

National Society of Orthopedic Medical Assistants

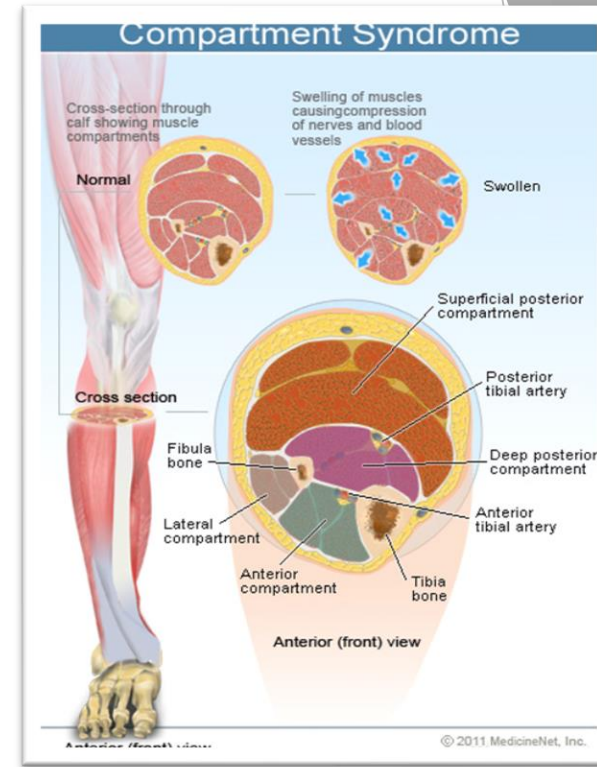
Orthopedic Lecture Series®

Bone/ Structures, Fracture Types and Skeletal Disorders/ Specialty Casts and Appliances/Surgical Procedures, Positioning and Devices

Lesson 9: Orthopedic Conditions – PART I

Compartment Syndromes

1. The arms and legs are divided into several different compartments separated by connective tissue.
 - ▶ Each compartment contains muscles as well as nerves and vascular structures
 - ▶ Abnormal pressure in a particular compartment can interfere with blood flow and perfusion to the structures within that compartment
 - This can lead to rapid irreversible damage to tissue if not addressed immediately
2. Compartment syndrome can result from a fracture if a large amount of blood collects in the compartment
3. Improper, or premature casting can lead to compartment syndrome
 - ▶ If the affected extremity continues to swell, and the cast restricts the expansion, the muscles and nerves can become damaged
4. Bleeding into an extremity following surgery or traumatic laceration can quickly lead to compartment syndrome



http://www.medicinenet.com/compartments_syndrome/page2.htm



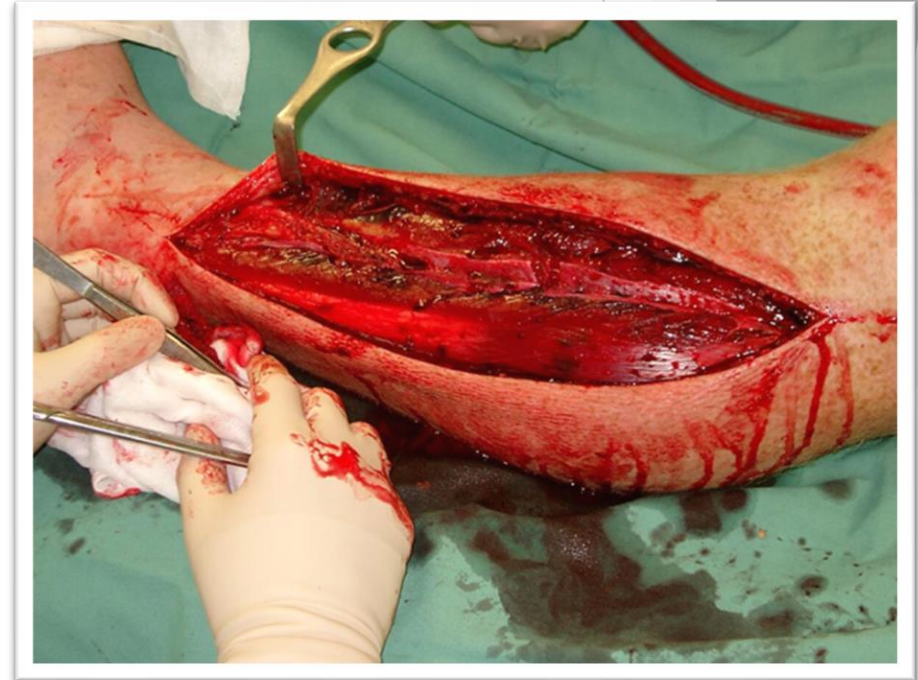
<http://lifeinthefastlane.com/bone-and-joint-bamboozler-002/>

Compartment Syndromes

5. Tibial plateau fractures, femur fractures, and stab wounds of the extremities are risk factors for the development of compartment syndrome.
 - ▶ Individuals with these injuries should be examined for signs of the disorder
6. Muscle ischemia is extremely painful
 - ▶ Pain out of proportion to the original injury is a symptom of compartment syndrome
 - ▶ On palpation, the affected extremity will feel full, and firm
 - ▶ Palpating the area will cause pain, as will passive movement of the extremity
7. Neurovascular status of the limb distal to the suspected compartment syndrome should be checked as an absent pulse, or disturbed sensation, is of great concern.
8. Measurements of the compartment pressure can be performed with a special instrument, and readings approaching 30mmHG are of concern.
9. Compartment syndrome is treated by surgical intervention to open the compartment and release the pressure.



