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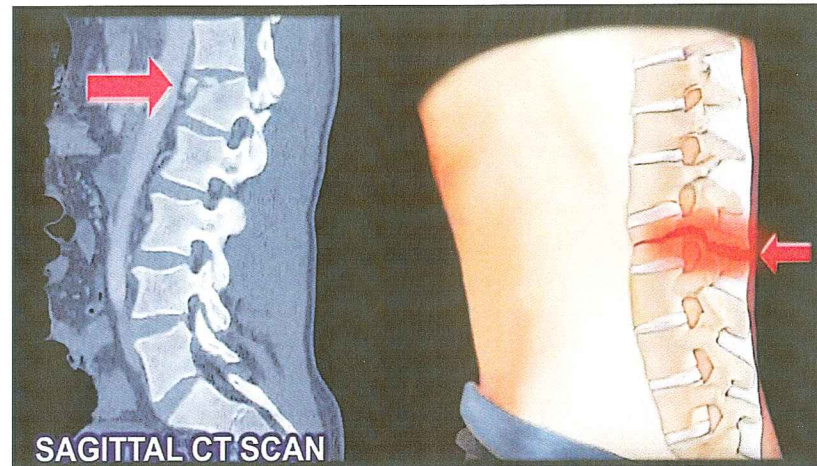
ORTHOPAEDIC MONTHLY

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Flexion Distraction Injury of the Lumbar Spine

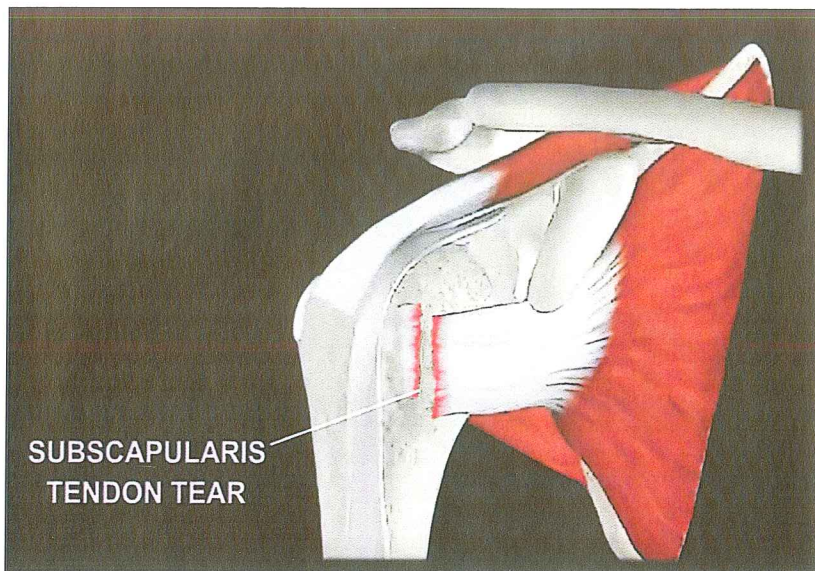
It is sometimes called a seat belt injury or “chance fracture.” Usually, the patient is a restrained, back seat passenger in a car accident that is wearing only a lap seat belt. The chance fracture is a variant of the flexion/distraction injury. The terminology is sometimes confusing, but a chance fracture could indicate a bony injury. It may present itself with a minimal compression fracture of the vertebral body, however, in this case all three columns of the spine are injured from distraction and tension. When you deal with a traumatic compression fracture in a young patient that is involved in a car accident, rule out a seat belt injury or “chance fracture”. This condition could be misdiagnosed or not diagnosed. Bowel trauma occurs in these cases due to crushing of the bowel between the lap seat belt and the spinal column, which results in devascularization and acute bowel rupture. In flexion/distraction injury, there will be an anterior wedge fracture of the vertebral body plus horizontal fracture of the posterior elements or distraction of the facet and the spinous processes. If it goes unrecognized, it may lead to progressive kyphosis with pain and deformity. This injury usually occurs in the thoracolumbar junction or in the midlumbar area. The posterior column fails first because of the axis of rotation is anterior to the vertebral body. The flexion/distraction injury is unstable in flexion and usually needs surgery to restore the disrupted tension band and prevent progressive deficit and pain, as well as enhance the functional recovery of the patient. In patients with flexion/distraction injury of the lumbar spine, up to 50% of these patients have associated potential life threatening injuries such as visceral and gastrointestinal injury. Look for transabdominal ecchymosis; you will probably need to consult a general surgeon, and this condition occurs more in children. The



