-rays of the knee are required to make certain, there are no broken bones but often with stress or overuse injuries where no direct blow has occurred, plain X-rays may not be needed and imaging of the knee may wait until a later date, where an MRI might be considered.

Types of Knee Injuries

Muscle Tendon Injuries

Almost all of these strains are treated with ice, elevation, and rest. Sometimes compression with an Ace wrap or knee sleeve is recommended and crutches may be used for a short time to assist with walking. Ibuprofen (Advil) can be used as an anti-inflammatory medication.

The mechanism of injury is either hyperextension in which the hamstring muscles can be stretched or torn, or hyperflexion in which the quadriceps muscle is injured. Uncommonly, with a hyperflexion injury, the patellar or quadriceps tendon can be damaged and rupture. This injury is characterized by

the inability to extend the knee and a defect that can be felt either above or below the patella. Surgery is required to repair this injury.

Except for elite athletes, tears of the hamstring muscle are treated conservatively without an operation, allowing time, exercise, and perhaps physical therapy to return the muscle to normal function.

Medial Collateral Ligament (MCL) and Lateral Collateral Ligament (LCL) Injuries

These ligaments can be stretched or torn when the foot is planted and a sideways force is directed to the knee. This can cause significant pain and difficulty walking as the body tries to protect the knee, but there is usually little swelling within the knee. The treatment for this injury may include a knee immobilizer, a removable Velcro splint that keeps the knee straight and keeps the knee stable. PRICED-R (prevention, rest, ice, compression, elevation, diagnose - rehabilitation) are the mainstays of treatment.

Anterior Cruciate Ligament (ACL) Injuries

If the foot is planted and there is force applied from the front or back to the knee, then the cruciate ligaments can be damaged. Swelling in the knee occurs within minutes and attempts at walking are difficult. The definitive diagnosis is difficult in the emergency department because the swelling and pain make it hard to test if the ligament is loose. Long-term treatment may require surgery and significant physical therapy to return good function of the knee joint. Recovery from these injuries is measured in months, not weeks.

Meniscus Tears

The cartilage of the knee can be acutely injured or can gradually tear. Acutely, the injury is of a twisting nature; the cartilage that is attached to and lays flat on the tibia is pinched between the femoral condyle and the tibial plateau. Pain and swelling occur gradually over many hours (as opposed to an ACL tear which swells much more quickly). Sometimes the injury seems trivial and no care is sought, but chronic pain develops over time. There may be intermittent swelling, pain with walking uphill or climbing steps, or giving way of the knee that results in near falls. History and physical examination often can make the diagnosis and MRI may be used to confirm it.

Fractures of Knee

Fractures of the bones of knee are relatively common. The patella or kneecap may fracture due to a fall directly onto it or in car accidents, when the knee is

driven into the dashboard. If the bone is pulled apart, surgery will be required for repair, but if the bone is in good position, a knee immobilizer and watchful waiting may be all that is required.

The head of the fibula on the lateral side of the knee joint can be fractured either by a direct blow or as part of an injury to the shin or ankle. This bone usually heals with little intervention, but fractures of this bone can have a major complication. The peroneal nerve wraps around the bone and can be damaged by the fracture. This will cause a foot drop, so do not be surprised if the physician examines your foot when you complain of knee problems.

With jumping injuries, the surface of the tibia can be damaged, resulting in a fracture to the tibial plateau. Since this is where the femoral condyle sits to move the knee joint, it is important that it heals in the best position possible. For that reason, after plain X-rays reveal this fracture, a CT scan is done to make certain that there is no displacement of the bones. Occasionally, this type of fracture requires surgery for repair.

Fractures of the femur require significant force but in people with osteoporosis, less force is needed to cause a fracture of this large bone. In people with knee replacements who fall, there is a potential weakness at the site of the knee replacement above the femoral condyle, and this can be a site of fracture. The decision to operate or treat by immobilization with a cast will be made by the orthopedist.

Bursa Inflammation

Housemaid's knee (prepatellar bursitis) is due to repetitive kneeling and crawling on the knees. The bursa or space between the skin and kneecap becomes inflamed and fills with fluid. It is a localized injury and does not involve the knee itself. Treatment includes padding the knee and using ibuprofen as an anti-inflammatory medication. This injury is commonly seen in carpet installers and roofers.

Patellar Injuries

The kneecap sits within the tendon of the quadriceps muscle, in front of the femur, just above the knee joint. It is held in place by the muscles of the knee.

The patella can dislocate laterally (toward the outside of the knee). This occurs more commonly in women because of anatomic differences in the angle aligning the femur and tibia. Fortunately, the dislocation is easily returned to the normal position by straightening out the knee, usually resulting in the kneecap popping into place. Physical therapy for muscle strengthening may be needed to prevent recurrent dislocations.

Patello-femoral syndrome occurs when the underside of the patella becomes inflamed if irritation develops as it rides its path with each flexion and extension of the knee, and it does not track smoothly. This inflammation can cause localized pain, especially with walking down stairs and with running. Treatment includes ice, anti-inflammatory medication, and exercises to balance the quadriceps muscle. More severe cases may require arthroscopic surgery to remove some of the inflamed cartilage and realign parts of the quadriceps muscle.

Knee Injury Treatment

Almost all knee injuries will need more than one visit to the doctor. If no operation is indicated, then PRICED-R (prevention, rest, ice, compression, elevation, diagnose and rehabilitation) with some strengthening exercises and perhaps physical therapy will be needed. Sometimes the decision for surgery is delayed to see if the PRICED-R and physical therapy will be effective. Each injury is unique and treatment decisions depend on what the expectation for function will be. As an example, a torn ACL (anterior cruciate ligament) would usually require surgery in a young athlete or a construction worker, but the ACL may be allowed to heal with physical therapy in an 80-year-old who is not very mobile.

With the technology available, many knee injuries that require surgery can be treated surgically with an arthroscopy, in which a camera is used and small punctures are made in the knee to insert instruments. Patients usually begin their post-op rehabilitation within days of the surgery.

If there is no rush to operate, then opportunity exists to strengthen the quadriceps and hamstring muscles beforehand. When a joint like the knee is injured, the muscles around it start to weaken almost immediately. This is also true after the surgery, which can also be considered a further injury. Strong muscles in the pre-operative state allow the potential for easier post-operative therapy.

Prevention of Knee Injuries

Accidents happen and while many knee injuries occur during recreational activities or sports, more happen at work and at home.

Strong muscles stabilize joints. With the knee, having strong and flexible quadriceps and hamstring muscles can prevent minor stresses to the knee from causing significant injury.

Proper footwear can also minimize the risk for knee injury. Wearing shoes that are appropriate for the activity can lessen the risk of twisting and other forces that can stress the knee.

Shoulder Injuries

Shoulders contain muscles, bones, nerves, arteries, and veins, as well as many ligaments and other supporting structures. Many conditions can cause pain in the neck and shoulder area. Some are life-threatening (such as heart attack and major trauma), and others are not so dangerous (such as simple strains or contusions).

The Shoulder The function of the shoulder allows the greatest range of motion of any joint in the body, but unfortunately can also lead to many problems. The shoulder is arranged in several layers, the deepest layers include the bones (humerus, scapula, clavicle and acromion) and the joints of the shoulder, followed by ligaments that make up the joint capsule of the shoulder. The ligaments are the main source of stability and help to keep the shoulder from dislocating. The tendons and muscles are the next layer. The rotator cuff muscles and tendons control our ability to raise and rotate the shoulder in many directions.

Anatomy of Shoulder Joint

The shoulder joint is a ball and socket joint situated at the top end of the arm bone. There is a mismatch between the ball and the socket where the ball is much larger than the small saucer shaped socket. The advantage of this is that the shoulder is the most mobile joint in the body. This is in contrast to the hip joint which is also a ball and socket joint. The hip joint is an enclosed joint which has a limited arc of motion as compared to the shoulder joint. The downside of having such a mobile shoulder joint is that it is not very stable. Hence dislocations of the shoulder are more common than hip dislocations.

The very mobile shoulder joint is made stable by a number of factors. It has a sac around it known as the capsule, which has a number of thickenings called ligaments. The shallow socket is deepened by a thick lip of cartilage around the border known as the labrum. Often when the shoulder dislocates ligaments, labrum, and the capsule can be damaged.

Above the shoulder is the collarbone. The collarbone forms a joint with a flat bone known as the acromion, which is part of the shoulder blade. This arch of the collarbone, the acromion and the joint between the two (acromioclavicular joint) form an arch above the ball and socket shoulder joint. The space in between is known as the sub-acromial space. This space is not vacant but is filled with a small sac of fluid known as a bursa and four tendons. These tendons join together and form a cuff over the ball of the shoulder joint. They are responsible for movement of the arm, particularly rotation and are, therefore, known as the rotator cuff. As the rotator cuff function, it moves the arm up and

down, inwards and outwards underneath the coraco-acromial arch. This movement is made smooth by the bursa.

The ball and socket are covered by soft and smooth cartilage. This is essential for easy and pain free movement of the shoulder joint.

Shoulder Pain

Most shoulder problems involve the soft tissues (muscles, ligaments and tendons) rather than bones. The main problems being tendonitis (inflammation of the tendons), rupture of the tendons, instability of the joint due to ligamentous laxity and arthritis (degeneration of the articular cartilage surfaces in the joint).

Tendonitis

A tendon is a cord which connects muscles to bone or other tissue. The tendon may become inflamed or damaged owing to injury or overuse. The tendon may become stiff and painful (frozen shoulder / adhesive capsulitis). Inflammation in the tendon can occur (tendinosis) or the tendon may tear (rotator cuff tear).

Rotator Cuff Tear

Sometimes after the tendon is inflamed, it may become completely torn and detached from the humeral head. This usually requires surgical repair of the tendon back to the humeral head.

Impingement

Sometimes the rotator cuff tendons may be jammed between the bones in the shoulder joint. This is termed impingement and may require removal of bone to allow more room for any swelling in the tendon (sub-acromial decompression).

Instability

Dislocation of the shoulder joint may occur, usually following severe injury. If this recurs the ligaments holding the joint in place may need to be repaired. This can usually be performed arthroscopically but sometimes open repair is necessary.

Arthritis

Shoulder pain can also result from arthritis. Arthritis involves wear and tear of the articular cartilage (lining cartilage surfaces of the joint). The joint often becomes swollen, painful, and stiff.

Causes

The most common cause of shoulder pain is injury to the soft tissues including the muscles, tendons, and ligaments within these structures. This can occur from injury to these areas. Degenerative arthritis of the spine in the neck (cervical spine) can pinch nerves that can cause shoulder pain. Abnormal conditions involving the spinal cord, heart, lungs, and some abdominal organs also can cause shoulder pain. Here are some examples:

- **Broken Collarbone:** Falling on your outstretched arm can cause your collarbone to break. This is particularly common when cyclers fall off of their bicycles.
- **Bursitis:** A bursa is a sac over the joints to provide a cushion to the joints and muscles. These bursae can become swollen and painful after injuries.
- **Heart Attacks:** Although the problem is the heart, heart attacks can cause shoulder or neck pain, known as "referred" pain.
- **Broken Shoulder Blade:** An injury to the shoulder blade usually is associated with relatively forceful trauma.
- **Rotator Cuff Injuries:** The rotator cuff is a group of tendons that support the shoulder. These tendons can be injured during lifting, when playing sports with a lot of throwing or after repetitive use over a long time.
- **Shoulder Separation:** The collarbone (clavicle) and shoulder blade (scapula) are connected by ligaments. With trauma to the shoulder, these ligaments can be stretched or torn.
- **Tendonitis:** The tendons connect the muscles to the bones. With strain, the tendons can become swollen and cause pain. This is also referred to as tendinitis.

Symptoms

- **Pain:** All pain seems sharp, but pain can also be described as dull, burning, crampy, shock like or stabbing. Pain can lead to a stiff shoulder and loss of range of motion. Headache may result. The character of each symptom is important to your doctor because the particular features can be clues to the cause of your pain.
- **Weakness:** Weakness can be due to severe pain from muscle or bone movement. The nerves that supply the muscles, however, also could be

injured. It is important to distinguish true weakness (muscle or nerve damage) from inability to move because of pain or inflammation.

- **Numbness:** If the nerves are pinched or cut, you may not be able to feel things normally. This may cause a burning sensation, a loss of sensation, or an altered sensation similar to having your arm "fall asleep."
- **Coolness:** A cool arm or hand suggests that the arteries, veins, or both have been injured or blocked. This may mean that not enough blood is getting into the arm.
- **Color changes:** A blue or white tinge to the skin of your arm or shoulder is another sign that the arteries or veins could have been injured. Redness can indicate infection or inflammation. Rashes may be noted as well. Bruising may be evident.
- **Swelling:** This may be generalized to the whole arm or may be localized over the involved structures (a fracture area or an inflamed bursa, for example). Muscle spasms or tightness may simulate actual swelling. Dislocation or deformity may cause a swollen.
- **Deformity:** A deformity may be present if you have a fracture or a dislocation. Certain ligament tears can cause an abnormal positioning of the bony structures.

Diagnosis

A thorough history and physical examination are usually adequate to establish the diagnosis for most injuries. However, your doctor may do a series of tests, depending on the cause of your injury, the location of your pain, or your other symptoms. The list is extensive and may include X-rays, an electrocardiogram (ECG), blood tests, CT scans and MRI.

- **X-rays:** These may be done if you have tenderness to touch along the bony areas of your spine or shoulder, a history of significant trauma, deformity of the area, or your doctor suspects a condition related to your heart or lungs.
- **ECG:** An electrocardiogram may be ordered if you also have chest pain, shortness of breath, and risk factors for a heart attack (such as high blood pressure, diabetes, high cholesterol, or tobacco use).
- **Blood tests:** These may be performed if you also have chest pain, shortness of breath, and risk factors for a heart attack (such as high blood pressure, diabetes, high cholesterol, or tobacco use) or if your doctor suspects an underlying illness as the cause of the pain.
- **CT scan:** This may be performed when X-rays are difficult to read or suggest a fracture, when more detail is needed, or when other structures are suspected to be the source of the pain (possibly the large artery known as the aorta leading from the heart or the lungs).

- **MRI:** An MRI is usually not indicated during an initial evaluation but can be helpful in assessing ongoing pain and failure to respond to basic treatment measures.

Treatment

Minor injuries that have only slight pain can be treated at home. If the source of the pain and the cause of the pain are not known, or if symptoms suggest you might have a more serious condition, you should contact your doctor while initiating basic care measures.