<http://www.orthopaedicsone.com/display/Clinical/What+is+compartment+syndrome>



<http://lifeinthefastlane.com/ccf/compartment-syndrome/>

Ewing's Family of Tumors

Ewing's family of tumors (EFT) are malignant tumors that affect adolescents and children.

- ▶ Malignant tumors that affect adolescents and children
- ▶ Tumors in this family all have the same characteristics

Although bones are most commonly affected, these tumors can be found in any tissue.

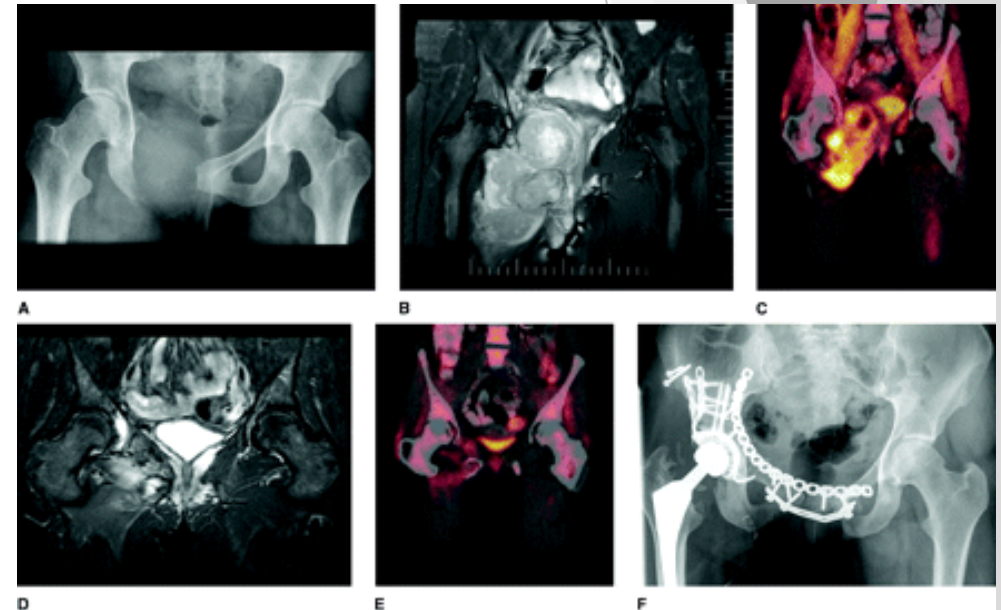
- ▶ It used to be thought that this tumor affected only bones, but now it is known that this is not the case
- ▶ Ewing's tumors that affect different types of tissue have different names
- ▶ Ewing's tumors affecting bone are usually found in the long bones, but other commonly affected sites are the pelvis and chest

The malignancy is thought to be caused by genetic mutations.

Treatment may include chemotherapy, surgery, and radiation

- ▶ The cure rate is fairly high

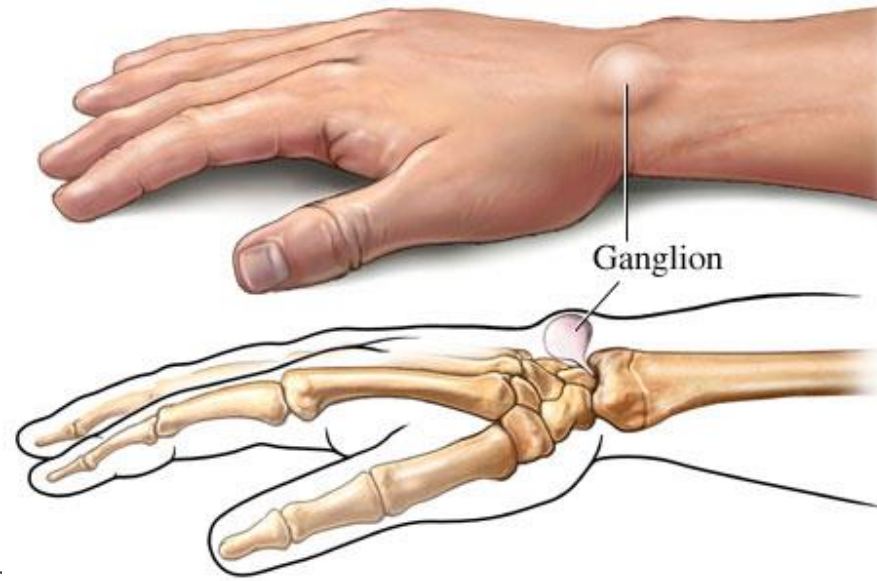
<http://www.jaaos.org/content/18/2/94/F5.expansion>