hallmark of this injury is the axial split of the pedicle which is seen on the sagittal CT scan. There will be little comminution and since the center of rotation is the anterior longitudinal ligament, the posterior ligaments will be disrupted or the posterior neural arch is fractured transversely. Flexion/distraction injury or seat belt injury can be purely bony, purely ligamentous, or mixed. The treatment of flexion/distraction injury, especially if the injury is ligamentous, is usually a posterior reconstruction of the tension part of the spine with short segment fusion with instrumentation. Ligamentous injuries of the spine do not heal (needs to be fused). The bony chance fracture can be stable in extension and the fracture can heal. The fracture could heal, but the fracture will probably need long term follow-up. The fracture could be treated in a TLSO (Thoracic Lumbar Sacral Orthosis) brace and watch the fracture for the development of kyphosis.

Subscapularis Muscle Tear

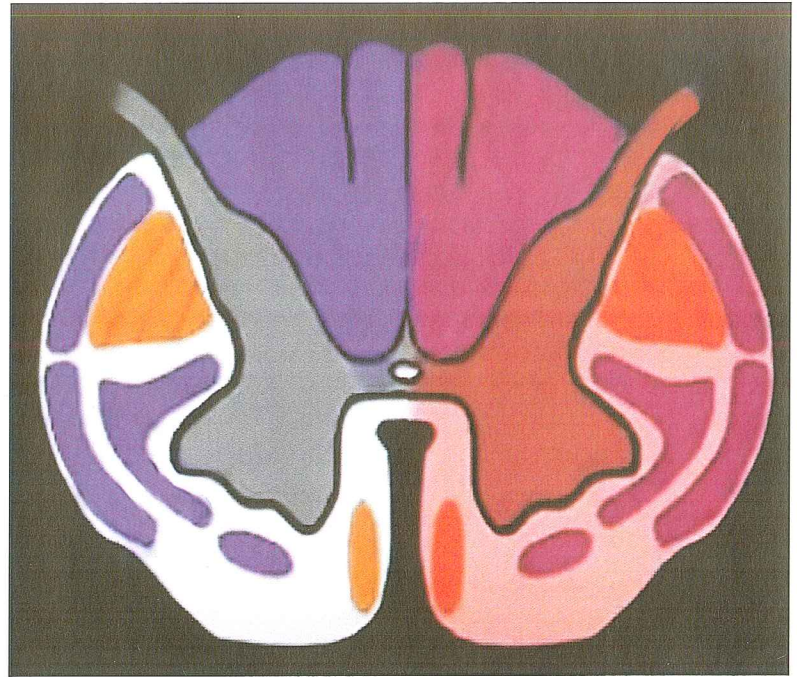
The subscapularis muscle is a large muscle that originates on the anterior surface of the scapula and lies in front of the shoulder. The subscapularis muscle tendon inserts into the lesser tuberosity of the humerus. The subscapularis muscle provides about 50% of the total cuff strength. The subscapularis muscle inserts into the lesser tuberosity of the humerus, while the other rotator cuff muscles have an insertion into the greater tuberosity. The long head of the biceps tendon lies in a groove anteriorly and is held in its position by the transverse humeral ligament. The action of the subscapularis muscle is adduction and internal rotation of the shoulder. The upper and lower subscapular nerves originate from the posterior cord of the brachial plexus. The suprascapular nerve is a different nerve, it innervates the supraspinatus and the infraspinatus muscles. A fall onto an outstretched arm during abduction is usually the mechanism of injury. The presentation is usually anterior shoulder pain following a forcible external rotation injury to the shoulder. Tear of the subscapularis tendon may follow anterior shoulder surgery. There may be an avulsion of the lesser tuberosity of the humerus. Subscapularis tendon tear may be isolated, or it may be associated with other rotator cuff tears. 88% of patients with biceps tendon subluxation are found to have subscapularis tendon tear. Tears can be either acute or chronic. There will be pain in front of the shoulder with weakness of internal rotation and increased passive external rotation. The diagnosis could be difficult and the condition could be missed. The transverse humeral ligament may be torn with complete rupture of the subscapularis tendon, and this may lead to medial dislocation of the biceps tendon from its groove. Lift-off test, bear-hug test, and belly press test all show weakness of internal rotation of the shoulder. When the patient is unable to lift their hand away from the lower back while the shoulder is maximally internally rotated. If you hear that there is a hyper abduction injury after an open repair of the shoulder and an inability to move the dorsum of the hand away from the back, then this is a subscapularis tendon tear. Tears of the subscapularis tendon can be diagnosed with an ultrasound or MRI. The MRI will show detachment of the subscapularis from its insertion into the lesser tuberosity of the humerus. The sagittal MRI will also show you if there is an atrophy of the muscle. If the patient has a total shoulder repair, and the patient fell down and there is an increase in the passive external rotation of the shoulder, the x-ray shows that everything is good, then you will probably need to do