- **Rest:** Use the injured area as little as possible for the first two to three days, and then slowly begin to exercise the injured area. This speeds recovery.
- **Ice:** Place the ice in a plastic bag, wrap the bag with a towel, and then apply to the injured area for 15-20 minutes every hour. Directly applying ice can damage the skin.
- **Elevation:** Elevation of the injured area above your heart helps the swelling go down. This reduces your pain. Use pillows to prop yourself up.
- **Pain control:** Acetaminophen (Tylenol) or ibuprofen (Advil, Motrin) can help control swelling and pain.
- **Heat:** Do not apply heat in the first week because it can increase the swelling in the injured area and worsen your pain.

Conservative Treatment

Many patients respond to simple treatment which involves altering activities, rest, and physical therapy to help improve shoulder strength. Medication is usually prescribed to reduce inflammation and reduce pain. Corticosteroid Injections are sometimes given.

Surgical Treatment

Some shoulder injuries do not respond well to conservative measures and require surgical intervention. Shoulder arthroscopy is used to visualize, diagnose and treat many shoulder problems. An arthroscopy and specialized instrumentation can be inserted into the joint through small incisions and many surgical procedures can be performed. The advantages of arthroscopic surgery include smaller incisions, less pain, and ideally a shorter recovery period. Sometimes more involved surgery will require an open incision and thus a longer recovery period.

Complications

- **Stiffness** may occur following surgery and injury to the shoulder joint. **Gentle mobilization** either active (you move the limb yourself) or passive (the physiotherapist moves it for you) is the best way to avoid long term stiffness.
- **Infection** in the wound can occur, despite precautions being taken. This is usually easily treated with antibiotics. In rare cases arthroscopic drainage may be required.
- **Repeat injury** to the shoulder, either to the rotator cuff tendons or recurrent dislocation, is always possible. Therefore, it is important to be careful not to overload the shoulder or place it at risk until complete healing has occurred. You should discuss the need for individual restriction of shoulder activities at your post-operative visits.

Prevention

- **Proper exercise** of the shoulders can reduce the risk of injury.
- When performing **dangerous tasks**, have someone present to reduce the likelihood of injury. For example, when climbing a ladder, have someone hold the base of the ladder to keep it from sliding to either side.
- Know your **limitations**. Do not perform activities that you do not have the training, skills, tools, or strength to accomplish.
- Wear seat belts and use other safety equipment to reduce injuries.
- Hold the gun properly to focus the target and avoid injury of shoulder in rifle shooting.

Clavicle Bone (The Collar Bone)

The clavicle is a long bone that connects trunk with upper limb. It is also known as collar bone. Its main function is support of the shoulder and transmittal of upper limb weight to the trunk through the sternum. The clavicle forms the anterior portion of the shoulder girdle. It is curved somewhat like the italic letter *ƒ* and placed nearly horizontally at the upper and anterior part of the thorax, immediately above the first rib. It articulates medially with the manubrium sterni and laterally with the acromion of the scapula. It presents a double curvature; the convexity being directed forward at the sternal end and the concavity at the scapular end.

Human anatomy

The clavicle is a doubly curved short bone that connects the arm (upper limb) to the body (trunk) located directly above the first rib. It acts as a strut to keep the

scapula in position so the arm can hang freely. Medially, it articulates with the manubrium of the sternum (breast bone) at the sternoclavicular joint. At its lateral end it articulates with the acromion of the scapula (shoulder blade) at the acromioclavicular joint. It has a rounded medial end and a flattened lateral end.

From the roughly pyramidal sternal end, each clavicle curves laterally and anteriorly for roughly half its length. It then forms a smooth posterior curve to articulate with a process of the scapula (acromion). The flat, acromial end of the clavicle is broader than the sternal end. The acromial end has a rough inferior surface that bears prominent line, Trapezoid line and a small rounded projection and Conoid tubercle. These surface features are attachment sites for muscles and ligaments of the shoulder.

Clavicle can be divided into a cylindrical part called the shaft and two ends – medial and lateral.

The lateral end is also called acromial end and is flat from above downwards. It articulates with the acromion process of the scapula through a facet. The articular surface for the acromioclavicular joint gives' attachment to the joint capsule.

The medial end is called sternal end, is quadrangular in shape. This part articulates with the clavicular notch of the manubrium sterni to form the sternoclavicular joint. It also articulates with first costal cartilage via extension of the articular surface. The articular surface for the sternum gives attachment to the fibrous capsule all round, to the articular disc posterosuperiroly and to the interclavicular ligament superiorly.

The shaft of the clavicle can be divided into the lateral one third and the medial two thirds.

The lateral one third of the shaft is flattened from above downwards. It has two borders, anterior which is curved interiorly and posterior which is curved posteriorly. Between the two borders are two surfaces- the superior surface and inferior surface. While the superior surface is subcutaneous, the inferior surface has elevation called the conoid tubercle and a ridge called the trapezoid ridge. The anterior border gives origin to the deltoid muscle and the posterior border provides insertion to the trapezius muscle. The conoid tubercula and trapezoid ridge give attachment to the conoid and trapezoid parts of the coracoclavicular ligament.

The medial two thirds of the shaft of the clavicle is rounded and has four surfaces.

- The anterior surface- It is convex forwards.

- The posterior surface- It is thickened and smooth.
- The superior surface- This surface is rough in its medial part.
- The inferior surface- It has a rough oval impression at the medial end. It harbors a longtitudinal groove called sub-clavian groove in its lateral half.

The anterior surface gives origin to the pectorals major. The rough superior surface gives origin to the clavicular head of the sternocleidomastoid. The oval impression on the inferior surface gives attachment to the costoclavicular ligament. The subclavian groove gives insertion to the subclavius muscle and the margins of the groove give attachment to the clavipectoral fascia.

Determination of Side

- The lateral end is flat and the medial end is large and quadrilateral.
- The shaft is slightly curved so that it is convex forwards in its medial 2/3 and concave forwards in its lateral 1/3.
- The inferior surface is grooved longitudinally in its middle 1/3.

The Sternal Extremity (*extremities sternalis; internal extremity*) —The sternal extremity of the clavicle is triangular in form, directed medial ward, and a little downward and forward; it presents an articular facet, concave from before backward, convex from above downward, which articulates with the manubrium sterni through the intervention of an articular disk. The lower part of the facet is continued on to the inferior surface of the bone as a small semi-oval area for articulation with the cartilage of the first rib. The circumference of the articular surface is rough, for the attachment of numerous ligaments; the upper angle gives attachment to the articular disk.

The Acromial Extremity (*extremities acromial; outer extremity*) —The acromial extremity presents a small, flattened, oval surface directed obliquely downward, for articulation with the acromion of the scapula. The circumference of the articular facet is rough, especially above, for the attachment of the acromioclavicular ligaments. In the female, the clavicle is generally shorter, thinner, less curved, and smoother than in the male. In those persons who perform considerable manual labor it becomes thicker and more curved, and its ridges for muscular attachment are prominently marked.

Structure — the clavicle consists of cancellous tissue, enveloped by a compact layer, which is much thicker in the intermediate part than at the extremities of the bone.

Gender Variations

Female clavicle is shorter, lighter, thinner, smoother, and less curved than in males. The lateral end of the clavicle is a little below the medial end in females whereas in males, the lateral end is either at the same level or slightly higher than the medial end.

Fractures of Collar Bone

Clavicle fractures are common injuries and they can occur different ways. Some athletes fall on an outstretched hand; others fall and hit the outside of their shoulder. Broken collar bones can also occur from a direct hit to the clavicle. In babies, clavicle fractures occur at birth during passage through the birth canal.

Symptoms of a broken Collar Bone

Most often, patients have shoulder pain, and difficulty moving the arm. Swelling and bruising around the broken bone are also quite common. After the swelling has subsided, the fracture is often easily felt through the skin.

At the doctor’s office or in the emergency room, an x-ray will show the fracture. Doctor will also perform an examination to ensure the nerves and blood vessels surrounding the clavicle are intact. The nerves and vessels are rarely injured because of a broken collarbone.

Treatment for a Clavicle Fractures

Treatment of clavicle fractures most commonly involves resting the affected extremity. There are several types of slings available; one commonly used is called a"figure-of-8" splint. This is a brace that wraps around the shoulders to keep them back--like a soldier standing at attention.

It is unusual for a clavicle fracture to require surgery and most often an attempt at treatment in a sling is made. Surgery is required in some situations when either the skin is broken or if the fracture is severely displaced or shortened.

Recovery from a Clavicle Fractures

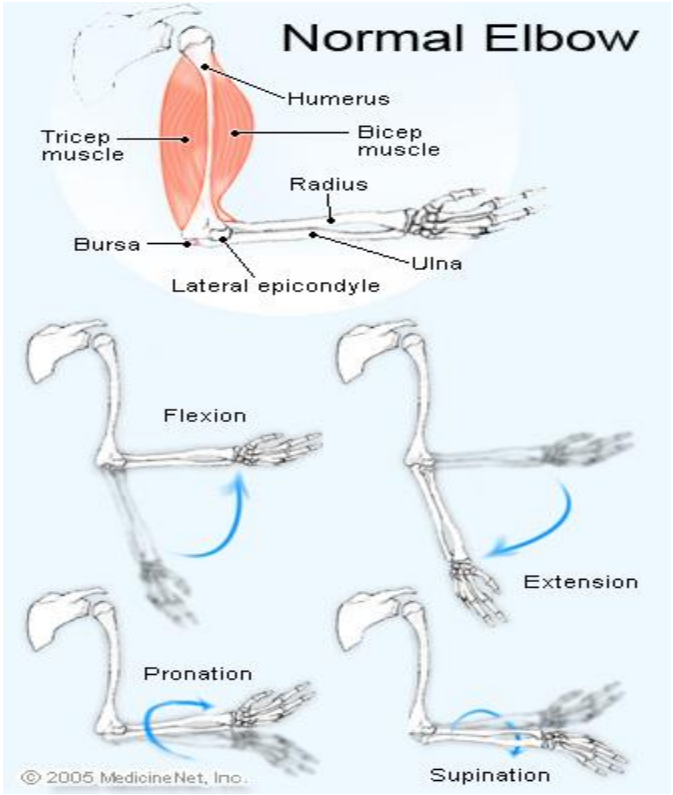
Clavicle fractures should heal completely within 12 weeks, but the pain usually subsides within a few weeks. Often patients are back to full activities before 12 weeks has passed, especially with younger patients.

As a general guide to return to activities, nothing should cause worsening pain. If not wearing a sling causes pain, wear a sling. If driving hurts the fracture site, do not drive. If throwing a ball hurts, do not throw. Once an activity does not cause significant pain, a gradual return can be attempted.

Recovery is usually complete with a full return expected. Patients may notice a persistent bump where the fracture was (often for months or longer), but this should not be bothersome.

Elbow Injuries

Climbers are likely to encounter an elbow injury of some form in their mountaineering career. The elbow joint is the center of articulation between the Humerus (bone of the upper arm) and the Radius and Ulna of the forearm. It is an important joint for range of motion and mobility of the upper extremities. As compared to the wrist and shoulder, the elbow provides less weight bearing activity.



Elbow Anatomy

I) Bones Forming the Elbow Joint

The elbow joint occurs at the junction of three bones, the Humerus (upper arm bone), Ulna (larger of the two forearm bones) and Radius. The Humerus forms the upper part of the joint and widens near the end to form the Medial and Lateral Epicondyles which are the two bony processes you can feel either side of the elbow joint.

The Ulna is situated on the inside of the joint and forms a cup shape which allows articulation with the Humerus. The Radius is the smaller of the two forearm bones and sits on the outside of the joint. The radial head is round and again cup-shaped to allow it to move around the wide base (Capitulum) of the Humerus.

There are actually three joints at the elbow. The first being the hinge joint formed between the Humerus and the Ulna (humeroulnar joint) which allows to bend and straighten the elbow. The second is the humeroradial joint between the Radius and Humerus which again allows flexion and extension but is also involved in the more complex motion of turning the hand over so the palm faces up/down (Supination/Pronation). The third is a pivot joint formed by the Radius and Ulna (proximal radio ulna joint).

II) Ligaments of the Elbow Joint

There are three main ligaments supporting the elbow joints:

- **Medial Collateral Ligament:** Sometimes known as the Ulnar Collateral Ligament and consists of two triangular bands, anterior and posterior. Both sections arise from the Medial Epicondyle and pass over the inside of the elbow joint. The anterior portion then attaches to the front part of the top of the Ulna, known as the Coracoids process and the posterior part to the back of the Ulna or Olecranon process.

- **Lateral Collateral Ligament:** Sometimes known as the Radial Collateral Ligament and is a short, narrow band which passes from the base of the Lateral Epicondyle to the Annular Ligament.

- **Annular Ligament:** This is a band of fibers which circle the head of the Radius, maintaining contact between the Radius and Humerus

III) Muscles of the Elbow Joint

There are a large number of muscles which cross the elbow joint to cause flexion/extension and supination/pronation. The following are the largest and most commonly injured:

- **Biceps Brachii:** This muscle arises from the Coracoids process and Supra-gleniod tubercle (both parts of the shoulder blade) and travels down the arm, crosses the elbow joint and inserts on the Radius. Its action is to flex the elbow joint and supinate the forearm.

- **Triceps Brachii:** Originates from the Scapula and back surface of the Humerus to cross the elbow and attach to the Olecranon process (posterior Ulna). This is the main extensor of the elbow.

- **Brachialis:** This muscle is the strongest elbow flexor when the palm is pronated. It arises from the lower half of the front of the Humerus and inserts on the Coronoid process (front bony protusion) of the Ulna.

- **Brachioradialis:** This muscle starts at the outer edge of the lower third of the Humerus, crosses the joint and inserts at the lower end of the Radius. Its job is to flex the elbow and aid pronation and supination.

- **Pronator Teres:** This muscle is often involved in golfers' elbow (Medial Epicondylitis) and its action is to aid flexion of the elbow and pronate the forearm. It originates just above the medial epicondyle and inserts on the outer surface of the Radius.

- **Extensor Carpi Radials Brevis:** Most often the muscle involved in tennis elbow (Lateral Epicondylitis), its action is to extend the wrist and aid extension of the elbow. It arises from the lateral epicondyle of the Humerus and inserts on the third Metacarpal of the hand.