Ganglion Cysts

<http://www.oahuspineandrehab.com/ganglion-cysts-symptoms-treatment/>

1. Ganglion
 - ▶ A cystic growth that can develop anywhere on the wrist, or hand
 - ▶ It is not a malignant growth
2. A ganglion is a benign fluid-filled cyst.
 - ▶ It develops from a joint capsule, or tendon sheath
3. It has been theorized that these cysts result from damage to the tissue layer that produces synovial fluid.
 - ▶ This fluid builds up outside its proper location in a joint or tendon, and forms an enlargement
4. Ganglions may cause pain, and changes in bone structure.
5. Ganglions attach to an associated joint, or tendon sheath but not to the skin on top of them.
6. Ganglions may resolve without treatment, or resolve with the immobilization of the affected area.
7. Aspiration of the cysts may result in its permanent disappearance.
8. Surgery may be indicated to excise the cyst.
 - ▶ After excision, treatment involves a compression dressing, and splinting



<http://www.handsurgeonlasvegas.com/ganglion-cyst-surgery-las-vegas/>

Chondroma

- ▶ Noncancerous tumor formed of cartilage
- ▶ Thought to originate in epiphyseal cartilage

1. This benign tumor generally develops in the bones of the hands or feet, but it also develops in the long bones, and ribs.

2. These tumors can occur in several types of tissue, and are categorized according to the tissue in which they are found.

3. Three Types of Chondroma

- ▶ **Enchondroma (1)**
 - Benign cartilaginous growth arising from the metaphysis and/ or diaphysis of a long bone
- ▶ **Periosteal Chondroma (2)**
 - Benign cartilage tumor that occurs on the surface of the bones, under the periosteum
- ▶ **Soft Tissue Chondroma (3)**
 - Benign soft tissue tumors that most often form on the tendons that attach muscles to bone or to the tendon sheaths that keep tendons in place next to bone

Chondroma usually produces symptoms, but occasionally causes pain at the site of the tumor.

If the tumor produces not symptoms, treatment is not usually necessary.

- ▶ Treatment is excision

1



<http://orthoinfo.aaos.org/topic.cfm?topic=a00085>

3



<http://www.tumorlibrary.com/case/image.jsp?title=Chondroma%2C+soft+tissue++Hand++X-ray&turi=/case/images/3493.jpg>

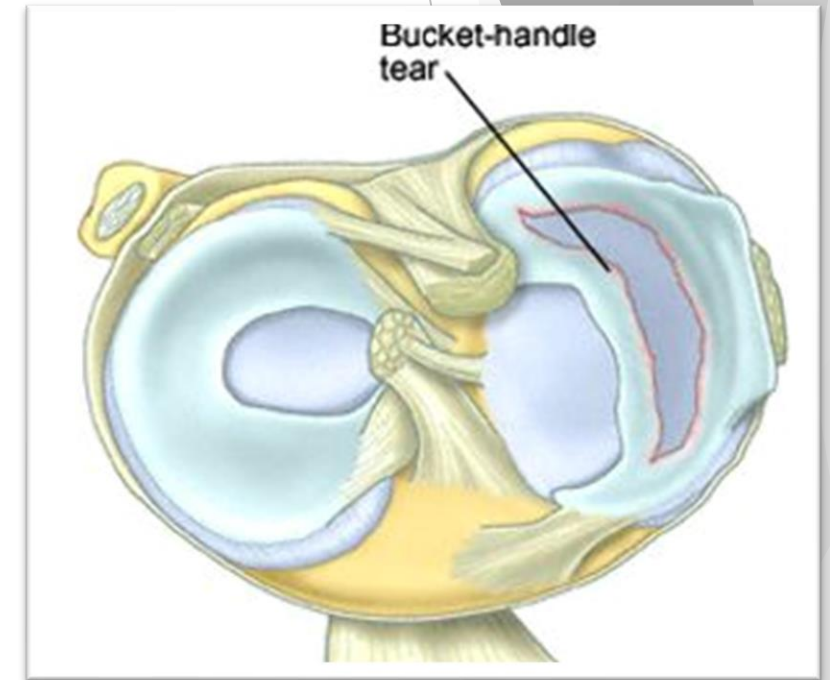
2



<http://www.tumorlibrary.com/case/image.jsp?title=Chondroma%2C+periosteal++Hand++X-ray&turi=/case/images/3486.jpg>