ultrasound evaluation of the shoulder to check the integrity of the subscapularis tendon. Arthroscopic identification of a chronic subscapularis tear can be done by the comma sign, which represents avulsion of the superior glenohumeral ligament. Chronic supraspinatus and infraspinatus tear in a young patient, and the tear cannot be repaired, then you will do latissimus dorsi transfer. Both the lift off test and the abdominal compression test needs to show that the patient has a good subscapularis muscle function before you do the latissimus dorsi transfer. Preoperative subscapularis function is necessary for good clinical outcome. In case of posterior dislocation of the shoulder in a young patient, when the humeral head defect is large but less than 50%, you may transfer the subscapularis tendon and the lesser tuberosity into the humeral head defect which is called a reverse Hill-Sachs lesion. Treatment is usually surgery. For a complete acute tear, do open or arthroscopic surgical repair. Biceps tenodesis is needed if there is subluxation of the long head of the biceps. For a chronic subscapularis tendon tear, do pectoralis major muscle transfer. When the subscapularis tear is missed and the tear is chronic, the tendon becomes retracted and atrophic and you will do subcoracoid pectoralis major tendon transfer. It may improve the function and decrease the pain. The subcoracoid position of the transfer allows redirection of the pectoralis major in a direction that is recreating the vector of the subscapularis tendon.

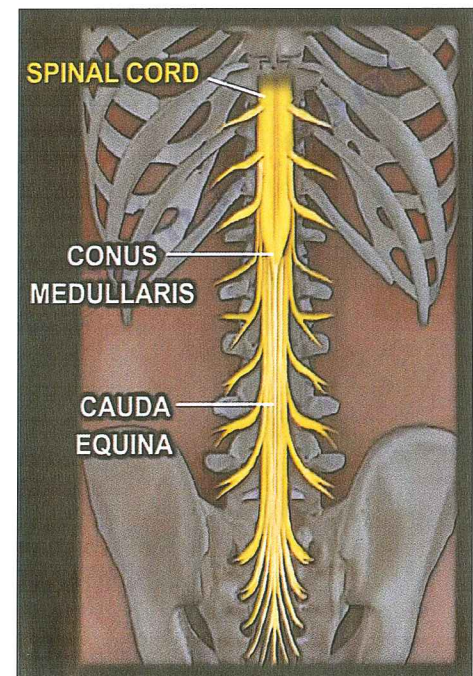
Brown-Sequard Syndrome

Brown-Sequard Syndrome results from an injury to one half of the spinal cord as seen in penetrating injuries. The spinothalamic tract fibers cross the midline below the level of the lesion resulting in contralateral loss of pain and temperature sensation. The posterior column and the corticospinal tracts carry vibration, position, light touch sensation, and motor function that are lost from the ipsilateral side of the body. The prognosis is usually good. 90% of the patients recover. If the patient has a wound on the right side, the patient will feel it on the left side. It is a hemisection lesion. There is loss of vibratory, light touch and motor on the same side while pain and temperature is lost on the other side.