Elbow Functions

The elbow is the joint where three long bones meet in the middle portion of the arm. The bone of the upper arm (humerus) meets the inner bone of the forearm (ulna) and the outer bone of the forearm (radius) to form a hinge joint. The radius and ulna also meet in the elbow to allow for rotation of the forearm.

The elbow functions are to move the arm like a hinge (forward and backward) and in rotation (twisting outward and inward). The biceps muscle is the major muscle that flexes the elbow hinge. The triceps muscle is the major muscle that extends the elbow hinge. The outer bone of the elbow is referred to as the lateral

epicondyle and is a part of the humerus bone. Tendons are attached to this area which can be injured, causing inflammation or tendinitis (lateral epicondylitis, or “Tennis Elbow”).

The inner portion of the elbow is a bony prominence called the medial epicondyle. Additional tendons from the muscles attach here and can be injured, causing medial epicondylitis, “golfer’s elbow.” A fluid-filled sac (bursa), which serves to reduce friction, overlies the tip of the elbow (bursa). The elbow can be affected by inflammation of the tendons or the bursae (plural for bursa) or conditions that affect the bones and joints, such as fractures, arthritis, or nerve irritation. Joint pain in the elbow can result from injury or disease involving any of these structures.

1) Acute Elbow Injuries

Acute injuries to the elbow are generally recognized as less than 2 weeks in duration and may or may not be associated with direct trauma. Acute trauma to the elbow is likely to involve a fracture, dislocation, or tendon rupture. Pain is typically well localized and a mechanism of injury is apparent. The climber may experience swelling, bruising, and loss of elbow function.

Elbow Dislocation

One of the most serious acute elbow injuries is an elbow dislocation. Typically, this results from falling on an outstretched or extended arm, most commonly as a result of a contact sport or fall from a height. The patient experiences an immediate loss of range of motion in combination with acute pain over the elbow surface.

The elbow may also appear deformed. In this situation, the elbow joint needs to be reduced or the joint needs to be put back in alignment. Since the patient likely needs sedation and pain management, the reduction should only be performed by a medical provider at an emergency clinic. An x-ray is also required since the climber may have also suffered a fracture of the olecranon and/or radial head in this situation.

Elbow Fracture

Fractures of the elbow also cause acute pain, swelling, bruising, and potential joint deformity. Elbow fractures need to be recognized and treated early to minimize long term complications such as loss of elbow range of motion and

chronic stiffness. Direct trauma or a fall on an outstretched hand may indicate an olecranon (proximal ulnar) fracture.

Fractures of the radius often occur over the radial head (at the elbow joint) and are associated with elbow dislocations. Pain with elbow flexion may indicate a fracture to the distal humerus. In these scenarios, an x-ray is required to determine a possible fracture. Surgery is often required for a fracture that is severely displaced. Additional damage to the nerves and blood vessels of the upper extremities may also be apparent.

Patients may complain of numbness or tingling of the digits of the forearm or hand indicating potential nerve damage. Injury to the blood vessels may decrease perfusion to the forearm and hand as indicated by diminished temperature and a weakened or absent pulse at the wrist.

Biceps Tendon Rupture

Typically, a rupture of the bicep tendon occurs in the older athlete. Sharp pain and the sensation of muscle tearing often occur after repetitive lifting or acute injury. The hallmark of biceps tendon rupture is the sudden contraction of the biceps muscle. Often, there is minimal pain in these individuals after the tear. Surgery is usually required for reattachment of the tendon. However, older athletes may elect not to repair this injury.

2) Chronic Elbow Injuries

Chronic elbow injuries are typically the result of repetitive injuries, general inflammatory conditions and/or post trauma. They are recognized as greater than 2 weeks in duration. Patients often describe recurrent pain, stiffness and/or loss of elbow range of motion.

Arthritis

Arthritis describes chronic joint pain. The most common forms encountered in the elbow include osteo arthritis (OA), posttraumatic arthritis (PA), and rheumatoid arthritis (RA). OA is the result of calcification of cartilage in the joint spaces. Occurring most often in older age, OA is characterized by pain, stiffness and restricted range of motion.

Patients with OA often experience a feeling of locking or catching in the joint which is related to lose cartilage pieces. PA often follows a history of a fracture, dislocation or cartilage injury and results in recurrent pain, stiffness and/or limited motion. RA often presents with pain and symmetrical swelling of multiple joints. Joint deformity may occur.

Olecranon Bursitis

Acute or chronic swelling over the tip of the elbow with increased pain during movement is a sign of the development of olecranon bursitis. Bursitis describes the inflammation of the bursa, the connective tissue structure surrounding the joint space. Typically, blood and serous fluid collect in this subcutaneous structure. It is caused by chronic overuse of the joint, previous injury or infection. People often encounter this condition after leaning on the elbow surface for long periods of time; this condition is also known as miner's elbow.

A single, acute episode of trauma to the tip of the elbow, such as a fall on a hard surface, may precede this condition. The condition can be either inflammatory, infectious or both. The olecranon region often appears red and is warm to palpation.

Initial treatment involves use of NSAIDS (non-steroidal anti-inflammatory agents, such as ibuprofen, aleve, and naprosyn) to control inflammation and swelling. Fluid collection over the olecranon is easily infected with a simple abrasion, insect bite or cut. If infection is suspected, the region is aspirated to drain infected fluid and perform a bacterial culture.

Further treatment with antibiotics and immobilization is required. Without treatment, more serious infections, such as osteomyelitis, bone infection, or septic arthritis can occur.

3) Tendinitis

There are three main forms of tendinitis inflammation of a tendon encountered in the elbow. These include **lateral epicondylitis** often known as tennis elbow, **medial epicondylitis** often known as golfer's elbow and **biceps tendinitis**. Each condition is usually the result of repetitive motion injuries to the elbow joint. Tendinosis, on the other hand, is a chronic condition that occurs when the tendon is never allowed adequate time to heal properly and can linger for

months to even years. Climbers who repeatedly return to the climbing wall too soon can suffer from this chronic state for life.

Lateral Epicondylitis (LE)

Lateral epicondylitis is a result of microscopic tears and scarring of the extensor carpi radials brevis tendon located on the lateral (outer) aspect of the elbow. Overuse of the elbow caused by repeated wrist extension against resistance results in lateral pain.

Treatment modalities include electrotherapeutic modalities, such as high voltage stimulation or laser treatment, massage, NSAIDS, and/or stretching. Muscle strengthening involving the wrist extensor is important for repair. If unsuccessful, steroid injections are considered for refractory cases. In severe cases, surgery may be required to excise degenerative tissue causing the discomfort. Modifications to both job and sport activities may also be needed.

Medial Epicondylitis (ME)

Also known as golfer's elbow, this condition is the result of chronic wrist flexion. It causes inflammation in the forearm flexor muscles and the pronatorteres tendon. Pain is localized over the medial (inner) aspect of the elbow and is increased with wrist flexion. Climbers tend to experience ME more frequently than LE, although anyone who must hold the wrist still and extended backwards for long periods of time (while using a computer mouse, performing a back hand, or painting a ceiling) may overuse the forearm flexors.

Treatment modalities are similar to that of lateral epicondylitis and also involve neural stretching to prevent damage to the ulnar nerve that courses across the medial elbow surface.

Bicep Tendinitis

Inflammation of the biceps tendon results in pain over the anterior aspect of the elbow and is associated with recurrent flexion of the biceps muscle such as with dips and bench pressing. Patients present with local tenderness over the bicep tendon, there may also be chronic thickening of the tendon with muscle tightening of the biceps.

Muscular Injuries

Muscular injuries as in football players are a common phenomenon. Acute traumatic injuries to muscle and tendon can account for 50% of all injuries.

Muscle strains (muscles are strained and ligaments are sprained) are commonly associated with an athlete strongly contracting the muscle while simultaneously stretching it (e.g. slide tackling with a straight knee). The strain occurs when the muscle's ability to handle the outside load is exhausted. The muscle's ability to absorb shock is overcome.

The muscle injury can range from breaking a few fibers (myofibrils), a tear in the outer covering (fascia) or a complete muscle rupture. They most commonly occur where the muscle and the tendon meet (musculotendinous junction). Muscle strains often involve muscles that cross two joints, like the rectus femoris of the quadriceps, biceps femoris of the hamstring and the gastrocnemius of the calf.

Types of Muscle Strain

Contusion injuries occur upon impact when the muscle is forcefully pressed against another player, the ground or goalpost. Bleeding will quickly ensue due to increased blood flow from exercising. Bleeding can be subdivided into two groups:

Intra-muscular (within the muscle membrane)

Inter-muscular (outside of the muscle membrane)

Intra-muscular bleeding usually occurs more on the outer portion of the muscle and has an intact membrane (fascia), which limits the extent of the bleeding. These athletes will experience pain and immobility (stiffness). This is difficult to treat secondary to the decreased ability for the muscle fascia to rapidly expand with increasing blood volume.

Inter-muscular bleeding occurs when the outer covering (fascia) of the muscle has been damaged. These athletes will experience less pain and stiffness due to the ability for the blood to disperse outside of the fascial membrane. Delayed onset muscle soreness (DOMS) occurs when there is a sudden change in activity level.

Symptoms usually begin 12 to 24 hours after exercise and include pain, weakness, fatigue, deep stiffness, and decreased mobility of the involved body part. Symptoms usually last from 1 to 2 days and can be treated with rest, ice,

and compression. DOMS usually occurs after prolonged eccentric (lengthening) activity of the muscle that leads to changes in the myofibril.

Signs and symptoms of a muscle strain:

* Pain with contraction

* Pain with stretching

* Bruising

*Torn of muscles

* Swelling (edema)

When muscles are injured, they go through a four-step process. This includes initial inflammation, cell proliferation (granulation), remodeling, and maturation of tissue. Non-steroidal anti-inflammatory medicines, physical modalities such as ice or ultrasound, and therapeutic exercise are used in the rehabilitation to decrease the inflammatory response.

Causes

Muscle strains may be caused by one or a number of factors including:

* Inadequate warm-up program

* Insufficient flexibility

* Insufficient muscular strength, poor coordination

* Fatigue

* A premature return to play after rehabilitation of a prior injury

Ideally, you should warm-up for 10 to 15 minutes prior to initiation of play. This brief warm-up allows for the intra-muscular temperature to rise sufficiently and allows for adequate deformation of the collagen and the musculotendinous junction. It should be followed by a thorough stretching session that allows a 30 to 60 second stretches of all major muscle groups. These stretches should be static in nature - do not bounce during a stretch.

Treatment of Muscle Injuries

Acute muscle injuries should be initially treated using the PRICED-R phenomenon:

- Prevention: Prevention of injury is an effort to prevent or reduce the severity of bodily injuries caused by external mechanisms, such as sports or accidents, before they occur. Prevent yourself from getting injured. Because if during play, you have preventive measures in your mind, then you can put yourself safer from injury.

- Rest: Reduce your regular activities. If you have injured your foot, ankle, or knee, take weight off of it. A support can help. If your right foot or ankle is injured, use the support on the left side. If your left foot or ankle is injured, use the support on the right side.
- Ice: Put an ice pack to the injured area for 20 minutes, four to eight times a day. You can use a cold pack or ice bag. You can also use a plastic bag filled with crushed ice and wrapped in a towel. Take the ice off after 20 minutes to avoid cold injury.
- Compression: Put even pressure (compression) on the injured area to help reduce swelling. You can use an elastic wrap, special boot, air cast, or splint. Ask your doctor which one is best for your injury.
- Elevation: Put the injured area on a pillow, at a level above your heart, to help reduce swelling.
- Diagnose: When you get injured, you have to pay special attention to diagnose the injury. See the nature of the injury i.e. tendon, ligament or fracture. When you diagnose the injury, it is easy to treat.
- Rehabilitation: Rehabilitation is a key part of treatment. It involves exercises that step by step get the injured area back to normal. Moving the injured area helps it to heal. The sooner this is done, the better. Exercises start by gently moving the injured body part through a range of motions. The next step is to stretch. After a while, weights may be used to strengthen the injured area.

Non-steroidal anti-inflammatory medications are effective in decreasing the pain and swelling that accompanies a muscle strain without compromising the strength of the muscle. If the lower extremity has been injured, it may be appropriate to utilize crutches or another assistive device to un-weight the affected body part.

Immobilization of the injured extremity will limit the activity within the muscle and can accelerate the healing response. It is important to immobilize the affected muscle in a lengthened position. It should be noted that prolonged immobilization of an extremity can lead to disuse atrophy and subsequent weakness of the muscle. This course of treatment should not exceed 72 hours (3 days) after the initial injury in an extreme case. After this time, gentle mobilization of the injured area should begin.

Rehabilitative exercises should begin when tolerated after a minor muscle strain. The program should be initially focused on passive mobility and static exercises

(contraction of the involved muscle with no movement). Gentle low-load cycling and pool rehabilitation may be introduced 3 to 7 days after injury.

Gradually introduce dynamic (movement based) exercises with low resistance. As healing progresses, one can increase the amount of resistance lifted with a concentric (shortening) muscular contraction. If these activities can be completed without the initiation of pain, eccentric (lengthening) exercises may be included to the rehabilitation program. If the athlete is unable to tense the muscle due to a complete tear, external electrical muscle stimulus may be utilized.

The more complex problems: In the more complex situation and if the muscle strain is intramuscular (intact muscle fascia), the use of ultrasound or MRI examinations may help characterizing the injury details. Surgical intervention is rarely needed in the case of muscle strain.

Generally, comprehensive rehabilitation will allow the athlete to heal in a timely and efficient fashion. However, in rare situations, if the bleeding causes an increase in the pressure (compartment syndrome) of the muscle membrane, surgical drainage and fasciotomy may be necessary.

If rehabilitation is unsuccessful (i.e. torn hamstring muscle), surgical intervention may be indicated. This usually occurs 4-6 weeks after injury when the blood begins to become inflexible and prevents optimal functioning of the involved muscle. Generally, rehabilitation will reduce symptoms and the athlete can return to play in 2 to 3 months.

Prevention

In general, prevention of muscle injury is always the goal and can be achieved through:

* A comprehensive preseason conditioning program
* Thorough warm-up
* Attention to stretching to enhance muscular flexibility
* Progressive strengthening exercises
* Proper nutrition and hydration.

If an injury does occur, conservative rehabilitation programs with an athletic trainer or physical therapist should be sought out. Upon completion of the prescribed therapeutic intervention, the athlete will be able to return to his/her prior level of play without risking further injury.