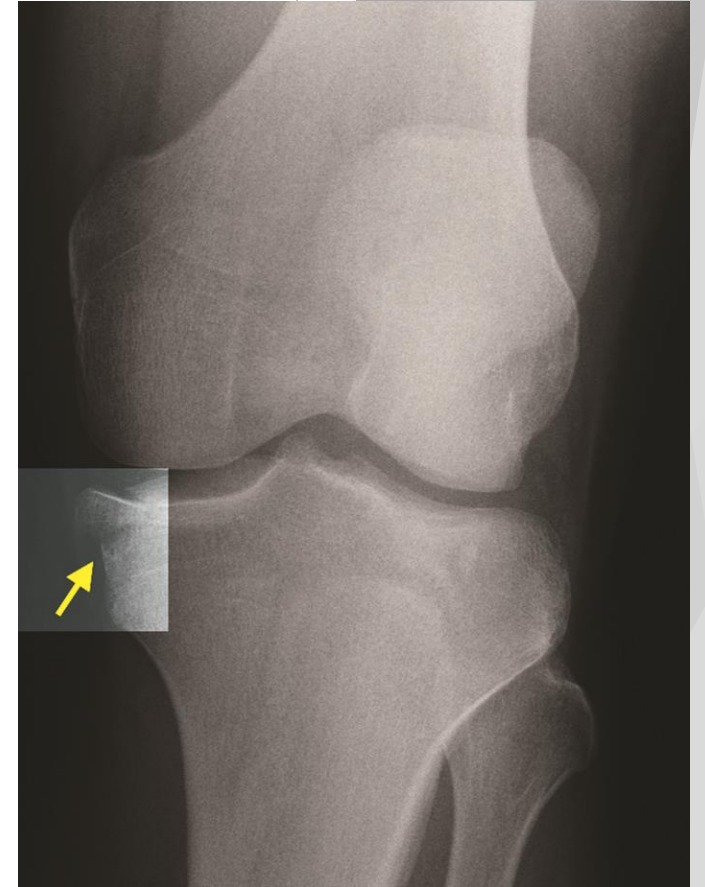
Bucket Handle Tear

1. Bucket Handle Tear
 - ▶ A particular type of meniscal tear
 - This type of tear results from trauma
2. I seen in younger and older patients.
 - ▶ Not the result of degenerative processes
3. In this injury, the meniscus is torn around the rim.
 - ▶ The middle part of the torn meniscus, which resembles a bucket handle, may become wedged in the joint
4. Although bucket handle tears may occur in both the medial and lateral menisci, they occur most often in the medial meniscus.
5. This type of meniscal tear interferes with normal functioning of the knee which cannot be fully extended.
 - ▶ This phenomenon is known as locking
6. Treatment may involve arthroscopic surgery to remove the fragment of meniscus.



Internal Derangement of the Knee Joint

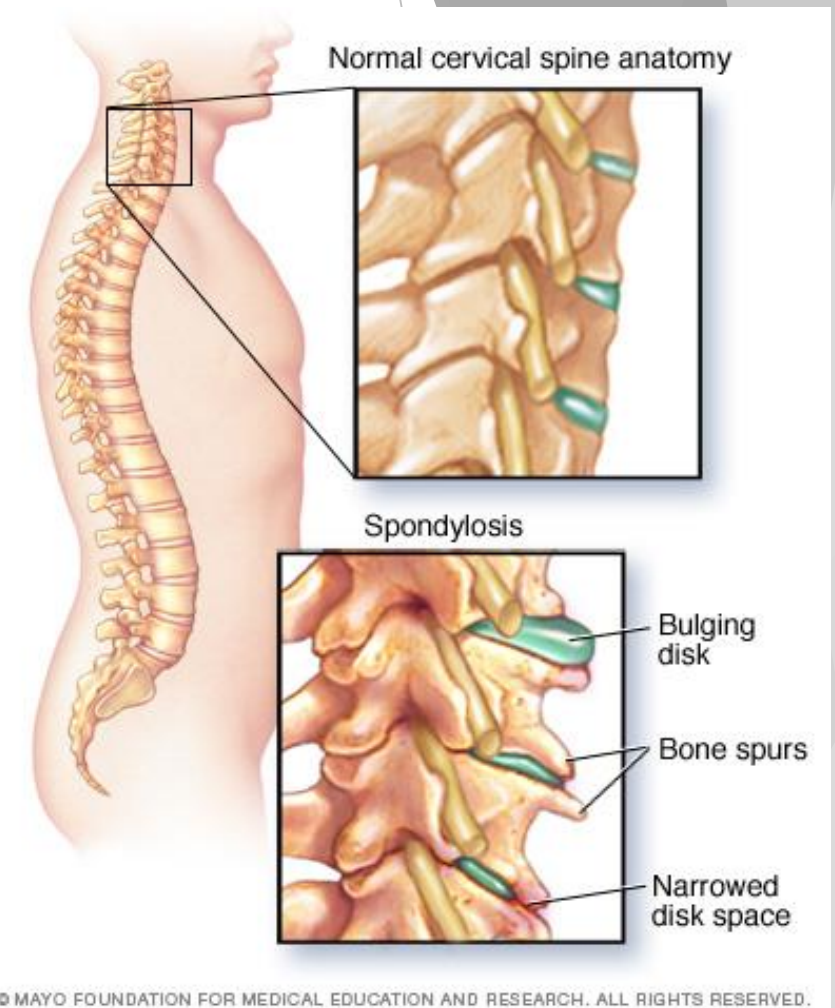
1. Internal derangement of the knee joint
 - ▶ A chronic condition involving a disruption in the inner structure of the joint
 - ▶ This condition interferes with normal function and activities
2. This term covers a number of abnormalities in the structure of the knee joint
3. Any of the following structures may be involved:
 - ▶ Collateral ligaments
 - ▶ Cruciate ligaments
 - ▶ Semilunar cartilages (menisci)
4. The most common internal derangement of the knee joint involves damage to the medial collateral ligament (MCL).
5. The medial meniscus and the anterior cruciate ligament (ACL) are the next most frequently affected.
6. Symptoms depend upon the severity of the injury.
 - ▶ Pain and swelling are common
 - ▶ Functional impairment occurs to varying degrees depending upon the structure injured, and the extent of damage
7. Treatment involves diagnosis and repair by arthroscopy, and arthroscopic surgery.
8. Prognosis depends upon the actual injury.



