

THE UNIVERSITY OF TOLEDO MEDICAL CENTER

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THE UNIVERSITY OF TOLEDO MEDICAL CENTER

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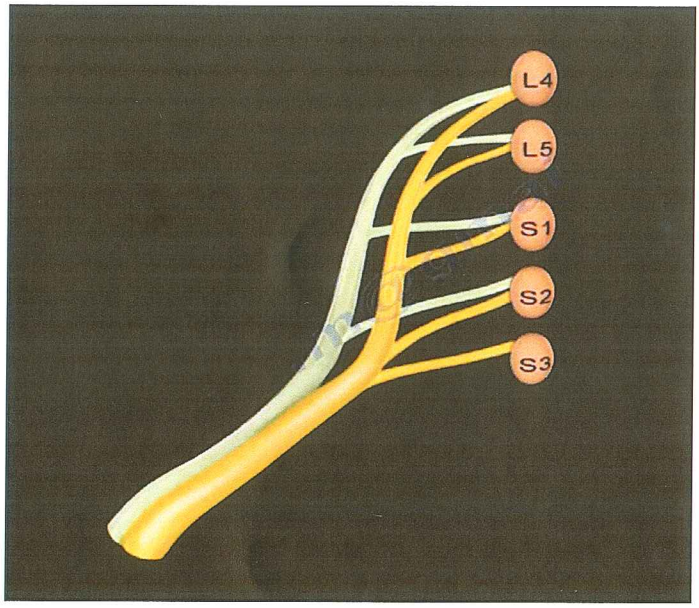
BY NABIL A EBRAHEIM, MD

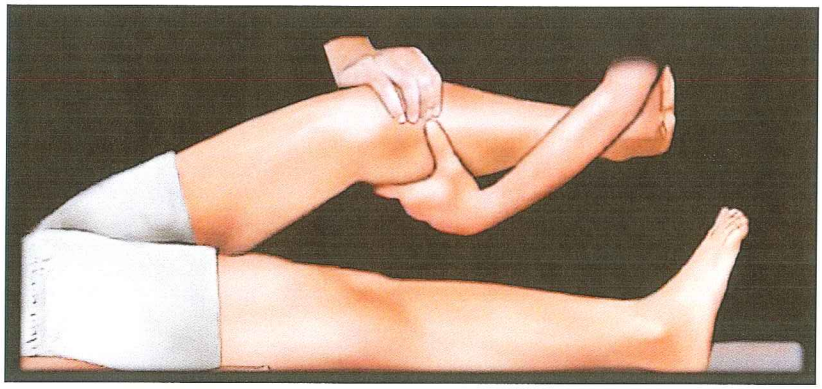
Lumbosacral Plexus

The lumbosacral plexus is easier than the brachial plexus. The sciatic nerve is the key nerve of the lumbosacral plexus. The sciatic nerve has two branches: the common peroneal nerve and the tibial nerve. It arises from the spinal nerves of L4, L5, S1, S2, and S3. The sciatic nerve is the cornerstone of the lumbosacral plexus. Knowledge of the lumbosacral plexus starts with knowledge about the sciatic nerve and its branches because it is the most important nerve. The lumbosacral plexus is predominantly the sciatic nerve, in addition to a small nerve root called S4. The superior gluteal nerve is predominantly L5. The inferior gluteal nerve is predominantly S1. L5 radiculopathy can give you Trendelenburg Gait. The superior gluteal nerve innervates the gluteus medius, gluteus minimus, and the tensor fascia lata muscles. The inferior gluteal nerve innervates the gluteus maximus muscle. When you add S4 to the sciatic nerve, that becomes the lumbosacral plexus (six nerve roots). Each branch will come from three nerve roots, and if you put them in order, the branches from the lumbosacral plexus will have a unique arrangement where the following nerve root will start with the lower numbered nerve root than the previous one.



