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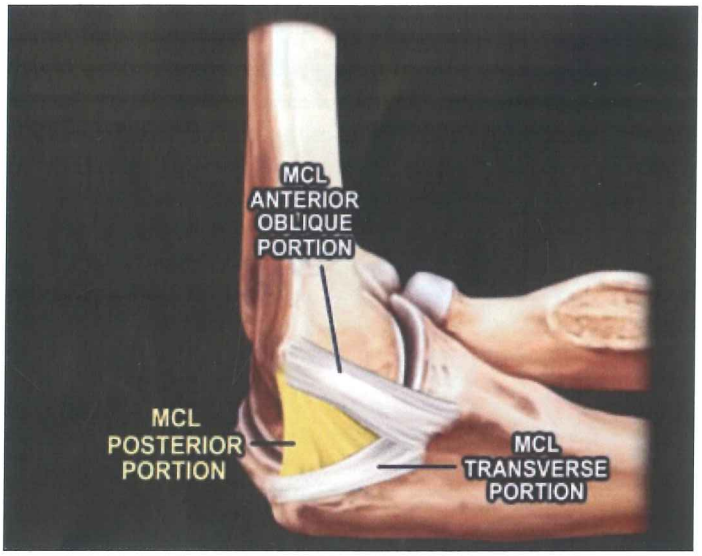
Ligaments of the Elbow

The primary stabilizer of the elbow is the ulnohumeral joint. The coronoid process is the anterior buttress of the olecranon. The coronoid process prevents posterior dislocation of the elbow. Fractures of the coronoid more than 50% of the height will lead to elbow instability. With fractures of the coronoid process, it is important to recognize the anteromedial fracture. LCL tear and impaction fracture of the anteromedial coronoid facet will lead to posteromedial instability of the elbow joint. Sometimes this fracture is not easily seen on x-rays and can be missed. Delayed treatment of this fracture may result in varus and posteromedial instability, as well as early onset osteoarthritis. Surgical fixation should be done and is usually done through a medial approach. Posteromedial instability results from a varus deforming force. The coronoid process is also the attachment site for the important ligament, the anterior bundle of the medial collateral ligament of the elbow. Fracture of the coronoid process may also be a part of the terrible elbow triad. The MCL is composed of three bands: the anterior, posterior, and transverse bundles.

The anterior band of the MCL is the strongest primary stabilizer to valgus stress in 90 degrees of flexion. In extension, it provides about 30% of the restraint. The osseous and articular components of the elbow joint, as well as the anterior joint capsule, resist the valgus forces in extension. The MCL originates from the posterior medial epicondyle of the distal humerus. It inserts into the sublime tubercle of the medial coronoid process. Late cocking and early acceleration will give the highest valgus torque to the medial collateral ligament. The deficiency of this ligament is diagnosed with the moving valgus stress or the valgus stress test.

With the arm fully supinated, the physician should find the MCL and take the forearm into full extension, placing a valgus stress on the medial collateral ligament. The elbow valgus stress test is used to assess the integrity of the medial collateral ligament. A clinical exam is not as good as an MRI. An MRI is the best study to diagnose complete tears of the MCL of the elbow. A CT scan arthrogram is more sensitive than an MRI for partial lesions. In the case of a complete tear, reconstruction of the medial collateral ligament (ulnar) deficiency is the best procedure. A complete tear in high level throwing athletes is an indication for surgery. 90% of patients return to pre-injury levels of activities. The posterior portion of the MCL forms the floor of the cubital tunnel. The posterior bundle of the



flexion of the stiff elbow, they should release the contracted posterior band of the medial collateral ligament. The third part of the MCL is called the transverse bundle.