<http://radiology.casereports.net/index.php/rcr/article/view/537/947>

Spondylosis

1. Spondylosis
 - ▶ A type of osteoarthritis of the spine
2. The disease is degenerative.
 - ▶ It damages the structure of the vertebral column, and interferes with its function
3. It is a disease of aging, but the course of the disease is variable and individual.
4. The cervical, thoracic, and lumbar divisions of the vertebral column are affected.
 - ▶ The intervertebral disks, facet joints, bones and ligaments of the vertebral column may be affected, and show degenerative changes
 - ▶ Cervical spondylosis
 - Causes neck pain which may radiate into the shoulder
 - ▶ Thoracic spondylosis
 - Can cause pain on flexion, and hyperextension
 - ▶ Spondylosis of the lumbar region
 - Can cause pain with sitting for extended periods of time, or activities requiring repetitive bending



http://riversideonline.com/health_reference/brain-spine-stroke/ds00697.cfm

Spondylolysis

1. Spondylolysis

- ▶ Sometimes called pars defect
- ▶ A condition which involves a fracture of the pars interarticularis
 - Pars interarticularis is the bony ring of the back of the vertebra
 - This ring is the weakest section of the vertebra

2. Spondylolysis is generally the result of a strain.

- ▶ The strain occurs when the spinal column is bent backwards repeatedly

3. The fracture can occur at any age

- ▶ It occurs most often in children and adolescents because their vertebral columns are in the process of maturing

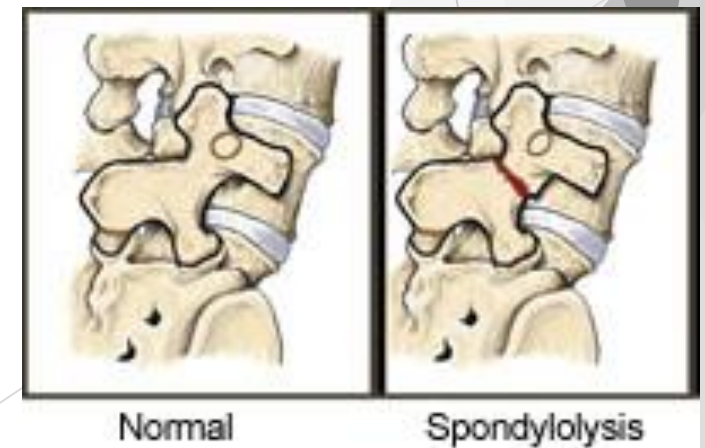
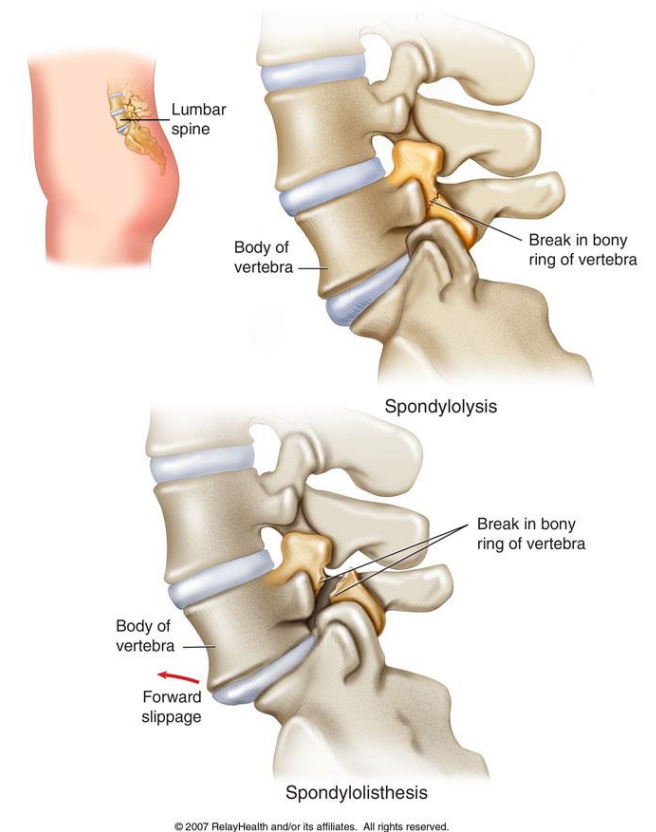
4. Symptoms of this fracture cause pain and stiffness in the lower back.

- ▶ The pain may radiate down the legs, because of pressure on the nerves resulting from the fracture
 - This is called neurogenic pain
 - This occurs because extra cartilage is formed as a part of the healing process, and this can press on the nerve
 - This pressure can produce tingling in the legs, and cause pain and weakness

Diagnostics tools include X-rays, and bone scans.