Pivot Shift Test ACL Tear

The anterior cruciate ligament is located in the front of the knee. Rupture of the anterior cruciate ligament (ACL) is a condition commonly seen in sports usually due to a non-contact pivoting injury. The Pivot Shift test is a specific test for ACL deficient knee (ACL injury). Pivot shift is pathognomonic for an ACL tear and is best demonstrated in a chronic setting. Lachman's test is the most sensitive examination test for ACL injury. The ACL keeps the tibia from sliding out in front of the femur and provides rotational stability to the knee. Rupture of the ACL causes anterolateral rotatory instability. The tibia moves anterolaterally in extension; however, when you flex the knee, the IT band becomes a flexor of the knee. The IT band pulls back and reduces the tibia. The pivot shift test goes from extension (tibia subluxed) to flexion, with the tibia reduced by the iliotibial band. Both the Lachman's tests and the Pivot shift test are associated with 20-30 degrees of knee flexion. The Lachman's test starts at 20-30 degrees of flexion. With the Pivot shift test, you feel the clunk at 20-30 degrees of flexion.



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20-30 degrees of flexion is important for examination of the ACL. For the Lachman's test, the femur is stabilized with one hand and the other hand pulls the tibia anteriorly and posteriorly against the femur. The tibia can be pulled forward more than normal (anterior translation). The examiner will have a sense of increased movement and lack of a solid end point. For the pivot shift test, the patient should be lying supine and totally relaxed. With pivot shift, the knee is in the subluxed position when the knee is in full extension. The pivot shift starts with extension of the knee and you can feel a "clunk" at 20-30 degrees of flexion. To perform, hold the knee in full extension then add valgus force plus internal rotation of the tibia to increase the rotational instability of the knee. Then take the knee into flexion. A palpable clunk is very specific of an ACL tear. The iliotibial band will reduce the tibia and create the clunk on the outside of the knee. Always compare with the other side. The ACL prevents anterior translation of the tibia. It is a secondary restraint to tibial rotation and varus and valgus stress. The ACL consists of two bundles: the posterolateral bundle and the anteromedial bundle. The posterolateral bundle prevents pivot shift, contributes to rotational stability, prevents internal rotation of the tibia with the knee in near extension, and increases the anterior translation and tibial rotation at 30 degrees of flexion. The anteromedial bundle is tight in flexion, and it increases anterior translation at 90 degrees of flexion. The Lachman's test is the most sensitive test especially in acute settings, and the examiner will find no end point with anterior translation of the tibia. In an acute setting, physical examination can be difficult or limited due to pain. With the Pivot shift test, the patient must be completely relaxed, and the test is helpful in chronic situations especially if the patient complains of the knee giving way. In the Pivot shift, the knee subluxes in extension and reduces at 20-30 degrees of flexion. The Pivot shift correlates closely with patient satisfaction of their reconstructed knee. It is a measure of functional instability following ACL reconstruction. Vertical femoral tunnel placement will cause rotational instability seen as a positive pivot shift, and the malposition of the bone tunnel will be seen in an AP view x-ray of the knee. The 9 or 10 o'clock position is better than the 12 o'clock position; the vertical position is bad. The patient with an ACL injury usually has a non-contact pivoting injury event with an awkward landing, feeling a "pop" sensation, or immediate swelling. Aspiration usually shows blood in the knee which proves a 75% chance of ACL tear when you aspirate blood from the knee. Patients will also exhibit a positive Lachman's test which may be hard to examine because of the pain. Aspiration of the knee may make the examination easier. MRI of the knee joint will show the hematoma, and it may show bone lesions or bruising in the typical location which is characteristic with tears of the ACL. These injuries are typically located at the middle of the femoral condyle and posterior part of the tibia laterally. You may find a triple injury within the MRI (O'Donoghue's Unhappy Triad). The O'Donoghue's Unhappy Triad includes an anterior cruciate ligament (ACL) injury, a medial cruciate ligament (MCL) injury, and a lateral meniscus injury. In chronic ACL tears, the posterior horn of the medial meniscus is the most commonly injured structure. In acute ACL tear, send the patient for therapy for range of motion, brace the patient and allow the MCL to heal and reconstruct the ACL later if needed. Patients should do stress hamstring therapy in ACL tears. The patient will probably complain of instability immediately or later on.