The lateral collateral ligament (LCL) consists of four parts: the lateral ulnar collateral ligament, lateral radial collateral ligament, accessory lateral collateral ligament, and annular ligaments. The lateral ulnar collateral ligament (LUCL) is the key anatomic structure which prevents posterolateral instability. The radial collateral ligament (RCL) and the accessory collateral ligament (ALCL) has some contribution to lateral elbow stability. All of this is debated and controversial, but there is consensus that the lateral collateral ligament complex and not an individual ligament is important in preventing posterolateral rotatory instability of the elbow. The lateral ulnar collateral ligament (LUCL) acts like a sling for the radial head. The LUCL traverses the posterolateral aspect of the radial head. The LUCL originates from the lateral humeral epicondyle. The LUCL inserts into the crista supinatoris of proximal ulna. Posterolateral rotary instability of the elbow occurs with LUCL deficiency. Deficiency is usually diagnosed with a lateral pivot shift test. The LUCL is deep and slightly distal to the common extensor tendon. Surgical approaches and arthrotomy to the lateral elbow may damage this ligament and may result in posterolateral instability of the elbow.


Posterolateral rotatory instability of the elbow can also occur from iatrogenic injury to the LCL during treatment of tennis elbow. This can be a complication of surgery or can be part of the pathology that involves the extensor carpi radialis brevis muscle. It may also occur from injection of steroids into this area. The LCL may also be injured during an excessive release of the origin of the ECRB tendon.

The patient will have a painful click and difficulty in achieving full elbow extension after surgery. To avoid this condition, keep the detachment of the tendon anterior to the equator of the radial head. The annular ligament stabilizes the radioulnar joint. The radial head is important and provides approximately 30% of valgus stability.

Cubital Fossa

While this article is going to heavily identify structures of the elbow, it will be helpful to physicians and surgeons in knowing how to approach the insertion of the distal biceps for repair or how to approach the proximal radius fracture anteriorly. If you look at the bony structures of the anterior elbow, you will need to first identify the common flexor tendon origin, the supinator and the pronator teres, as well as where the brachialis is inserted.

The cubital fossa is a triangular depression located in front of the anterior elbow. The medial border of the cubital fossa is formed by the pronator teres, which arises from the medial epicondyle of the humerus. The lateral border of the cubital fossa is formed by the brachioradialis muscle which arises from the lateral supracondylar ridge of the humerus. The meeting of these two muscles forms the apex of the cubital fossa. The brachioradialis muscle overlaps the pronator teres, so the lateral border overlaps the medial border. The base of the cubital fossa is superior and is represented by a horizontal line connecting the two epicondyles of the humerus, the lateral and medial epicondyles.

The median nerve disappears by entering the forearm between the two heads of the pronator teres muscles. The brachial artery bifurcates into the ulnar artery and the radial artery. The brachial artery is over the brachialis muscle. The ulnar artery leaves the fossa by going under the deep head of the pronator teres muscle. The deep head of the pronator teres muscles separates the median nerve, which goes between the two heads of the pronator teres muscle from the ulnar artery, which goes deep to the deep head of the pronator teres muscle. Another branch located within the cubital fossa is the radial artery. The radial artery descends laterally and is overlapped by the brachioradialis muscle. The biceps tendon is lateral to the brachial artery within the cubital fossa. The biceps tendon has one main insertion laterally to the radial tuberosity and another insertion going medially to the bicipital aponeurosis. The bicipital aponeurosis covers and protects the vital structures medially to the biceps tendon

(brachial artery and median nerve). The biceps tendon passes backwards (twisted) towards its insertion into the radial tuberosity. Lateral to the biceps tendon, is the radial nerve and its major branch, the posterior interosseous nerve. Other important nerves in the vicinity of the cubital fossa include the superficial radial nerve, which is located below the brachioradialis, and the lateral cutaneous nerve of the forearm. The lateral cutaneous nerve of the forearm is a branch of the musculocutaneous nerve and lies below the biceps proximally and then laterally. The floor of the cubital fossa is made up of the lower part of the brachialis muscle medially and the supinator muscle laterally. The roof of the cubital fossa is made up of skin, fascia, and the bicipital aponeurosis.