Tendon Injuries

Tendons are the tough fibers that connect muscle to bone. For example, see the Achilles tendon, which connects the calf muscle to the heel bone. Most tendon injuries occur near joints, such as the shoulder, elbow, knee, and ankle. A tendon injury may seem to happen suddenly, but usually it is the result of many tiny tears to the tendon that have happened over time.

Types of Tendon Injuries

- Tendinitis: This actually means "inflammation of the tendon," but inflammation is rarely the cause of tendon pain.

- Tendinosis: This refers to tiny tears in the tissue in and around the tendon caused by overuse.

Most experts now use the term tendinopathy to include both inflammation and micro-tears. But doctors may still use the term tendinitis to describe a tendon injury.

Causes of Tendon Injury

Most tendon injuries are the result of gradual wear and tear to the tendon from overuse or aging. Anyone can have a tendon injury. But people who make the same motions over and over in their jobs, sports, or daily activities are more likely to damage a tendon.

A tendon injury can happen suddenly or little by little. You are more likely to have a sudden injury if the tendon has been weakened over time.

Symptoms of Tendon Injury

Tendinopathy usually causes pain, stiffness, and loss of strength in the affected area.

- The pain may get worse when you use the tendon.
- You may have more pain and stiffness during the night or when you get up in the morning.
- The area may be tender, red, warm, or swollen if there is inflammation.
- You may notice a crunchy sound or feeling when you use the tendon.

The symptoms of a tendon injury can be a lot like those caused by bursitis.

Tendon Injury diagnosis

To diagnose a tendon injury, a doctor will ask questions about your past health and your symptoms and will do a physical exam. If the injury is related to your use of a tool or sports equipment, the doctor may ask you to show how you use it.

If your symptoms are severe or do not improve with treatment, your doctor may want you to have a test, such as an X-ray, ultrasound, or MRI.

Treatment of Tendon Injury

In most cases, you can treat a tendon injury at home. To get the best results, start these steps right away:

- Rest the painful area, and avoid any activity that makes the pain worse.
- Apply ice or cold packs for 10 to 15 minutes at a time, as often as 2 times an hour, for the first 72 hours. Keep using ice as long as it helps.
- Take over-the-counter pain relievers such as acetaminophen or NSAIDs (such as ibuprofen or naproxen) if you need them.
- Do gentle range-of-motion exercises and stretching to prevent stiffness.

As soon as you are better, you can return to your activity, but take it easy for a while. Do not start at the same level as before your injury. Build back to your previous level slowly, and stop if it hurts. Warm up before you exercise, and do some gentle stretching afterward. After the activity, apply ice to prevent pain and swelling.

If these steps do not help, your doctor may suggest physical therapy. If the injury is severe or long-lasting, your doctor may have you use a splint, brace, or cast to hold the tendon still. See a picture of a night brace used for an Achilles tendon injury.

It may take weeks or months for a tendon injury to heal. Be patient, and stay with your treatment. If you start using the injured tendon too soon, it can lead to more damage.

To keep from hurting your tendon again, you may need to make some long-term changes to your activities.

- Try changing your activities or how you do them. For example, if running caused the injury, try swimming some days. If the way you use a tool is the problem, try switching hands or changing your grip.

- If exercise caused the problem, take lessons or ask a trainer or pro to check your technique.
- If your job caused the tendon injury, ask your human resource department if there are other ways to do your job.
- Always take time to warm up before and stretch after you exercise.

You can prevent a tendon injury (also known as tendinopathy) from developing or recurring by taking steps at home, work, and during activities to promote healing and protect your tendons.

Effective treatment steps include:

- Rest the affected area and avoid any activity that may cause pain. Get enough sleep. To keep your overall health and fitness, continue exercising but only in ways that do not stress the affected area. Do not resume an aggravating activity as soon as the pain stops. Tendons require weeks of additional rest to heal. You may need to make long-term changes in the types of activities you do or how you do them.
- Apply ice or cold packs as soon as you notice pain and tenderness in your muscles or near a joint. Apply ice 10 to 15 minutes at a time, as often as twice an hour, for 72 hours. Continue applying ice (15 to 20 minutes at a time, 3 times a day) as long as it relieves pain. Although heating pads may feel good, ice will relieve pain and inflammation.
- Take pain relievers. Use acetaminophen or non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, naproxen, or aspirin, as directed for pain relief. (Do not give aspirin to anyone younger than age 20 because of the risk of Reye syndrome, a central nervous system complication in children.) NSAIDs also reduce any inflammation you might have in or around the tendon (tendinitis). Do not rely on medicine to relieve pain in order to continue overusing a joint.
- Do range-of-motion exercises each day. Gently move your joint through its full range of motion, even during the time that you are resting the joint area. This will prevent stiffness in your joint. As the pain goes away, continue range-of-motion exercises and add other exercises to strengthen the muscles around your joint.
- Gradually resume your activity at a lower intensity than you maintained before your symptoms began. Warm up before and stretch after the activity. Increase your activity slowly, and stop if it hurts. After the activity, apply ice to prevent pain and swelling.
- Avoid tobacco smoke. Tendon injuries heal more slowly in smokers than in nonsmokers. Smoking delays wound and tissue healing.

To prevent tendon injuries from developing or from happening again:

- Warm up and stretch. Warm up before any activity, and stretch gently after you finish.
- Strengthen your muscles to reduce stress on the soft tissues. A physical therapist, an athletic trainer, or your doctor can teach you specific exercises for strengthening your injured area.
- Evaluate and change daily activities that tend to cause or aggravate your symptoms. In your daily routine, change activities involving repeated movements that may strain your muscles or joints. For example, start alternating hands or change the grip size of your tool.
- Try alternating your usual activities with some new ones. For example, if you like to walk for exercise and have had Achilles tendon problems, try swimming or doing water exercise on some days.
- Notice what you do and how you do it, and take action if needed.
    - If you suspect that certain activities at your workplace are causing a tendon injury, talk to your human resources department for information on alternative ways of doing your job, equipment modifications, or other job assignments.
    - If a certain exercise or sport is causing a tendon injury, consider taking lessons to learn proper techniques. Also, have an athletic trainer or person who is familiar with sports equipment check your equipment to ensure that it is well suited to your size, strength, and ability. Demonstrate how you use your equipment, and ask for feedback about any mistakes you might be making.

Fractures

Bones form the skeleton of the body and allow the body to be supported against gravity and to move and function in the world. Bones also protect some body parts, and the bone marrow is the production center for blood products.

Bone is not a stagnant organ. It is the body's reservoir of calcium and is always undergoing change under the influence of hormones. Parathyroid hormone increases blood calcium levels by leeching calcium from bone.

Causes of a Fracture

When outside forces are applied to bone, it has the potential to fail. Fractures occur when bone cannot with stand those outside forces. Fracture, break, or crack all mean the same thing. One term is not better or worse than another. The integrity of the bone has been lost and the bone structure fails.

Broken bones hurt for a variety of reasons including:

- The nerve endings that surround bones contain pain fibers and these fibers become irritated when the bone is broken or bruised.

- Broken bones bleed, and the blood and associated swelling (edema) causes pain.

- Muscles that surround the injured area may go into spasm when they try to hold the broken bone fragments in place and these spasms cause further pain.

Often a fracture is easy to detect because there is obvious deformity. However, at times it is not easily diagnosed. It is important for the physician to take a history of the injury to decide what potential problems might exist. Moreover, fractures do not always occur in isolation, and there may be associated injuries that need to be addressed.

Fractures can occur because of direct blows, twisting injuries or falls. The type of forces on the bone may determine what type of injury that occurs. Descriptions of fractures can be confusing. They are based on:

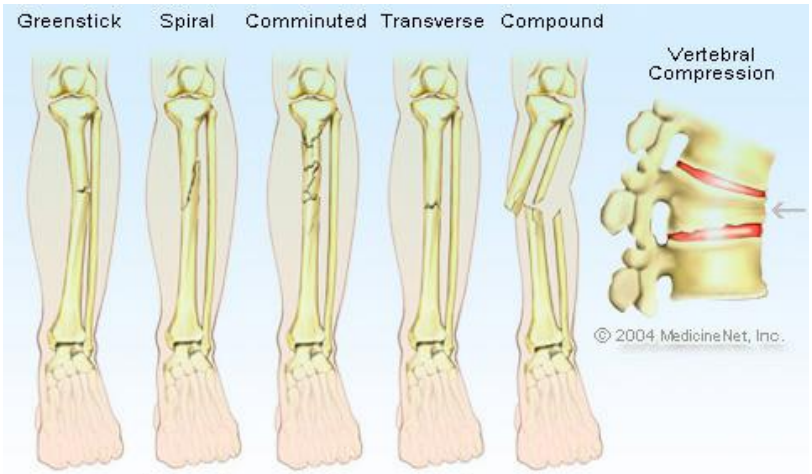
- where in the bone, the break has occurred?

- how the bone fragments are aligned?

- whether any complications exist

The first step in describing a fracture is whether it is open or closed. If the skin over the break is disrupted, then an open fracture exists. The skin can be cut, torn, or abraded (scraped) but if the skin's integrity is damaged, the potential for an infection to get into the bone exists. Since the fracture site in the bone communicates with the outside world, these injuries need to be cleaned out aggressively and many times require anesthesia in the operating room to do the job effectively.

Next, there needs to be a description of the fracture line. Does the fracture line go across the bone (transverse) at an angle (oblique) or does it spiral? Is the fracture in two pieces or is it comminuted in multiple pieces?



Typical Bone Fractures

Finally, the fracture's alignment is described as to whether the fracture fragments are displaced or in their normal anatomic position. If the bones fragments are not in the right place, they need to be reduced or placed back into their normal alignment.

Types of Fractures

Stress Fracture

A stress fracture is an overuse injury. Because of repeated micro-trauma, the bone can fail to absorb the shock that is being put upon it and become weakened. Most often it is seen in the lower leg, the shin bone (tibia), or foot. Athletes are at risk the most, because they have repeated footfalls on hard surfaces. Tennis players, basketball players, jumpers, and gymnasts are typically at risk.

A March fracture is the name given to a stress fracture of the metatarsal or long bones of the foot. (It is named because it often occurs in soldiers who are required to march long distances.)

Diagnosis is made by history and physical exam though on occasion a bone scan may be done to confirm the diagnosis.

Treatment is conservative, rest, ice, and anti-inflammatory medication like ibuprofen. These fractures can take six to eight weeks to heal (as long as the

fracture can be seen on x-ray). Trying to return too quickly can cause re-injury, and may also allow the stress fracture to extend through the entire bone.

Shin splints may have very similar symptoms as a stress fracture of the tibia but they are due to inflammation of the lining of the bone, called the periosteum. Shin splints are caused by overuse, especially in runners, walkers, dancers, including those who do aerobics. Muscles that run through the periosteum and the bone itself may also become inflamed. Treatment is similar to a stress fracture and physical therapy can be helpful.

Compression Fracture

As people age, there is a potential for the bones to develop osteoporosis, a condition where bones lose their calcium content. This makes bone more susceptible to breaking. One such type of injury is a compression fracture to the spine, most often the thoracic or lumbar spine. Since we are an upright animal, if the bones of the back are weaker than the force of gravity, these bones can crumple. Pain is the major complaint, especially with movement.

Compression injuries of the back may or may not be associated with nerve or spinal cord injury. An x-ray of the back can reveal the bone injury; however, sometimes a CT scan or MRI will be used to insure that no damage is done to the spinal cord.

Treatment includes pain medication and often a back brace. Some compression fractures can also be treated with vertebroplasty. Vertebroplasty involves inserting a glue-like material into the center of the collapsed spinal vertebra in order to stabilize and strengthen the crushed bone. The glue (methylmethacrylate) is inserted with a needle and syringe through anesthetized skin into the mid-portion of the vertebra under the guidance of specialized x-ray equipment. Once inserted, the glue soon hardens, forming a cast-like structure with the locally broken bone.

Rib Fracture

The ribs are especially vulnerable to injury and are prone to breaking due to a direct blow. Rib x-rays are rarely taken as it does not matter if the rib is broken or just bruised. A chest x-ray is usually taken to make certain there is no collapse or bruising of the lung.

When we breathe, it is like a bellows. We inhale air into our lungs and the ribs move out and the diaphragm moves down. When a person has a rib injury, the pain associated with it makes breathing difficult, and the person has a tendency to not take deep breaths. If the lung underlying the injury does not expand, it is

at risk for infection. The person is then susceptible to pneumonia (lung infection), which is characterized by fever, cough, and shortness of breath.

As opposed to other parts of the body that can rest when they are injured, it is very important to take deep breaths to prevent pneumonia when rib fractures are present. The treatment for bruised and broken ribs is the same: ice to the chest wall, ibuprofen as an anti-inflammatory, deep breaths and pain medication. Even if all goes well, there will be significant pain for four to six weeks.

With lower rib fractures, there may be concern about organs in the abdomen that the ribs protect. The liver is located under the ribs on the right side of the chest, and the spleen under the ribs on the left side of the chest. Many times your doctor may be more worried about abdominal injury than about the broken rib itself. Ultrasound or CT scan may help diagnosis intra-abdominal injuries.

Skull Fracture

With the wide availability of CT scans, skull x-rays are rarely taken to diagnose head injury. If a head injury exists, the physician will feel or palpate the scalp and skull to determine if there may be a skull fracture. He will also look into the ears to see if there is blood behind the ear drum and he will also complete a neurologic examination.

The skull is a flat, compact bone and it takes significant force to break it. If a skull fracture exists, there is an increased likelihood of bleeding in the brain, especially in children. There are guidelines that are available to decide whether a CT scan is indicated (needed).

Minor head injury is defined as witnessed loss of consciousness, definite amnesia, or witnessed disorientation in patients with a GCS (Glasgow Coma Score) score of 13-15. With minor head injury, the following risk groups are considered when evaluating need for CT brain scan:

High risk for potential neurosurgical operation:

- Abnormal neurologic exam within two hours after injury
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture (blood behind the ear drum, blackened eyes, clear fluid running from the ears, or bruising behind the ear)
- Vomiting - two episodes
- 65 years of age or older

Medium risk (for brain injury on CT)

- Amnesia before impact - more than 30 minutes
- Dangerous mechanism (pedestrian struck by motor vehicle, occupant ejected from motor vehicle, fall from height greater than 3 feet or five stairs)

Fracture in Children

Children can break bones and yet have normal x-rays. Fractures appear as clear lines through the bone on an x-ray through the bone. If calcium has not yet accumulated in the repairing bone, the break may not be apparent. This lack of calcification happens in two ways.