Cauda Equina or Conus Medullaris

When comparing cauda equina to conus medullaris, they are two different clinical entities. Their clinical presentations are not the same. The cauda equina is multiple nerve roots within the lower end of the spinal canal (beginning at the level of L1). The conus medullaris is the termination of the spinal cord. It contains the motor cell bodies of the sacral roots. In cauda equina, the pathology is at the level of the roots, and it usually causes lower motor neuron problems, and the symptoms are usually bilateral. Cauda equina syndrome usually occurs due to a space occupying lesion such as disc herniation, tumor, fracture, epidural hemorrhage, or an abscess. Central disc herniation is the most common cause of cauda equina syndrome. The conus medullaris is at the level of the conus, which is the lower part of the cord, usually at T12/L1. Injury at the level of the conus medullaris usually has a mixed spinal cord and nerve roots injury, so it is a mixed upper and lower motor neuron injury. Conus medullaris injury most commonly occurs from a trauma or injury from T12 to L2 levels. The conus medullaris injury exhibits the highest potential for neurologic improvement, more than the complete or incomplete thoracic or thoracolumbar spinal cord injury. In cauda equina, there is usually more back pain with sudden onset of pain. In conus medullaris, there is more radicular pain, usually gradual onset. In cauda equina, the sensory deficit is mainly over the perianal area. It is bilateral and symmetrical. In conus medullaris, the sensory deficit is mainly over the saddle area. It can be unilateral or asymmetrical. In cauda equina syndrome, the bowel and bladder symptoms are usually early involvement. In conus medullaris, it is usually a sacral level neural injury affecting the bladder and bowel. Lower extremity weakness is usually uncommon. Bladder and bowel symptoms can be early or it can be late. It has a



poor prognosis for recovery of bladder and bowel dysfunction. Treatment for either a cauda equina or conus medullaris injury is the same; it is emergency surgical decompression. In cauda equina syndrome, early diagnosis and surgery is important. There is a chance for recovery of the bladder and bowel dysfunction if the condition of cauda equina syndrome is diagnosed early and the patient had surgery within 48 hours.

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Distal Brachial Plexus

The brachial plexus arises from nerve roots C5, C6, C7, C8, and T1 (five nerve roots). The upper two roots (C5, C6) join to form the upper trunk. The middle root (C7) is independent, forming the middle trunk. The lower two roots (C8, T1) join to form the lower trunk. Each trunk divides into anterior and posterior divisions. All three posterior divisions join to form the posterior cord. The upper two anterior divisions join to form the lateral cord. The anterior division of the lower trunk forms the medial cord. These cords (lateral, posterior, medial) give the terminal branches of the brachial plexus. These cords are named according to its relationship to the axillary artery, deep to the pectoralis minor muscle. The posterior cord runs deep to the axillary artery, then gives the axillary nerve and continues as the radial nerve. The median nerve is formed from the lateral branch and the medial branch on the anterior surface of the axillary artery. The lateral contribution of the median nerve arises from the lateral cord, and it is predominantly sensory. The medial contribution of the median nerve comes from the medial cord and mainly motor to the hand intrinsic muscles. After giving its contribution to the median nerve, the medial cord continues as the ulnar nerve and the lateral cord continues as the musculocutaneous nerve. This anatomical arrangement looks like an M over the axillary artery. The lateral leg is the musculocutaneous nerve. The central leg is the median nerve. The medial leg is the ulnar nerve.

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