Serratus Anterior Muscle

The serratus anterior muscle originates on the superolateral surface of the upper 8 or 9 ribs. The muscle inserts into the medial border on the anterior side of the scapula. The serratus anterior muscle is divided into three parts: serratus anterior superior, serratus anterior intermediate, and serratus anterior inferior. The serratus anterior muscle is the most powerful "protractor" of the scapula. The scapula is moved laterally and anteriorly along the chest wall. The serratus anterior muscle is sometimes called the "boxer's muscle" or the "big swing muscle". With the same motion that occurs from throwing a punch, the serratus anterior muscle is responsible for pulling of the scapula forward and around the rib cage. The serratus anterior muscle is innervated by the long thoracic nerve. The long thoracic nerve arises from three nerve roots, C5, C6, and C7 cervical nerve roots. The long thoracic nerve then passes between the clavicle and first rib, then down along the lateral chest wall giving innervation to the serratus anterior muscle. Deficit of the serratus anterior muscle is most commonly caused due to impingement or injury of the long thoracic nerve. If the serratus anterior muscle becomes paralyzed, the condition is known as "medial winging of the scapula". The long thoracic nerve can be injured by trauma, pressure, neuritis/inflammation, or surgery. Signs/symptoms of long thoracic nerve injury include

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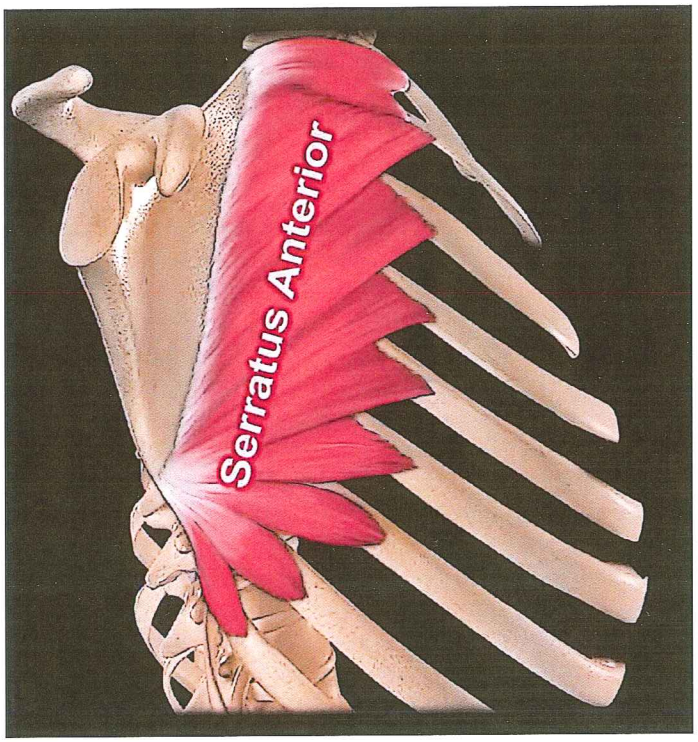

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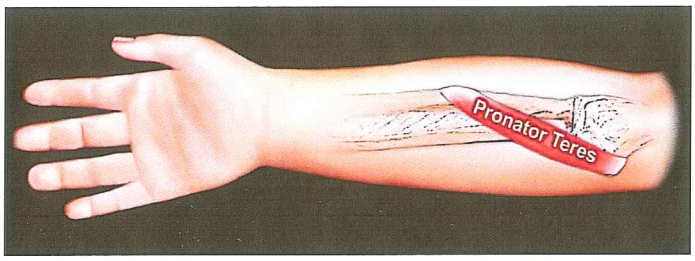
medial winging of the scapula, difficulty elevating arm, weakness, pain, spasms (periscapular muscles trying to compensate for deformity), or cosmetic deformity. The Wall Test is used for clinical evaluation for medical winging of the scapula. The patient is asked to face a wall, standing about two feet from the wall and then push against the wall with flat palms at the waist level in order to identify a long thoracic nerve injury. The resistance of forward flexion test is also used. This is a test in which the patient resists the examiner's attempt to bring down the forward flexed upper limbs. Lateral winging of the scapula is different from medial winging of the scapula. Lateral winging of the scapula is due to dysfunction of the trapezius muscle. Lateral scapular winging involves injury to the spinal accessory nerve. The treatment for medial scapular winging is nonoperative. You should observe for a minimal of 18 months to wait for the nerve to recover without surgery. Do MRI to indicate if a lesion is pressing on the nerve. Muscle test and EMG or serratus anterior strengthening are also used. To treat it operatively, do a pectoralis major transfer.