- ▶ The Scotty dog sign is indicative of spondylolysis
 - On x-ray, the outline of the vertebra normally looks like a dog
 - If spondylolysis is present, there is a small crack across the neck of the dog which has been likened to a collar

Spondylolysis and Spondylolisthesis



Spondylolisthesis

<http://orthoinfo.aaos.org/topic.cfm?topic=a00053>

1. Spondylolisthesis

- ▶ A condition where 1 vertebra slides forward in the vertebral column
 - May be caused by spondylosis
 - Usually involves a vertebra in the lumbar region

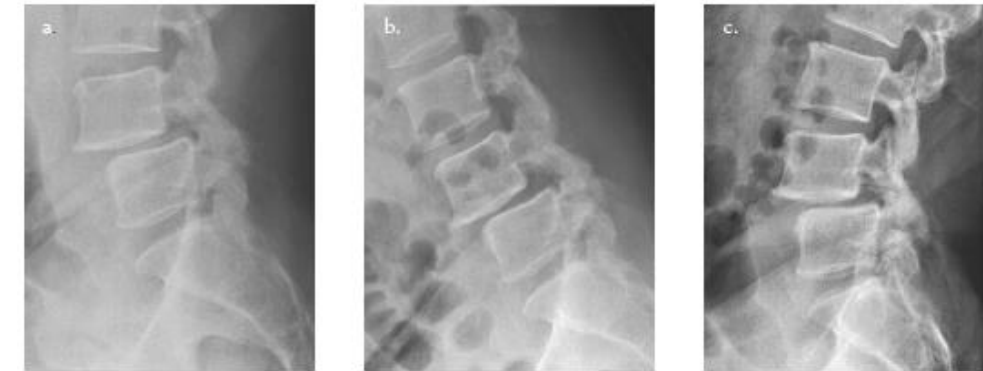
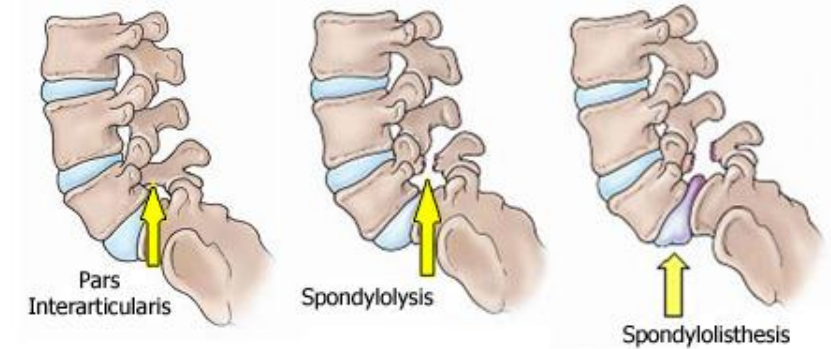
2. Symptoms

- ▶ Pain in the lumbar region, thighs, or legs
- ▶ Muscle spasms
- ▶ Weakness in the lumbar region
- ▶ Mild cases may show no symptoms
- ▶ Individuals with a severe case may look swayback, and waddle

3. The condition may be congenital, or acquired.

4. A congenitally thin bone in the vertebra may predispose an individual to developing the condition.

- ▶ The condition may also result from physical stress, and trauma



<http://www.wenzelspine.com/varilift-case-spondylolisthesis.php>

Spondylolisthesis

The Wiltse classification system lists 5 types of spondylolisthesis:

► Dysplastic

- Occurs due to a congenital defect of the lumbrosacral junction
- This is a rare form of the condition
- It is progressive, and causes neurological problems
- Prognosis is poor, and treatment is difficult because of the poorly developed vertebra

► Isthmus

- The most frequently observed form of the disorder
- The condition is not usually progressive
- The condition is often asymptomatic

► Degenerative

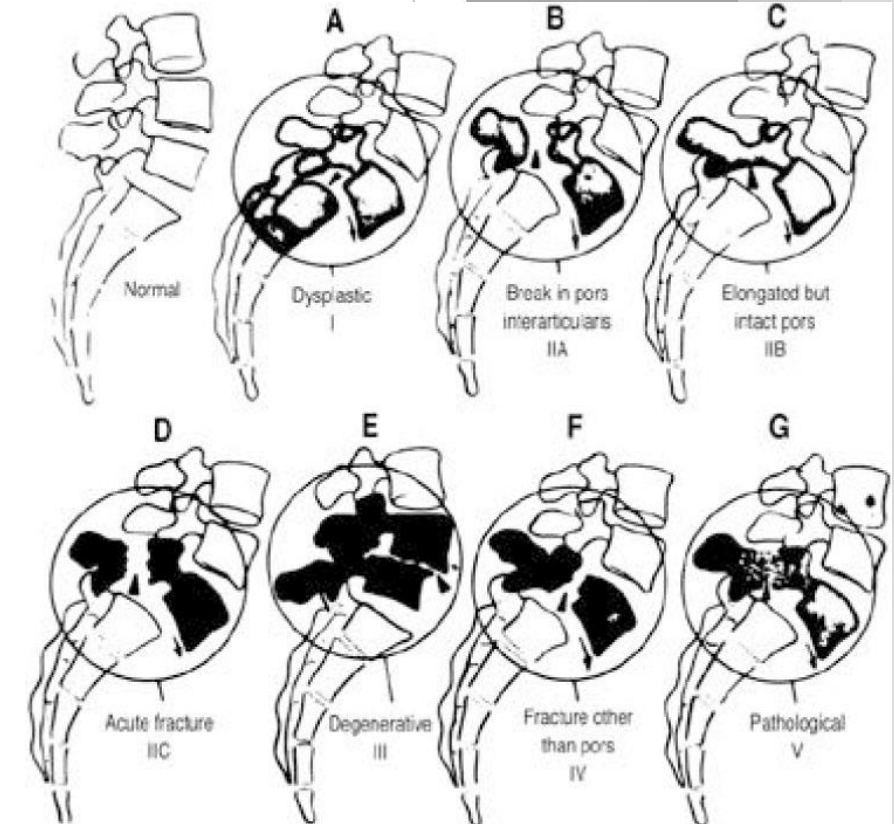
- The result of arthritis, and bone remodeling
- Occurs in individuals over the age of 50
- In this case, the spondylolisthesis can produce spinal stenosis