Intra-articular Extensile Approach for Tibial Plateau Fractures

Severe types of tibial plateau fractures are a complex management problem. The knee joint may have a significant comminution and depression, and the physician may need an extensile approach for reduction and fixation of this fracture. In general, fracture of the tibial plateau is a complicated problem. A vascular evaluation will be necessary. The ankle-brachial index (ABI) is needed in some types such as in medial plateau fractures, or in severe types such as in Schatzker Type V or Type VI. The ABI should be more than 0.9. Medial tibial plateau fractures are considered to be a knee dislocation.

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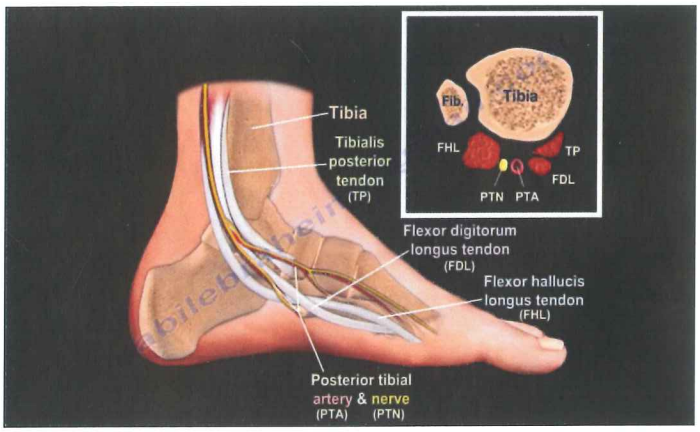
A fasciotomy may also be necessary for compartment syndrome. The soft tissue condition may be bad. The physician may want to use an external fixator initially, until the soft tissue condition improves. The association between tibial plateau fractrues and meniscal tear is not uncommon. The lateral plateau fracture will give lateral meniscal tear. The medial plateau fracture will give medial meniscal tear. A tear of the meniscus is usually peripheral. It should be recognized and dealt with. The physician may want to look at the x-ray and see if there is a depression or separation of more than 6 mm (high chance of meniscal tear).

When there is an extensive comminuted displaced tibial plateau fracture, excellent exposure of the articular surface may be necessary to allow for anatomic reduction of the joint, visualization, and repair or debridement of the meniscus if it is torn. The traditional way to see the articular cartilage of the tibial plateau is to do submeniscal approach by cutting the coronary ligament, but the exposure is limited. Other extensile approaches are also developed; however, the extensile intra-articular approach is used for complex, comminuted tibial plateau fractures. This involves anterior detachment and retraction of the meniscus to improve visualization of the tibial articular surface. This approach can be utilized for lateral or medial tibial plateau fractures, and it is especially helpful in diagnosing and repairing the torn meniscus. This allows inspection of the meniscus pathology in fractures of the articular surface. It improces reduction of the fracture and the torn meniscus is repaired and reattached to the coronary ligament. Incision and reflection of the meniscus allows great exposure and inspection of the joint, which is followed by reattachment and suturing of the anterior horn of the meniscus to its normal position which is followed by reattachment of the meniscotibial (coronary) ligament. The sutures are tied to the side of the patellar tendon on the opposite side of the meniscus.

Ankle Pain- Complete Overview

There are many structures present at the anterior aspect of the ankle, and these structures are often susceptible to injury. A common condition occurring around the anterior ankle is anterolateral impingement. This condition is characterized as painful limitation of full range of motion of the ankle due to soft tissue or osseous (bony) pathology. Soft tissue thickening is commonly seen in athletes with prior trauma that extends into the ankle joint. Tibial bone spur impinging on the talus can become a source of chronic ankle pain and limitation of ankle motion in athletes. Anterolateral impingement occurs due to an osseous or bony spur on an anterior lip of tibia contacting the talus during dorsiflexion. Arthritis of the ankle joint is commonly the result of a prior injury or inflammation to the ankle joint. This is usually diagnosed with an examination or an x-ray. Osteochondritis dissecans of the talus is a chip-type fracture that usually occurs with severe ankle sprains. This condition causes pain, swelling, and stiffness of the ankle joint. X-rays, CT scans, or an MRI are commonly used for the diagnosis. Tibialis Anterior Tendonitis is anterior tibialis tendonitis is an overuse condition common in runners. A common injury that usually accompanies anterior shin splints. If this tendon is strained, pain and tenderness will be felt upon active dorsiflexion or when the tendon is touched.