Pronator Teres Syndrome

Pronator teres syndrome is a compression of the median nerve at the level of the elbow which occurs more in females. In the forearm, the median nerve runs between the two heads of the pronator teres muscle, and it lies between the flexor digitorum superficialis and flexor digitorum profundus muscles. Pronator teres syndrome could be associated with medial epicondylitis. The principle symptoms of numbness in the radial 3 ½ fingers as well as thenar weakness may be mistakenly attributed to carpal tunnel syndrome. Potential sites for entrapment of the nerve include the median nerve. Compression of the median nerve between the two heads of the pronator teres muscle is the most common cause. It occurs in people who perform repetitive forceful pronation of the forearm. Entrapment can also occur due to thickening of the bicipital aponeurosis. The aponeurosis crosses from lateral to medial over the antecubital fossa, and it may irritate the median nerve. Compression of the nerve from the fibrous arch of the origin of the flexor digitorum superficialis (FDS) can be a potential site for entrapment. The median nerve runs down the medial side of the arm and passes 2 ½ to 4cm below the level of the medial epicondyle before it enters between the two heads of the pronator teres. About 1% of patients have a medial supracondylar humeral spur about 5cm proximally to the medial epicondyle. The ligament of Struthers is attached to this bony projection which connects the process to the medial epicondyle. The bony process points towards the elbow joint. The median nerve can become compressed or entrapped by the supracondylar spur and by the ligament of Struthers. The median nerve can also become trapped by the ligament of Struthers that extends from the supracondylar process to the medial epicondyle. The ligament of Struthers is different from the arcade of Struthers, which deals with compression of the ulnar nerve around the elbow. Paresthesia in these lateral 3 ½ fingers may occur with compression of the median nerve at the elbow region or at the carpal tunnel region. Symptoms are similar to carpal tunnel syndrome but the symptoms are worse with rotation of the forearm. The patient will complain of dull aching pain over the proximal forearm with no night symptoms. The pain is usually worsened by repetitive or forceful pronation. Tenderness of palpation to the pronator teres muscle. The median nerve gives off a palmar cutaneous branch before entering the carpal tunnel. Sensory disturbances over the palm of the hand occur due to involvement of the palmar cutaneous branch of the medial nerve, and this occurs proximal to the carpal tunnel. Sensory disturbance in this area indicates median nerve problems proximal to the carpal



tunnel. This differentiates between carpal tunnel syndrome and pronator teres syndrome. There are no specific provocative tests used to localize the site of compression that produce the pain and distal paresthesia. Tinel's sign at the wrist will be negative. Phalen's test will be negative. Median nerve compression tests are negative at the carpal tunnel; however, there will be a positive Tinel's sign at the proximal forearm. There will also be abnormal sensation in the palm of the hand. When compression of the nerve involves the supracondylar process, the test is considered positive if symptoms of tingling worsen while tapping on the spur. The pronator teres muscle can be assessed as the cause of the median nerve compression. Resisted forearm pronation with elbow extension will test for compression at the two heads of the pronator teres muscle. The patient's forearm is held in resisted pronation and flexion. While remaining in a pronated position, the forearm is gradually extended. Compression of the median nerve can also be tested by resisted elbow flexion with forearm supination (indicates compression of the median nerve at the bicipital aponeurosis) or resisted contraction of the FDS to the middle finger (compression at the FDS arch). C6/C7 radiculopathy can be a differential diagnosis. Involvement of the nerves at these levels will cause numbness of the thumb, index and long fingers, as well as weakness of the muscles of the forearm that are innervated by the median nerve. The radial nerve part of C6/C7 will show normal function of the wrist extensors and the triceps. Carpal tunnel syndrome is also a differential diagnosis. X-rays, imaging, and nerve conduction studies may be helpful in diagnosis as well as careful clinical examination. To treat pronator teres syndrome, rest, use splints, and prescribe NSAIDs. Do surgical decompression of the median nerve through all 4 or 5 possible sites of compression when non-operative management fails for 3-6 months. The results of surgery are variable. Full recovery is not always seen in all patients. About 80% of the patients improve with surgery. The skin incision may leave an unsatisfactory scar.