► Traumatic

- Extremely uncommon
- May occur due to severe fracture of the bony ring of the spine

► Pathologic

- Extremely rare
- Associated with cancer, metabolic bone disease, tumors, tuberculosis, and Paget's disease of bone



<http://synapse.koreamed.org/DOIx.php?id=10.4184/jkss.2001.8.3.336&vmode=PUBREADER#lpo=7.14286>

Trigger Finger

1. Trigger Finger

- ▶ Involves damage to the tendons that aid in bending the fingers and thumb
 - It is classified as stenosing tenosynovitis
 - This is a condition in which the sheath surrounding a tendon becomes inflamed and swollen, or when a nodule forms a tendon: this prevents the tendon from moving freely in the sheath

2. The digit involved can be bent, but is difficult and painful to straighten

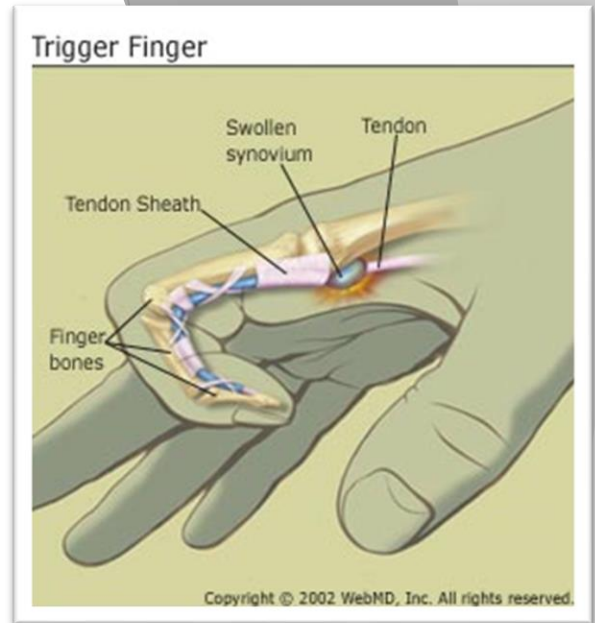
- ▶ A popping, or cracking noise may be heard when the finger is straightened.
- ▶ All digits may be affected

3. This injury is seen most commonly in individuals between 40 and 60 years of age

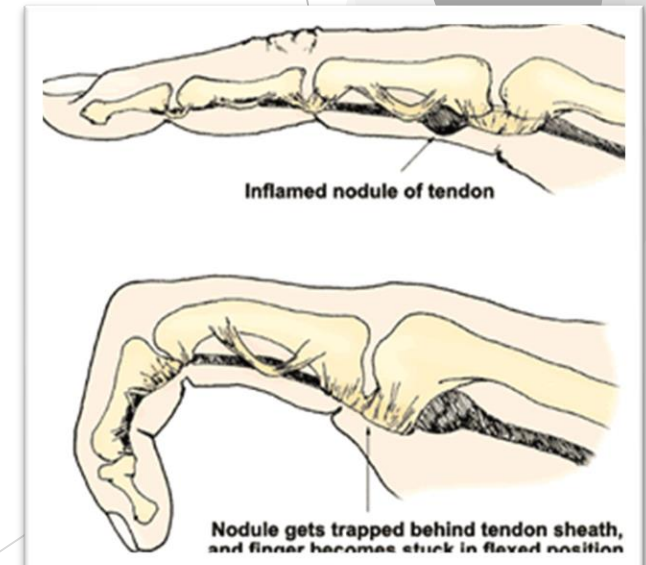
4. It occurs more often in individuals with diabetes, and rheumatoid arthritis

5. Treatment

- ▶ Splinting may allow this injury to heal
- ▶ Corticosteroid injects may ease the pain
- ▶ Surgery may be useful to stop permanent stiffness from developing
 - This involves opening the tunnel of the tendon sheath



<http://www.webmd.com/osteoarthritis/guide/trigger-finger>



http://www.emed.ie/Rheumatology/Trigger_Finger.php

Gamekeeper's Thumb

1. Gamekeeper's Thumb

- ▶ An injury to the ulnar ligament at the joint of the thumb and palm
- ▶ Also called skiers thumb, or UCL tear
 - It was originally called gamekeeper's thumb because this injury used to be common in gamekeepers due to their technique of carrying
 - It is also called skiers thumb because this injury is often sustained during a fall when the thumb gets caught in the ski pole loop