1. Bones mature at different times in a child's development and while the bony structure is there, it may have more cartilage than calcium.

2. The second situation is associated with growth plates. Each bone has an area where cell activity is maximal and where the bone grows. These areas appear as lucent lines on x-ray. It may be one of the weaker points in the bone as well, and a fracture through the growth plate may not be seen.

The doctor needs to match the history and physical exam with what is seen on x-ray to make to a diagnosis. Sometimes, the child is placed in a cast for a period of time to protect the broken limb. As fractures heal, the body lays down extra calcium as building material and then remodels it to normal shape. After 7-10 days, there may be evidence on x-ray of the healing calcium to confirm the fracture.

Growth plate fractures are classified by Salter-Harris category. When a break occurs through the growth plate, it can involve different parts of the bone on each side of the plate. It is important that these fractures are aligned properly so that the bone grows properly as the child ages. For more, please read the Growth Plate Fractures in Children article.

Children are more flexible than adults until the calcium completely solidifies their bone. If you think of an arm or leg bone as tubular, sometimes only one side of the bone breaks, just like an immature branch on a tree. This is referred to as a greenstick fracture, and may need to be "set" so that it heals properly. Sometimes the bones can bend but not break because they are so pliable. This is called a plastic deformity and again will need to be set or aligned to allow proper healing.

Fracture Diagnosis

When you arrive for medical care, the doctor will take a history of the injury. Where, when, and why did the injury occur? Did the person trip and fall, or did they pass out before the fall? Are there other injuries that take precedence over the fracture? For example, a person who falls and hurts their wrist because they had a stroke or heart attack will have their fracture care delayed to allow care for the life threatening illness. The injured area will be examined and a search will happen for potential associated injuries. These include damage to skin, arteries and nerves.

Pain control is a priority and many times, pain medication will be prescribed before the diagnosis is made. If the doctor believes that an operation is likely, pain medication will be given through an intravenous (IV) line or by an injection into the muscle. This allows the stomach to remain empty for potential anesthesia.

A decision will be made whether x-rays are required and which type of x-ray should be taken to make the diagnosis and better assess the injury. There are guidelines in place to help doctors decide if an x-ray is necessary. Some include the Ottawa ankle and knee x-ray rules.

The body is three dimensional, and plain film x-rays are only two dimensional. Therefore, two or three x-rays of the injured areas may be taken in different positions and planes to give a true picture of the injury. Sometimes the fracture will not be seen in one position, but is easily seen in another.

There are areas of the body where one bone fracture is associated with another fracture at a more distant part. For example, the bones of the forearm make a circle and it is difficult to break just one bone in that circle. Think of trying to break a pretzel in just one place, it is difficult to do.

Therefore, broken bones at the wrist may be associated with an elbow injury. Similarly, an ankle injury can be accompanied by a knee fracture. The doctor may x-ray areas of the body that do not initially appear to be injured.

Occasionally, the broken bone is not easily seen, but there may be other signs that a fracture exists. In elbow injuries, fluid seen in the joint on x-ray is an indicator of a subtle fracture. And in wrist injuries, fractures of the scaphoid or navicular bone may not show up on x-ray for one to two weeks, and diagnosis is made solely on physical examination with swelling and tenderness over the snuffbox at the base of the thumb.

In children, bones may have numerous growth plates that can cause confusion when reading an x-ray. Sometimes, the doctor will choose to x-ray the opposite

arm or leg to determine what normal is for the child before deciding whether a fracture exists.

Treatment of A Fracture

Initial treatment for fractures of the arms, legs, hands and feet in the field include splinting the extremity in the position it is found, elevation and ice. Immobilization will be very helpful with initial pain control. For injuries of the neck and back, many times, first responders or paramedics may choose to place the injured person on a long board and in a neck collar to protect the spinal cord from potential injury.

Once the fracture has been diagnosed, the initial treatment for most limb fractures is a splint. Padded pieces of plaster or fiberglass are placed over the injured limb and wrapped with gauze and an elastic wrap to immobilize the break. The joints above and below the injury are immobilized to prevent movement at the fracture site. This initial splint does not go completely around the limb. After a few days, the splint is removed and replaced by a circumferential cast.

Circumferential casting does not occur initially because fractures swell (edema). This swelling would cause a buildup of pressure under the cast, yielding increased pain and the potential for damage to the tissues under the cast.

Surgery

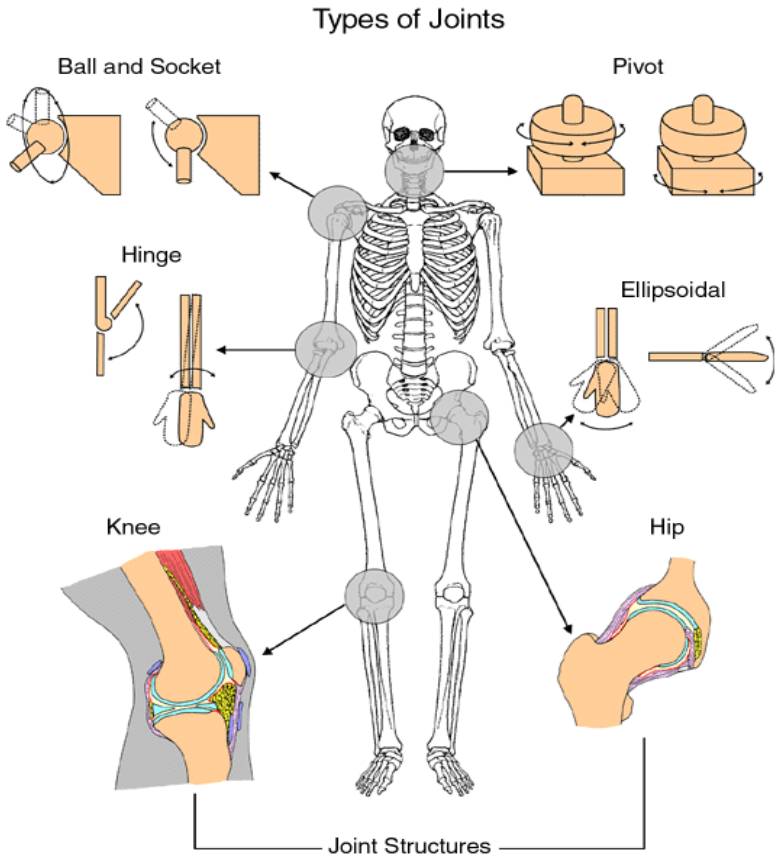
Surgery on fractures are very much dependent on what bone is broken, where it is broken, and whether the orthopedic surgeon believes that the break is at risk (for staying where it is) once the bone fragments have been aligned. If the surgeon is concerned that the bones will heal improperly, an operation will be needed. Sometimes bones that appear to be aligned normally are splinted, and at a recheck appointment, are found to be unstable and require surgery.

Surgery can include closed reduction and casting, where under anesthesia, the bones are manipulated so that alignment is restored and a cast is placed to hold the bones in that alignment.

Sometimes, the bones are broken in such a way that they need to have metal hardware inserted to hold them in place. Open reduction means that, in the operating room, the skin is cut open and pins, plates, or rods are inserted into the bone to hold it in place until healing occurs. Depending on the fracture, some of these pieces of metal are permanent (never removed), and some are temporary until the healing of the bone is complete and surgically removed at a later time.

Dislocations

A dislocation is an injury to a joint — a place where two or more of your bones come together in which the ends of your bones are forced from their normal positions. This injury temporarily deforms and immobilizes your joint and may result in sudden and severe pain.



Dislocations may occur in your major joints — shoulder, hip, knee, elbow and ankle — or in the smaller joints in your fingers, thumbs and toes.

A dislocation occurs when extreme force is put on a ligament, allowing the ends of two connected bones to separate. Ligaments are flexible bands of fibrous tissue that connect various bones and cartilage.

If you suspect a dislocation, seek prompt medical attention to return your bones to their proper positions without damaging your joint. When treated properly, most dislocations return to normal function after several weeks of rest and rehabilitation. However, some joints, such as your shoulder, have an increased risk of repeat dislocation.

Ligaments also bind the bones in a joint together. Severe trauma on joint ligaments can lead to dislocation of the joint. The hip and shoulder joints are called "ball and socket" joints. Extreme force on the ligaments in these joints can cause the head of the bone (ball) to partially or completely come out of the socket.

Dislocations are uncommon in younger children because their growth plates (area of bone growth located in the ends of long bones) are weaker than the muscles or tendons; instead, children are more prone to a fracture than a dislocation.

Causes of Dislocation

Causes of dislocations include:

- **Sports injuries:** Dislocations can occur in contact sports, such as football and hockey, and in sports that may involve falls, such as downhill skiing, gymnastics and volleyball. Basketball players and football players also commonly dislocate joints in their fingers and hands by accidentally striking the ball, the ground or another player.
- **Trauma not related to sports:** A hard blow to a joint during a motor vehicle accident is a common cause of dislocation.
- **Falls:** You may dislocate a joint during a fall.

Symptoms of Dislocation

The following are the most common symptoms of a dislocation. However, each child may experience symptoms differently. Symptoms may include:

- Severe pain in the injured area.
- Swelling in the injured area.
- Difficulty using or moving the injured area in a normal manner.
- Visibly deformity of the dislocated area.
- Immovable

The symptoms of a dislocation may resemble other medical conditions. Always consult your child's physician for a diagnosis.

While you are waiting for medical attention:

- Do not move the joint. Splint or sling the affected joint in its current position. Do not try to move a dislocated joint or force it back into place. This can damage the joint and its surrounding muscles, ligaments, nerves and even blood vessels.

- Ice the injured joint. Applying ice to the injured joint can help reduce pain and swelling by controlling internal bleeding and the buildup of fluids in and around the injured joint.

Diagnose of Dislocation

The physician makes the diagnosis with a physical examination. During the examination, the physician obtains a complete medical history of the child and asks how the injury occurred

Diagnostic procedures may help to evaluate the problem. Diagnostic procedures may include:

- X-ray - a diagnostic test which uses invisible electromagnetic energy beams to produce images of bones onto film.
- Magnetic resonance imaging (MRI) - a diagnostic procedure that uses a combination of large magnets, radio frequencies, and a computer to produce detailed images of organs and structures within the body.

Complications

Complications of a joint dislocation may include:

- Tearing of the muscles, ligaments and tendons that reinforce the injured joint
- Nerve or blood vessel damage in or around your joint
- Susceptibility to re-injury if you have a severe dislocation or repeated dislocations
- Development of arthritis in the affected joint as you age

If ligaments or tendons that support your injured joint have been stretched or torn, or if nerves or blood vessels surrounding the joint have been damaged, you may need surgery to repair these tissues.

Treatment for Dislocation

Specific treatment for a dislocation will be determined by your child's physician based on:

- Your child's age, overall health, and medical history.
- The extent of the injury.
- The type of injury.
- Your child's tolerance for specific medications, procedures, or therapies.
- Expectations for the course of the condition.

All dislocations require immediate medical attention. Fractures can also occur with dislocations.

Initial treatment of a dislocation includes rest, ice and elevation). Dislocations may reduce spontaneously, meaning the bone ends may go back into place by themselves.

However, for those dislocations that do not go back into place, your child's physician will need to place the joint back into its proper position so it will heal. Your child will receive sedation to help him/her remain comfortable before the procedure. Sedation will also help the muscles around the dislocated joint relax, so the joint can be put back into place more easily.

Your child's physician may recommend any of the following to help reduce the dislocation or promote healing afterwards:

- Reduction. During this process, your doctor may try some gentle maneuvers to help your bones back into position. Depending on the amount of pain and swelling, you may need a local anesthetic or even a general anesthetic before manipulation of your bones.

- Immobilization. After your bones are back in their right positions, your doctor may immobilize your joint with a splint or sling for several weeks. How long you wear the splint or sling depends on the nature and location of your dislocation.

- Pain medication. After the reduction process, any severe pain should improve. But if pain continues, your doctor may also prescribe a pain reliever or a muscle relaxant.

- Surgery. You may need surgery if your blood vessels or nerves are damaged or if your doctor can't move your dislocated bones back into their correct positions. Surgery may also be necessary if you have had recurring dislocations, especially of your shoulder.

- Rehabilitation. After your splint or sling is removed, you will begin a gradual rehabilitation program designed to restore your joint's range of motion and strength.

- Medications. Before the bones are manipulated back into place, you or your child may be given medications to relieve your pain and to help you relax.

- Therapy. After the joint's bones are back in their normal alignment, you or your child may have to wear a splint or sling for a few weeks. You may also need to do physical therapy exercises to improve the joint's range of motion and strength.

Famous Games Injuries

i) Athletic injuries

ii) Soccer Injuries

iii) Tennis Elbow

Athletic Injuries

Athletic injuries occur from two different mechanisms.

a) Macro-trauma

Macro-trauma is a sudden injury from a major force. This could, for example, be due to a fall or hit during play. Macro-trauma can cause fractures, sprains of ligaments, muscle strains and bruises or contusions.

b) Micro-trauma

Micro-trauma is due to repetitive injury over a long period of time and these injuries are also termed overuse. Types of injuries include stress fracture, little league elbow and shoulder impingement syndrome.

Most of the information regarding frequency of sports injuries in adolescents is obtained from records kept on interscholastic high school sports. For all high

school sports that boys participate in, the frequency of injury is twenty-seven to thirty-nine percent on an annual basis.

Football accounts for the most injuries in boys, while soccer accounts for most injuries in girls. Other sports that contribute to injuries for boys and girls include gymnastics, basketball, baseball, softball, track and field and cross-country.

Ligament sprains, muscle strains and bruises account for most of the acute injuries. However, overuse injuries are more common in adolescents than acute injuries. Research studies have shown that up to forty-eight percent of adolescent athlete's sustained one injury during their playing season. Most of the injuries were considered to be minor where no playing days were lost.

Who is to develop athletic injuries?

Adolescents may be at special risk for athletic injuries. During the growth spurt, the skeleton must support increased weight and load. As a result, there is increased risk for a severe injury in teenagers. It is well known that the number of football injuries increase for teenagers as they grow in height and weight. During growth and development, agility, power, speed and motor coordination improve, girls by age fourteen years seem to stabilize in regard to motor performance while boys improve during the later teenage years.