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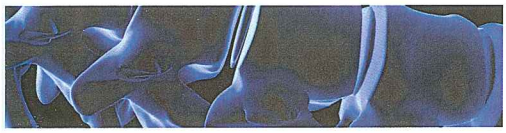
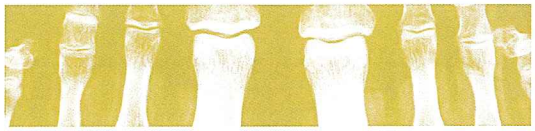
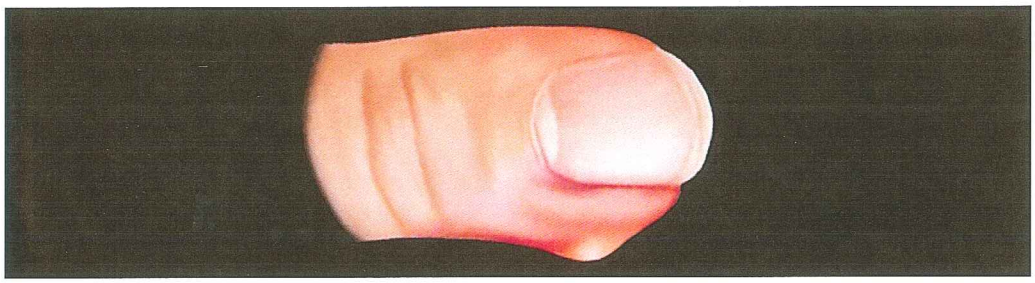
MEDICAL CENTER

Department of Orthopaedic Surgery
The University of Toledo
3000 Arlington Ave., MS 1094
Toledo, Ohio 43614


Felon

A felon is an abscess of the volar bulb of the finger tip that can cause pain and swelling. It occurs from penetrating trauma such as needles or splinters. The bulb has multiple, small compartments of subcutaneous fat, separated by septi between the dorsal phalanx (bone) and the dermis. The volar distal pulp is septated (multiple septum's and multiple compartments). When pus occurs, there will be swelling, and the pressure that is built inside of the compartment will lead to multiple, little compartment syndromes. This will lead to vascular compromise and necrosis of the tissue. It also may lead to osteomyelitis of the bone or flexor tenosynovitis. Staphylococcus aureus is the most common organism. It can be treated with incision and drainage. Do not violate the flexor tendon sheath or the DIP joint. Try to break up the septi to decompress the infection. If there is no foreign body in the finger, you will do the midaxial incision or the "J shaped" incision, and you will leave the wound open. If there is a foreign body present, such as a splinter or a thorn, you will do the volar longitudinal incision. Try to avoid doing the "fish mouth" incision, it will lead to unstable finger pulp. Try to avoid doing the double longitudinal incision, it may lead to injury of the neurovascular bundle.



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Editors:
Dr. Nabil Ebraheim, Professor and Department Chairman of Orthopaedic Surgery;
Amanda Critton; and Sara Bell

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

Department of Orthopaedic Surgery
The University of Toledo
3000 Arlington Ave., MS 1094
Toledo, Ohio 43614

For appointments, call
419.383.3761