There are many structures present at the medial aspect of the ankle. These structures are often susceptible to injury. Posterior tibial tendonitis or rupture can occur from overuse activities, degeneration, and trauma. The posterior tibial tendon is one of the major supporting structures of the foot. The tendon helps to keep the arch of the foot in its normal position. When there is insufficiency or rupture of the tendon, the arch begins to sag and a flatfoot deformity can occur with associated tight Achilles tendon. The posterior tibial tendon rupture occurs in a hypovascular zone. This occurs distal to the medial malleolus. Tendonitis or rupture will present itself as painful swelling on the posteromedial aspect of the ankle. The patient may be unable to perform a single leg to raise, have a flat



foot, or a fixed deformity of the hind foot. There are four stages of posterior tibial tendon rupture. Rupture of the posterior tibial tendon could be missed!

Tarsal Tunnel Syndrome is compression of the tibial nerve in the tarsal tunnel. The flexor retinaculum covers the nerve. Tarsal tunnel syndrome is similar to compression of the median nerve in the carpal tunnel. Tarsal tunnel syndrome is usually caused by ganglia, accessory muscles, or a soft tissue mass. Differential diagnosis consists of a herniated disc, a stress fracture of the calcaneus, and plantar fasciitis. It is characterized with pain on the medial side of the foot, with the pain being worse with dorsiflexion due to tension on the nerve. Paresthesia and numbness of the foot, as well as a positive Tinel's sign behind the medial malleolus are other common signs.

Flexor Hallucis Tendonitis refers to pain, swelling, and weakness posterior to the medial malleolus. Dorsiflexion of the big toe may be reduced when the ankle is placed in dorsiflexion. Triggering and pain along the tendon sheath may also occur with toe flexion. This often occurs in activities such as ballet dancing, where plantar flexion is necessary.

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continued

The deltoid ligament is the primary stabilizer of the ankle joint and provides support to prevent the ankle from everting. An isolated eversion sprain with tear of the deltoid ligament is a rare injury.

There are many structures present at the posterior aspect of the ankle. These structures are often susceptible to injury.

Posterior ankle impingement is an impingement of the os trigonum,or large process of the talus (stieda syndrome). It is a non-united piece of accessory bone seen posterior to the talus. This condition is common among athletes such as ballet dancers. Tenderness in the posterolateral aspect of the ankle posterior to the peroneal tendon especially with passive plantar flexion. This condition may be seen in association with flexor hallucis longus tenosynovitis.

Flexor hallucis longus tenosynovitis is a condition associated with ballet dancing, as extreme plantar flexion is necessary. Swelling and pain posterior to the medial malleolus are common symptoms. Triggering will occur with toe flexion. Dorsiflexion of the big toe is less when the ankle is dorsiflexed.

In Achilles tendonitis, irritation and inflammation occurs due to overuse. Symptoms include pain, swelling, and tears within the tendon. Achilles tendonitis is usually treated with therapy and injections, however the physician will not injection inside of the tendon. This condition is rarely treated with surgery. An Achilles tendon rupture can become prone to rupture with age, lack of use, or by aggressive exercises. Rupture is typically diagnosed by the Thompson test and an MRI. Treatment may be conservative, without surgery by using a cast or a boot; however, the rupture rate may be high if the patient is treated conservatively. Surgery is done by approximation of the torn ends. The risks of surgery is skin and wound complications, as well as infection when performing surgery.

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Dr. Ebraheim, Amanda Critton and Lauren Corba do not have any relationships with industry to disclose.

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