The increased skill levels in adolescent athletes usually lead to a higher level of competition during sports. Higher speeds and increased intensity of competition may then lead to increased injuries for both boys and girls.

During the growth spurt, lengthening of the bones occurs before growth in the connective tissues. As a result, there may be a relative decrease in flexibility during this period. Girls tend to be more flexible than boys and peak in their flexibility around age fifteen years compared to boys who develop increased flexibility later in adolescence. Decreased flexibility may cause an increased risk for overuse injuries in both boys and girls.

There are other factors that may contribute to a teenager sustaining an athletic injury. These include the following:

- Hazardous playing fields (overtraining)
- Poor conditioning
- Competing while injured or fatigued
- Poor nutrition
- Poor physical fitness
- Inadequate supervision
- Stress (less concentration)

- Weather conditions
- Inadequate, poorly fitted, improper safety equipment
- Teams set by age rather than size

Symptoms of Athletic Injuries

There are many different types of athletic injuries. Micro-trauma injuries usually cause overuse symptoms. Shoulder impingement syndrome causes shoulder pain in swimmers, tennis players, and gymnastics and in sports where overhead throwing is common including baseball.

The rotator cuff muscles in the shoulder help to stabilize the head of the humerus or arm bone in the shoulder joint. Repetitive overuse can lead to inflammation of rotator cuff tendons. This leads to swelling and pain in the shoulder especially with activities that involve the shoulder. Pain is worsened with overhead movements of the arm.

Another type of overuse syndrome in younger adolescents is little league elbow. This is caused by a pulling injury to the medial epicondyle on the lower part of the upper arm bone called the humerus. The teen develops pain on the inside part of the elbow associated with throwing motions. Often it is seen in pitchers, and when little league elbow develops; the pitcher's performance often deteriorates.

Gymnasts may develop overuse in the wrist and front foot fingers. The wrist is subjected to compression forces as the hand is flexed upward. This may produce pain in the dorsal or top surface of the wrist especially so with floor exercises and vaulting. Occasionally some gymnasts complain of pain in the forearm. Usually these symptoms are seen in young adolescent girls who practice gymnastics more than thirty-five hours each week.

Knee pain can be caused be several overuse syndromes. Patello-femoral syndrome is a disorder where the kneecap does not move in a normal manner when the knee is flexed and extended. Typically, the pain occurs during exercise when the tendon that connects the kneecap to the lower leg bone called the tibia is utilized. Osteo-chondritis dessicans may also cause knee pain. This problem occurs when a portion of the bone separates from the femur or thighbone. The knee may also feel unstable, lock or swell.

Macro-trauma or acute injuries constitute problems including contusions, sprains, strains and fractures. Acute sports injuries are the second most common cause for adolescents to visit hospital emergency rooms, and it is estimated that approximately three million youth are seen in hospitals for sports related injuries.

Concussion is the most common head injury seen by sports physicians. A concussion is defined as a transient alteration to the athlete's mental status due to head injury. Loss of consciousness is not necessary. Concussion is graded from one to three depending on the severity. Symptoms of grade one concussion included transient confusion such as inattention, inability to maintain a coherent stream of thought or carry out goal-directed movements. There is no loss of consciousness and symptoms usually resolve in fifteen minutes or less. Grade two concussion is more severe. Here there is no loss of consciousness, but there is transient confusion, and the symptoms last more than fifteen minutes. And grade three concussions do have loss of consciousness.

An example of contusion to the foot is seen in football players and runners who suffer turf toe. Pain and swelling of the great toe may occur. Often there is blood under the toenail, and this causes pain.

Sprain occurs in supporting tissues including ligaments and tendons. The most common sports injury is the sprained ankle. Ankle injuries comprise up to forty-five percent of all basketball injuries and about twenty-five percent of all injuries in volleyball.

The ankle consists of three bones and two joints; ligaments hold the joints together and provide stability. A sprain occurs when an abnormal movement of force causes the ligaments to be stretched or torn. There is pain, swelling and often bruising on the outside of the ankle.

Sprain or even torn ligaments occur not uncommonly in the knee joint in athletes. The anterior cruciate ligament is strong tissue, and it connects the femur to the tibia while it helps to stabilize the knee joint. When the athlete has a sudden directional change, a strong force can be placed on this ligament causing a tear or rupture. There may be a popping sound that is followed by pain, swelling and instability.

A muscle strain can be caused by excessive contraction or overuse of a muscle group. Marathoners frequently have muscle strain often in the hamstrings located on the back of the thigh, quadriceps on the front of the thigh or the calves. Symptoms usually include pain. Quadriceps injuries are most common in soccer, rugby and football players.

Fractures may occur in most bones in adolescent athletes especially in collision sports such as football. Appropriate athletic equipment will help to prevent fractures. Long distance runners may trip and fall landing on an outstretched hand.

A fracture of the radius, the lower arm bone, will produce the symptoms of pain, swelling and deformity. Basketball players can sustain fractures to fingers, and

football players may get rib fractures. Most fractures will be painful; swelling is usually present while deformity does not always occur.

Athletic Injuries Evaluation

Injuries are evaluated depending on the extent, location and severity. For example, a coach or trainer may evaluate grade one concussion. An adolescent with grade two concussion is removed from the contest, examined on site and then usually seen in follow up by a clinician prior to return to athletics. And a teen with grade three concussions is transported immediately to a medical facility for evaluation.

Although clinicians should see all potential fractures, some sprains, strains and contusions need not have medical evaluation. A teen should ask his or her family, coach, trainer or physician if there is any question whether an injury should be evaluated.

Athletic Injuries Treatment

Treatment of athletic injuries will depend, of course, on the nature of the injury. The treatment of these injuries would comprise a large textbook. One should remember the PRICED-R. Sprains and strain may be treated with Prevention, Rest, Ice, Compression, Elevation, Diagnose - Rehabilitation. Obviously one needs to be certain that the teen does not have a condition that requires more extensive treatments.

It is important to mention “second impact” syndrome which is an entity seen almost exclusively in athletes who are younger than twenty-one years. Repeated head injury to adolescents can result in a serious condition where there is sudden severe brain swelling.

Usually there is a history of a prior head injury, and the athlete has returned to sports before all symptoms from the first head injury have cleared. Even though the second head injury may be relatively mild, the athlete is stunned, collapses and becomes comatose. Within two to five minutes, the teen may be critically ill. Prevention of this catastrophic injury includes heading the clinician’s advice not to return to practice until symptoms from the first injury have dissipated.

Athletic Injuries Prevention

The following are some of the strategies that may help teens prevent athletic injuries:

- Have a sports pre-participation physical examination

- Before each training or sports event, warm up and then cool down afterward
- Do flexibility exercises (stretching exercises)
- Play within safe ranges for one's age and size
- Use proper and well fitted equipment
- Keep oneself physically fit (pay full attention)
- Begin training one to two months before the sports activity is to begin
- Gradually increase one's training time but not more than ten percent each week

Parents should recall the following strategies to help prevent athletic injuries in adolescents:

- Encourage teens to participate in several different sports
- Insist coaches adhere to appropriate training principles
- Modify rules for adult games so they are appropriate for adolescents
- Ensure contests are supervised carefully and rules strictly enforced
- Be careful not to emphasize winning beyond safety

Soccer Injuries

Soccer is one of the most popular sports in the world and the fastest growing team sport in the United States. Although soccer provides an enjoyable form of aerobic exercise and helps develop balance, agility, coordination, and a sense of teamwork, soccer players must be aware of the risks for injury. Injury prevention, early detection, and treatment can keep kids and adults on the field long-term.

Common Soccer Injuries and their Symptoms

Injuries to the lower extremities are the most common in soccer. These injuries may be traumatic, such as a kick to the leg or a twist to the knee, or result from overuse of a muscle, tendon, or bone.

Lower Extremity Injuries

Sprains and strains are the most common lower extremity injuries. The severity of these injuries varies. Cartilage tears and anterior cruciate ligament (ACL) sprains in the knee are some of the more common injuries that may require surgery. Other injuries include fractures and contusions from direct blows to the body.

Overuse Lower Extremity Injuries

Shin splints (soreness in the calf), patellar tendinitis (pain in the knee), and Achilles tendinitis (pain in the back of the ankle) are some of the more common soccer overuse conditions. Soccer players are also prone to groin pulls and thigh and calf muscle strains.

Stress fractures occur when the bone becomes weak from overuse. It is often difficult to distinguish stress fractures from soft tissue injury.

If pain develops in any part of your lower extremity and does not clearly improve after a few days of rest, a physician should be consulted to determine whether a stress fracture is present.

Upper Extremity Injuries

Injuries to the upper extremities usually occur from falling on an outstretched arm or from player-to-player contact. These conditions include wrist sprains, wrist fractures, and shoulder dislocations.

Head, Neck and Face Injuries

Injuries to the head, neck, and face include cuts and bruises, fractures, neck sprains, and concussions. A concussion is any alteration in an athlete's mental state due to head trauma and should always be evaluated by a physician. Not all those who experience a concussion lose consciousness.

Soccer Injuries Treatment

Participation should be stopped immediately until any injury is evaluated and treated properly. Most injuries are minor and can be treated by a short period of rest, ice, and elevation. If a trained health care professional such as a sports medicine physician or athletic trainer is available to evaluate an injury, often a decision can be made to allow an athlete to continue playing immediately. The athlete should return to play only when clearance is granted by a health care professional.

Overuse injuries can be treated with a short period of rest, which means that the athlete can continue to perform or practice some activities with modifications. In many cases, pushing through pain can be harmful, especially for stress fractures, knee ligament injuries, and any injury to the head or neck. Contact your doctor for proper diagnosis and treatment of any injury that does not improve after a few days of rest.

Soccer Injuries Prevention

- Have a pre-season physical examination and follow your doctor's recommendations.
- Use well-fitting cleats and shin guards — there is some evidence that molded and multi-studded cleats are safer than screw-in cleats.
- Be aware of poor field conditions that can increase injury rates.
- Use properly sized synthetic balls — leather balls that can become waterlogged and heavy are more dangerous, especially when heading.
- Watch out for mobile goals that can fall on players and request fixed goals whenever possible.
- Hydrate adequately — waiting until you are thirsty is often too late to hydrate properly.
- Pay attention to environmental recommendations, especially in relation to excessively hot and humid weather, to help avoid heat illness.
- Maintain proper fitness — injury rates are higher in athletes who have not adequately prepared physically.
- After a period of inactivity, progress gradually back to full-contact soccer through activities such as aerobic conditioning, strength training, and agility training.
- Avoid overuse injuries — more is not always better! Many sports medicine specialists believe that it is beneficial to take at least one season off each year. Try to avoid the pressure that is now exerted on many young athletes to over-train. Listen to your body and decrease training time and intensity if pain or discomfort develops. This will reduce the risk of injury and help avoid "burn-out".
- Speak with a sports medicine professional or athletic trainer if you have any concerns about injuries or prevention strategies.

Tennis Elbow Injury

Tennis elbow is a common cause of elbow pain in athletes. It is an inflammation of several structures of the elbow. These include muscles, tendons, bursa, periosteum, and epicondyle.

Tennis elbow is considered a cumulative trauma injury that occurs over time from repeated use of the muscles of the arm and forearm. The pain of tennis elbow is thought to be related to small tears and damage to the tendons that attach muscles of the forearm to the lateral epicondyle of the elbow. In most cases of chronic elbow pain, it is believed to be due to tendinopathy rather than tendinitis.

Description

The classic tennis elbow is caused by repeated forceful contractions of wrist muscles located on the outer forearm. The stress, created at a common muscle origin, causes microscopic tears leading to inflammation. This is a relatively small surface area located at the outer portion of the elbow.

Medial tennis elbow, or medial epicondylitis, is caused by forceful, repetitive contractions from muscles located on the inside of the forearm. All of the forearm muscles are involved in tennis serves, when combined motions of the elbow and wrist are employed. This overuse injury is common between ages 20 and 40.

People at risk for tennis elbow are those in occupations that require strenuous or repetitive forearm movement. Sport activities that require individuals to twist the hand, wrist, and forearm, such as tennis, throwing a ball, bowling, golfing, and skiing, can cause tennis elbow.

Individuals in poor physical condition who are exposed to repetitive wrist and forearm movements for long periods of time may be prone to tennis elbow. This condition is also called epicondylitis, lateral epicondylitis, medial epicondylitis, or golfer's elbow, where pain is present at the inside epicondyle.

Tennis Elbow Causes

In racket sports, overuse of the forearm extensor muscles, particularly the extensor along with repeated impact can increase the risk of tennis elbow. Other factors that may contribute to tennis elbow include lack of strength, poor technique, and increases in duration or intensity of play. There is some concern about racket string tension leading to higher impact forces on the forearm muscles, which may increase stress on the tendons. Although some believe racket grip size can reduce tennis elbow, there is little evidence to support the theory.

In some cases, damage to the tendon is caused by a direct impact which causes the muscles and tendons to partially tear.

Tennis Elbow Symptoms

Pain on the outside of the elbow, usually during or after intense use, is the first sign of tennis elbow. In some cases, lifting or grasping objects may be difficult and some have pain that radiates down the arm.

Diagnosis

Diagnosis of tennis elbow includes the individual observation and recall of symptoms, a thorough medical history, and physical examination by a physician. Diagnostic testing is usually not necessary unless there may be evidence of nerve involvement from underlying causes. X - rays are usually always negative because the condition is primarily soft tissue in nature, in contrast to a disorder of the bones.

Tennis Elbow Treatment

Rest is the first treatment for tennis elbow. Stop all activities that cause the pain and use the PRICED-R treatment method to reduce pain and swelling. Conservative treatments are often all that is needed for a full recovery of a tendinitis which usually resolves in a few days to a few weeks.

If tennis elbow pain is due to a deterioration of the tendon, it can take from two to six months to fully recover. Many cases of lateral epicondylitis become chronic problems that progressively get worse if the athlete continues activity despite irritating elbow pain.

If elbow pain lasts more than a few days despite rest and conservative treatment, you should see a physician for an evaluation and a referral to physical therapy.

A physical therapist may use ultrasound or other modalities to help heal tendinopathy. The specific rehab for lateral epicondylitis depends upon the exact cause of the injury and the diagnosis; however, the most common rehab methods include ultrasound, medications, massage, braces or splints.

Once the tendon has healed, strengthening and flexibility exercises may be prescribed. Your therapist will help determine the best rehab path for you. Keep in mind that beginning any exercises before the tendon has healed may make the problem worse, so follow your therapist or physician's recommendations.

Anti-inflammatory medication may help reduce inflammation and pain in some cases of tendinitis. If you have a particularly difficult or severe case, your physician may consider using cortisone injections to help relieve the discomfort.

Alternative Treatment

Massage therapy has been found to be beneficial if symptoms are mild. Massage techniques are based primarily on increasing circulation to promote efficient reduction of inflammation. Manipulation, acupuncture, and acupressure have been used as well. Contrast hydrotherapy (alternating hot and cold water or

compresses, three minutes hot, 30 seconds cold, repeated three times, always ending with cold) applied to the elbow can help bring nutrient-rich blood to the joint and carry away waste products.

Prevention

Until symptoms of pain and inflammation subside, activities requiring repetitive wrist and forearm motion should be avoided. Once pain decreases to the point that return to activity can begin, the playing of sports, such as tennis, for long periods should not occur until excellent condition returns.

Many times, choosing a different size or type of tennis racquet may help. Frequent rest periods are important despite what the wrist and forearm activity may be. Compliance with a stretching and strengthening program is very important in helping prevent recurring symptoms.

Rehabilitation of Sports Injuries

Rehabilitation is a common term for the comprehensive treatment of injury and/or medical conditions. It has active and passive elements. It focuses upon the whole person not just the injury and aims to restore the greatest possible degree of function in the shortest possible time. The factors implicated in the cause of injury should be addressed to prevent injury repetition.

Ankle Injuries Rehabilitation

Ankle injury rehabilitation is based on stretching and strengthening the joint. It should not replace an evaluation by your physician. This routine generally takes 20 minutes and should be done three times per week until full recovery. Do not attempt if you experience pain.

A proper, safe stretch should not be painful. To perform the following stretches properly move slowly, don’t bounce and hold for 15 seconds then switch sides and repeat 2- 4 times.

Ankle Exercises

The ankle joint is one of the major weight bearing structures in the body. As a result of this function and partly due to its structure, the ankle is the most commonly injured joint.

Injury to an ankle can increase the risk of re-injury to as much as 40 to 70%. For this reason it is important to strengthen and stretch your ankle after injury to help decrease your risk.

Rehabilitating your ankle should be done slowly and carefully. Start with non-weight bearing exercises, moving to resisted exercises, and then weight bearing activities as your ankle recovers. Review the ankle exercises below to rehabilitate your ankle to recovery.

1) Stretching Exercises

1. **Calf (gastrocnemius) Stretch – One**

   Place you hands on a wall with right foot behind you. Keep right knee straight and heel touching the ground. Lean forward until you feel a stretch along your calf. (You may have to move the foot closer to the wall or further back in order to feel the stretch)

2. **Calf (soleus) Stretch – Two**

   Place you hands on a wall with your right foot behind you. Bend your right knee, and keep the heel in contact with the ground. Lean forward until you feel a stretch along your calf.

3. **Range of Motion**

   Sit with one leg crossed over the other. With the toes of the free foot 'draw' small circles in the air, clockwise then counterclockwise, for 10-15 seconds in each direction. For more advanced exercises 'spell' out the letters of the alphabet. Repeat with the other foot.

4. **Leg Swing on One Leg**

   While balancing on one leg slowly swing the other leg forward then back through a full range of motions. Keep the knee straight and move from the hip. You can also swing the leg to the side. Do this for 10 seconds, rest and repeat several times.

5. **Toe Raises**

   While standing with one hand on the back of a chair for support, rise up on your toes and hold for 2 seconds and lower. Do not bounce. Do 2 sets of 10 repetitions. When exercise becomes easy perform with one foot at a time.

6. **Toe Taps**

   Sit in chair. Begin with right foot. Keep heel on the ground. Raise toes up toward body and then lower so toes touch ground. Perform 2 sets of 10 repetitions. Repeat toe taps for left foot.

This program can help strength the muscles that support the ankle joint. Be careful and do not perform exercises that cause pain.

2) Range of Motion Exercises - None Weight Bearing

All exercises should be performed while sitting on the floor or another flat surface with your legs fully extended, knees straight, out in front of you. Each exercise should be performed 10 times in a row.

Dorsiflexion

1. Moving only your ankle, point your foot back toward your nose (while keeping knees straight). Continue until you feel discomfort.
2. Hold this position for 15 seconds.
3. Return to neutral position.

Plantar flexion

1. Moving only your ankle, point your foot forward (while keeping knees straight). Continue until you feel discomfort or cannot move it any further.
2. Hold this position for 15 seconds.
3. Return to neutral position.

Inversion

1. Moving only your ankle and keeping your toes pointed up, turn your foot inward, so the sole is facing your other leg. Continue until either discomfort is felt or you can no longer turn your foot inward.
2. Hold this position for 15 seconds.
3. Return to neutral position.

Eversion

1. Moving only your ankle and keeping your toes pointed up, turn your foot outward, away from your other leg. Continue until either discomfort is felt or you can no longer turn your foot outward.
2. Hold this position for 15 seconds.

3. **Return to neutral position.**

3) Isometric Strengthening Exercises

Do these exercises to strengthen the muscles around your ankle. This will provided added support to the joint. Each exercise should be repeated between 5 and 10 times; increase the number of repetitions as you get stronger.

Eversion Isometrics

1. While seated, place the outside of the injured foot against a table leg or closed door.
2. Push outward with your foot into the object your foot is against (your ankle joint should not move) causing a contraction of your muscles.
3. Hold this muscle contraction for 15 seconds.
4. Relax for 10 seconds.

Inversion Isometrics

1. While seated, place the inside of the injured foot against a table leg or closed door.
2. Push inward with your foot into the object your foot is against (your ankle joint should not move) causing a contraction of your muscles.
3. Hold this muscle contraction for 15 seconds.
4. Relax for 10 seconds.

4) Partial Weight-Bearing Exercises

These exercises will help put more weight on the injured foot as well as strengthen it. Each one should be performed 10 times in a row.

Seated Calf Raise

1. Sit in a chair with the injured foot on the floor.
2. Lift your heel as far as possible while keeping your toes on the floor.
3. Return heel to the floor.

Single Leg Stand

1. Stand upright while holding onto a stable object.
2. Shift some of your weight onto the injured foot.

3. Hold the position for 15 seconds.
4. Relax and put your weight back onto your uninjured foot.

5) Full Weight-Bearing Exercises

These exercises will help put more weight on the injured foot as well as strengthen it. Perform each one 10 times in a row.

Single Leg Stance

1. Stand on the injured foot while lifting the uninjured foot off the ground.
2. Hold the position for 15 seconds.
3. Relax and put your weight back onto your uninjured foot.

Standing Calf Raise

1. Stand on the injured foot while lifting the uninjured foot off the ground.
2. Raise up, standing only on the ball of the injured foot and lifting your heel off the ground.
3. Hold the position for 15 seconds.
4. Relax and put your weight back onto your uninjured foot.

Lateral Stepping

(Increase the speed of this exercise as your healing progresses.)

1. Place a rolled towel or short object on the ground to the side of your injured foot.
2. Step over the towel with the injured foot and remain on that foot.
3. Then bring the uninjured foot over the object and stand on both feet.
4. Step back over the towel with the uninjured foot and remain on that foot.
5. Then bring the injured foot back over the towel and stand on both feet.

Lateral Jump

(Increase the speed of this exercise as your healing progresses.)

1. Place a rolled towel or short object on the ground to the side of your injured foot.
2. Hop over the towel and land on the injured foot.
3. Then hop back over the towel and land on the uninjured foot.

6) Balance Activities

Injury to ankles can often result in decreased balance ability. Towards the end of rehabilitation performing balance activities is an important way to prevent future injury. Perform this exercise 10 times in a row.

Single Leg Stance on a Towel

1. Fold a towel into a small rectangle and place on the ground.
2. Stand with the injured foot on the towel.
3. Lift the uninjured leg off the ground standing only on the towel with the injured leg.
4. Hold for 15 seconds. (As balance improves, increase stance time on injured leg up to 45 seconds.)
5. Return your uninjured foot to the floor.

Knee Injuries Rehabilitation

Importance of Exercise

Regular exercise to restore your knee mobility and strength is necessary. For the most part, this can be carried out at home. Your orthopedic surgeon may recommend that you exercise approximately 20 to 30 minutes two or three times a day. You also may be advised to engage in a walking program.

Before You Start

Your orthopedic surgeon may suggest some of the following exercises. The following guide can help you better understand your exercise or activity program that may be supervised by a therapist at the direction of your orthopedic surgeon. As you increase the intensity of your exercise program, you may experience temporary setbacks. If your knee swells or hurts after a particular exercise activity, you should lessen or stop the activity until you feel better.

1) Initial Exercise Program

Hamstring Contraction
Repeat 10 times.

No movement should occur in this exercise. Lie or sit with your knees bent to about 10 degrees. Pull your heel into the floor, tightening the muscles on the back of your thigh. Hold 5 seconds, and then relax.

Quadriceps Contraction
Repeat 10 times.

Lie on stomach with a towel roll under the ankle of your operated knee. Push ankle down into the towel roll. Your leg should straighten as much as possible. Hold for 5 seconds. Relax.

Straight Leg Raises
Repeat 10 times.

Lie on your back, with uninvolved knee bent, straighten your involved knee. Slowly lift about 6 inches and hold for 5 seconds. Continue lifting in 6-inch increments, hold each time. Reverse the procedure, and return to the starting position.

Advanced: Before starting, add weights to your ankle, starting with 1 pound of weight and building up to a maximum of 5 pounds of weight over 4 weeks.

Buttock Tucks
Repeat 10 times.

While lying down on your back, tighten your buttock muscles. Hold tightly for 5 seconds.

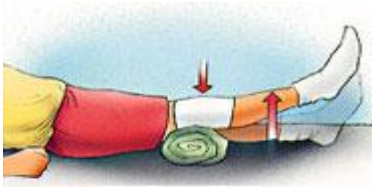
Straight Leg Raises, Standing
Repeat 10 times.

Support yourself, if necessary, and slowly lift your leg forward keeping your knee straight. Return to the starting position.

Advanced: Before starting, add weights to your ankle, starting with 1 pound of weight and building up to a maximum of 5 pounds of weight over 4 weeks.

2) Intermediate Exercise Program

Terminal Knee Extension, Supine
Repeat 10 times.



Lie on your back with a towel roll under your knee. Straighten your knee (still supported by the roll) and hold 5 seconds. Slowly return to the starting position.

Advanced: Before starting, add weights to your ankle, starting with 1 pound of weight and building up to a maximum of 5 pounds of weight over 4 weeks.

Straight Leg Raises

Perform 5 sets of 10 repetitions.

Lie on your back, with your uninvolved knee bent. Straighten your other knee with a quadriceps muscle contraction. Now, slowly raise your leg until your foot is about 12 inches from the floor. Slowly lower it to the floor and relax.

Advanced: Before starting, add weights to your ankle, starting with 1 pound of weight and building up to a maximum of 5 pounds of weight over 4 weeks.

Partial Squat, with Chair

Repeat 10 times.

Hold onto a sturdy chair or counter with your feet 6-12 inches from the chair or counter. Do not bend all the way down. DO NOT go any lower than 90 degrees. Keep back straight. Hold for 5-10 seconds. Slowly come back up. Relax.

Quadriceps Stretch, Standing
Repeat 10 times.

Standing with the involved knee bent, gently pull heel toward buttocks, feeling a stretch in the front of the leg. Hold for 5 seconds.

3) Advanced Exercise Program

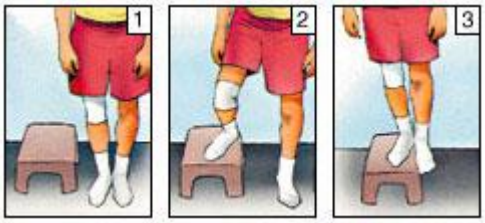
Knee Bend, Partial, Single Leg
Repeat 10 times.

Stand supporting yourself with the back of a chair. Bend your uninvolved leg with your toe touching for balance as necessary. Slowly lower yourself, keeping your foot flat. Do not overdo this exercise. Straighten up to the starting position. Relax.

Step-ups, Forward
Repeat 10 times.

Step forward up onto a 6-inch high stool, leading with your involved leg. Step down, returning to the starting position. Increase the height of the platform as strength increases.

Step-ups, Lateral
Repeat 10 times.



Step up onto a 6-inch high stool, leading with your involved leg. Step down, returning to the starting position. Increase the height of the platform as strength increases.

Terminal Knee Extension, Sitting
Repeat 10 times.

While sitting in a chair, support your involved heel on a stool. Now straighten your knee, hold 5 seconds, and slowly return to the starting position.

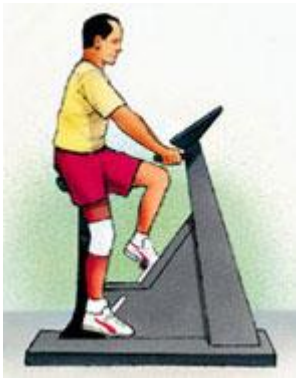
Hamstring Stretch, Supine
Repeat 10 times.

Lie on your back. Bend your hip, grasping your thigh just above the knee. Slowly straighten your knee until you feel the tightness behind your knee. Hold for 5 seconds. Relax. Repeat with the other leg. If you do not feel this stretch, bend your hip a little more, and repeat. No bouncing! Maintain a steady, prolonged stretch for the maximum benefit.

Hamstring Stretch, Supine at Wall
Repeat 10 times.

Lie next to a doorway with one leg extended. Place your heel against the wall. The closer you are to the wall, the more intense the stretch. With your knee bent, move your hips toward the wall. Now begin to straighten your knee. When you feel the tightness behind your knee, hold for 5 seconds. Relax. Repeat with the other leg.

Exercise Bike
Start pedaling for 10 minutes a day.



If you have access to an exercise bike, set the seat high so your foot can barely reach the pedal and complete a full revolution. Set the resistance to “light” and progress to “heavy”.

Increase the duration by one minute a day until you are pedaling 20 minutes a day.

Walking

An excellent physical exercise activity in the middle stages of your recovery from surgery (after 2 weeks).

Running

Running should be avoided until 6 to 8 weeks because of the impact and shock forces transmitted to your knee. Both walking and running activities should be gradually phased into your exercise program.

Shoulder Injuries Rehabilitation

The following exercises are examples of the strengthening routines commonly prescribed by physicians and physical therapists to help active people recover from rotator cuff injuries.

Depending on the specifics of your injury, some or all of these exercises may not apply. Always check with your physician or physical therapist before beginning a stretching or strengthening program.

1) Stretching Exercises

The following exercises are examples of shoulder and arm stretching routines to help you control arm movements and prevent injury. Depending on your specific medical history, some or all of these exercises may not apply. Always consult with your physician before beginning a strengthening program.

Physicians generally recommend stretching only the back of your shoulder. Over-stretching your shoulder may contribute to future injury. Each stretch is meant to be held for a count of 15 to 30 seconds and repeated three times for each arm.

Posterior Shoulder Stretch

Lift your arm to shoulder height. Using your opposite arm, pull the arm across your body. You should feel the tension in the back of your shoulder.

Shoulder Blade Stretch

Standing or sitting, reach across your chest with both hands and try to grasp your shoulder blades. Drop your chin toward your chest. Inhale, holding onto your shoulder blades for a count of 15. You should feel the stretch along the border of your shoulder blades.

Wrist Flexor and Elbow Extensor Stretch

With the palm of your hand facing the floor and your elbow straight, raise the arm to a point parallel to the floor. Use your opposite hand to bend the hand up, so your fingers are pointed toward the ceiling. You should feel the stretch in the tendons of your wrist and the inside group of forearm muscles.

Wrist Extensor Stretch

Standing or sitting, with the palm of your hand facing the floor and your elbow straight, raise the arm to a point parallel to the floor. Use your opposite hand to bend the hand down, so your fingers are pointing toward the floor. You should feel the stretch in your wrist and the outside group of forearm muscles.

2) Strengthening Exercises

The following exercises are examples of shoulder strengthening routines to help you control arm movements and prevent injury. Depending on your specific medical history, some or all of these exercises may not apply. Always consult with your physician before beginning a strengthening program.

Each exercise is meant to be performed three to five times a week. Begin the exercises with two- to three-pound weights, performing the motion slowly with each arm. Start with a set of ten repetitions and work up to 15. When you can finish one set without difficulty, try two and then three sets. Only increase the weights when you can easily perform three sets. Each time you increase the weights, reduce the number of sets to two until you can easily perform them.

Shoulder Flexion

Stand or sit with your arms at your side, palm toward your thigh. Keeping your elbow straight, raise your arm in front of you, leading with your thumb. Continue slowly until your arm is overhead. Return slowly to the starting position and repeat with each arm.

Shoulder Abduction

Stand with your arms at your side, palms facing your thighs. Lift both your arms sideways to shoulder height, keeping elbows straight. Lower your arms slowly to starting position and repeat.

Shoulder Elevation

Stand with your arms at your side. Keeping your elbows straight, turn your arms in so that thumbs are pointing downward. Bring your arms forward, slightly in front of your body. Raise both your arms to 70 degrees, keeping your elbows straight and thumbs pointed toward the floor. Slowly lower your arms to starting position and repeat.

Horizontal Abduction

Stand next to a table or bench. Lean forward from the hips, using the arm closest to the bench for balance. Allow the other arm to hang perpendicular to the floor with the elbow straight.

Hold the weight with your palm facing inward. Lift your arm up and to the side, keeping your elbow straight. Continue lifting until your arm is parallel to the floor. Make sure you do not lift your hand higher than your shoulder. Return slowly to the starting position. Begin the next repetition right away to avoid unnecessary traction on your shoulder.

Shoulder Extension

Stand next to a table or bench. Lean forward from the hips, using the arm closest to the bench for balance. Allow the other arm to hang perpendicular to the floor. Holding a weight with your palm facing inward, lift your arm backward until it is level with your trunk. Keep your elbow straight and your arm close to your

trunk. Return slowly to the starting position. Begin the next repetition right away to avoid unnecessary traction on your shoulder.

External Rotation Exercise

Lie on your side. With the hand of the unsupported side, hold a weight close to your abdomen with your elbow bent 90 degrees. You can place a rolled-up towel in your armpit for added support.

Rotate your shoulder, moving the back of your hand toward the ceiling. Keep your upper arm and elbow on the pillow or towel. Return slowly to the starting position and repeat.

Internal Rotation

Stand near a door with the shoulder you are exercising facing the door and the other shoulder facing away from the door. With your arm at your side, bend your elbow 90 degrees. Place tubing or a resistive band in your hand with the other end attached to the doorknob. Rotate your hand toward your stomach. Return slowly to the starting position and repeat.

Clavicle Injuries Rehabilitation

As an athlete, one concern is getting back to full strength as soon as possible so that you can return to training and competition. That is why appropriate rehabilitation is extremely important. Rehabilitation for a clavicle fracture often includes the following:

- rest during the acute phase
- ice the injury multiple times per day
- compression of the injured shoulder with a secure wrap or bandage
- elevation of the injured shoulder above heart level
- use anti-inflammatory medications such as ibuprofen to reduce inflammation and speed up recovery

Most clavicle fractures can be rehabilitated with a figure-of-eight strap, which is wrapped around the body and the shoulders, or a sling. These devices help hold the shoulder in place while the clavicle heals. Your doctor also may prescribe pain medication and rehabilitation exercises once the strap is removed.

The major objectives of rehabilitation from a clavicle fracture are to increase flexibility, establish pain-free range of motion, and strengthen the muscles of the shoulders, upper back, front chest, and upper arms. In severe cases, you should avoid activity that causes shoulder pain altogether.

Keep in mind that rehabilitation for a clavicle fracture may be different when the injury requires surgery to put the pieces of the bone back in position. In these cases, your doctor may prescribe special physical therapy. Recovery time will vary.

1) Rehabilitation Exercises

Rehabilitation exercises often prescribed by your doctor/trainer may include:

- **Shrugs**

  Stand with hands at sides with no weight in either hand. Raise shoulders to the point of pain and hold for five seconds. Relax for five seconds. Perform this sequence 10 times, 3 times daily. As pain permits, hold dumbbells of equal weight in each hand while performing this exercise. Add weight by using hand-held dumbbells as pain permits.

- **Bicep Curls**

  Stand with arms fully extended at sides while grasping 2- to 5-pound weights in each hand, held palm forward. Flex the arms at the elbow to approximately 100 degrees, or to the point of pain, whichever comes first. Hold this position for 5 to 10 seconds. Return to the start position. Rest for 5 seconds. Repeat this exercise 10 times. Increase the weight as pain allows and strength develops.

- **Triceps Curls**

  Stand with elbows directed upward over the shoulders and with arms relaxed. Extend arms at the elbow so that the hands proceed upward to the point of pain. Hold this position for five seconds. Return to the starting position and relax for five seconds. Perform this sequence 10 times, 3 times daily. As pain permits, add weight by using hand-held dumbbells.

- **Chest Raises**

  Lie on belly with hands extended along sides of the body. Raise the upper chest from the floor to the point of pain and hold this position for 5 seconds. Return to the start position and relax for 10 seconds. Repeat this sequence 10 times, 3 times daily.

- **Saws**

  Reach out and place the unaffected side hand on a corner of a table. Bend at the waist. Flex the injured side arm at the elbow and pull the

injured side arm backward and upward as if sawing wood. Slowly bring the shoulder blades as close together as pain will permit. Slowly bring the injured side arm down to its beginning position. Repeat this sequence 10 times, at least three times daily.

- **Pendulum Swings**

  Stand with the hand of the unaffected arm resting on the corner of a table and supporting some of the body weight. Slightly bend the knee on the unaffected side and extend the other leg sideways. Allow the injured arm to hang loosely over the unaffected side foot. By shifting the body weight, cause the relaxed injured arm to swing in circles to the fullest extent possible as limited by pain. Perform 25 swings in a clockwise direction. Pause. Perform 25 swings of the injured arm in a counterclockwise direction. Repeat this sequence at least three times daily.

- **Shoulder Rotation**

  Stand in a doorway with affected side arm bent at the elbow and the palm of the hand against the door frame. Turn the body away from the injured side hand until a stretching sensation is experienced in the injured shoulder. Hold this position for 10 seconds. Return to the starting position. Relax for 10 seconds. Repeat this sequence 10 times at least three times a day.

- **Shoulder Flexion**

  Stand close to a wall. With the palm of the injured side arm turned so as to face you, slowly slide the forearm and then the upper arm up the wall by moving closer to the wall. Slide the arm upward to the point of initial significant pain. Hold this position for 10 seconds. Return to the starting position and relax for 10 seconds. Repeat this sequence 10 times, at least three times daily.

- **Towel Stretch**

  Roll a towel lengthwise. While standing erect, dangle the rolled towel down the back, holding it with the unaffected side hand. Reach behind the back with the hand of the injured side and grasp the rolled towel. Gently pull upward on the towel, raising the injured side arm until first significant pain in the injured shoulder is felt. Hold this position for 10 seconds. Relax the arms while maintaining the grasp on the rolled towel for ten seconds. Repeat this sequence 10 times at least three times daily.

- **Flexed Elbow Pull**

  Bend and raise the injured side elbow to shoulder height. Grasp the injured side elbow with the uninjured side hand. Gently pull the injured side elbow toward the opposite shoulder until limited by first significant pain. Hold this position for 10 seconds. Relax for 10 seconds. Repeat this sequence 10 times at least three times daily.

Depending on the severity of the injury, some of the above exercises, and perhaps others of similar nature intended to increase the range of motion of the injured shoulder, may be prescribed to be done in water or a warm whirlpool apparatus. Water relieves the arm of some of its weight, thus allowing a greater pain-free range of motion, while warm water and a water massaging effect may also be effective.

2) Alternative Exercises

During the period when normal training should be avoided, alternative exercises may be used. These activities should not require any actions that create or intensify pain at the site of injury. They include:

- water running
- stationary bicycle (add resistance gradually from one session to the next, as pain allows)

3) Rehabilitation after surgery

Surgery is rarely needed to set a broken collarbone - putting the pieces of the bone back in position. Your doctor may place pins, a plate, or screws in the bone to hold it in place, and you will need to wear a sling or figure-of-eight strap while you heal.

When your doctor decides you are ready, you may start range-of-motion and strengthening exercises. You may be referred to a physical therapist to assist you with these exercises. Under no circumstance should you return to sports activity until your shoulder is fully healed.

A physical therapy program usually begins with range-of-motion and resistive exercises, then incorporates strength training, aerobic and muscular endurance, flexibility, and coordination drills.

Rehabilitation for Elbow Injuries

As an athlete, your number one concern is getting back to full strength as soon as possible so that you can return to training and competition. That is why appropriate rehabilitation is extremely important.

The major objectives of rehabilitation from an elbow fracture, once it's healed, are to improve the elasticity of the elbow joint and to gradually increase pain-free range of motion. The exercises below stretch the muscles of the forearm and upper arm. These exercises should be performed once or twice daily.

1) Stretching Exercises

- **Wrist Flexor Stretch**

  Extend affected arm forward with palm up and elbow straight. Place fingers and palm of opposite hand across palm and fingers of the extended hand and draw back with it until stretch is felt in the forearm. Hold this position for 3 to 5 seconds then relax for 3 to 5 seconds. Perform this exercise 10 times.

- **Wrist Extensor Stretch**

  Extend affected arm forward with palm down, elbow straight, and fingers slightly curled. Grasp the affected side hand with other hand and draw affected side hand down until stretch is felt in the forearm. Hold this position from 3 to 5 seconds then relax for 3 to 5 seconds. Perform this exercise 10 times.

- **Pronation/Supination Stretch**

  Extend affected arm forward in a hand-shaking position with palm facing up. Slowly rotate the hand from a palm-up position to a palm-down position. Hold for 3 to 5 seconds and then rotate back. Perform this exercise 10 times. When you work your way up to strength training, you may use a small weight while rotating the hand and wrist.

- Tricep Stretch

  Stand erect with feet at about shoulder width. Raise injured arm at the shoulder with elbow bent and place the forearm behind the head. Grasp the injured elbow with opposite hand and draw it toward the center of the body until stretch is felt. Hold this position for 3 to 5 seconds then relax for 3 to 5 seconds. Perform this exercise 10 times.

- **Bicep Stretch**

  Stand erect with arms raised to shoulder height and palms up. Press arms backward until stretch is felt. Hold this position for 3 to 5 seconds and then relax for 3 to 5 seconds. Perform this exercise 10 times. The bicep is stretched by this exercise as well as the muscles of the shoulder and upper chest.

2) Strengthening Exercises

The following exercises develop strength of the muscles of the forearm and upper arm. To maintain symmetry of the arms in terms of strength and appearance, perform these strength exercises with the uninjured arm as well as the injured arm.

- **Wrist Extension**

  Sit in a chair with forearm resting on the end of a table, palm down. Grasp a light weight dumbbell and raise the weight up as high as possible while maintaining contact with the table top. Hold this position for 3 to 5 seconds. Relax for 3 to 5 seconds. Repeat this exercise 5 to 10 times. Substitute a heavier dumbbell as strength increases.

- **Arm Curls**

  Either standing or sitting, grasp a two- to four-pound dumbbell in one hand. With palm up, flex elbow and draw the dumbbell up to the same side shoulder while maintaining erect posture. Do not bend at the waist or swing the dumbbell. Lower dumbbell slowly and with control to the starting position. Repeat this exercise 10 times. Use a heavier dumbbell as strength increases.

3) Alternative Exercises

During the period when normal training should be avoided, alternative exercises may be used. These activities should not require any actions that create or intensify pain at the site of injury. They include:

- brisk walking/light jogging
- stationary bicycle

4) Rehabilitation after Surgery

Keep in mind that if your elbow fracture requires surgery, the soft tissue needs time to heal before exercise can begin. While in the hospital, patients start partial weight bearing with exercises to re-establish elbow joint mobility. In these cases, you would be required to wear a splint or cast for eight to ten weeks.

A physical therapy program usually begins with range-of-motion and resistive exercises, then incorporates power, aerobic and muscular endurance, flexibility, and coordination drills.

Finally, patients develop speed and agility through sport-specific exercise routines.

The ultimate goal of reconstructive elbow surgery is to provide dynamic stability while maintaining full range of motion, so that athletes can return to competitive or recreational sports. Progress is assessed by the patient's perception of how stable the elbow feels and by comparing the strength and stability of the injured and uninjured arms.