2. The injury is the result of forceful abduction of the thumb.

3. The injury involves stretching, or tearing of the ligament away from the bone.

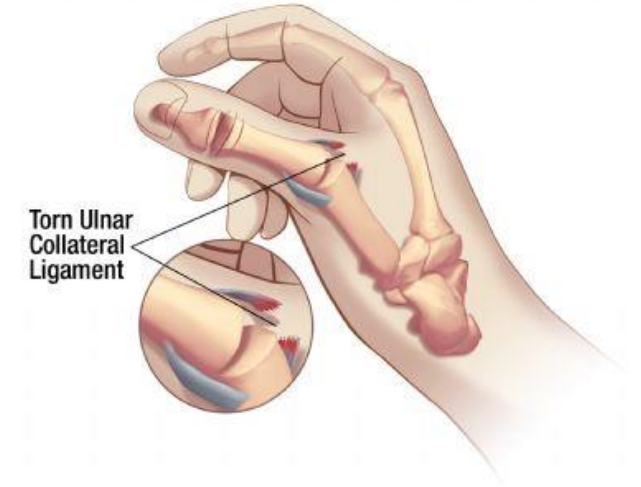
4. A small chip of bone may also be avulsed.

5. Treatment may involve:

- ▶ Casting
- ▶ Splinting
- ▶ Surgery to reattach the ligament
 - The ligament may be reattached to the bone with an anchor
 - Surgery should be performed as soon as possible for best results.

6. Arthritis may result from this injury.

Game Keeper's Thumb



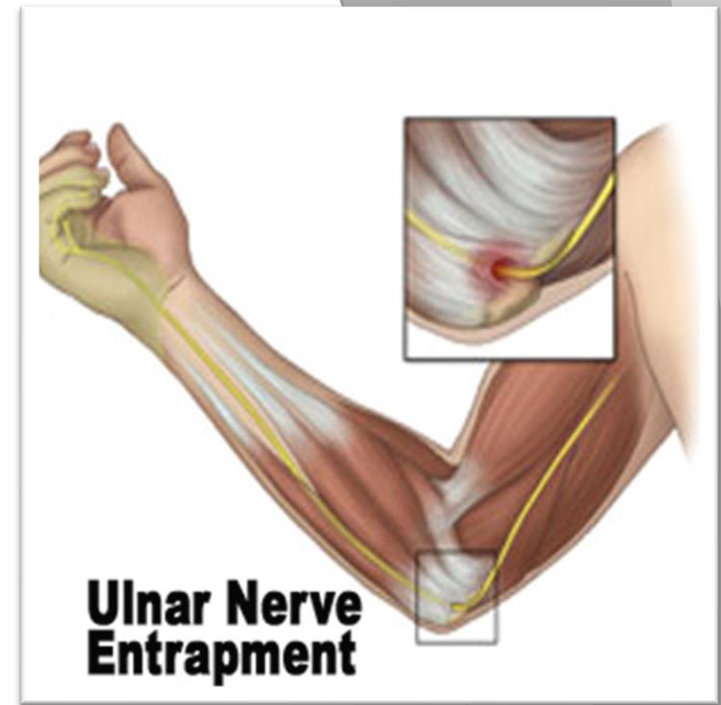
<http://www.3pointproducts.com/gamekeepers-thumb>

<http://radiopaedia.org/articles/gamekeeper-thumb>

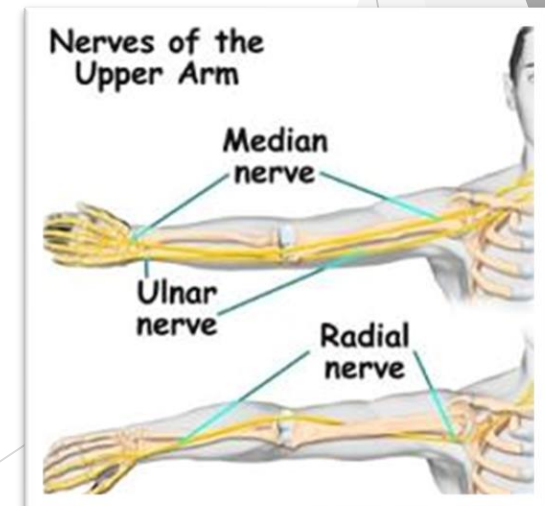


Ulnar Nerve Entrapment

1. Ulnar nerve entrapment
 - ▶ Involves the compression of the nerve running from the collarbone down the inside of the arm
2. Cause
 - ▶ As the nerve travels down the arm, it passes through the cubital tunnel which is found behind the inner part of the elbow
 - ▶ The nerve then proceeds down the arm and into the hand
 - ▶ Once in the hand, the nerve passes through Guyon's canal
 - ▶ The most likely site of compression is in the back of elbow, but compression of the nerve at the wrist and near the neck also occur
3. Fractures of the elbow, bone spurs, cysts, and trauma are risk factors for development of ulnar nerve entrapment
4. Symptoms of the condition include numbness in the ring finger and pinky finger, muscle weakness, coordination problems in the hand, and muscle wasting
 - ▶ If muscle wasting should occur, it is irreversible



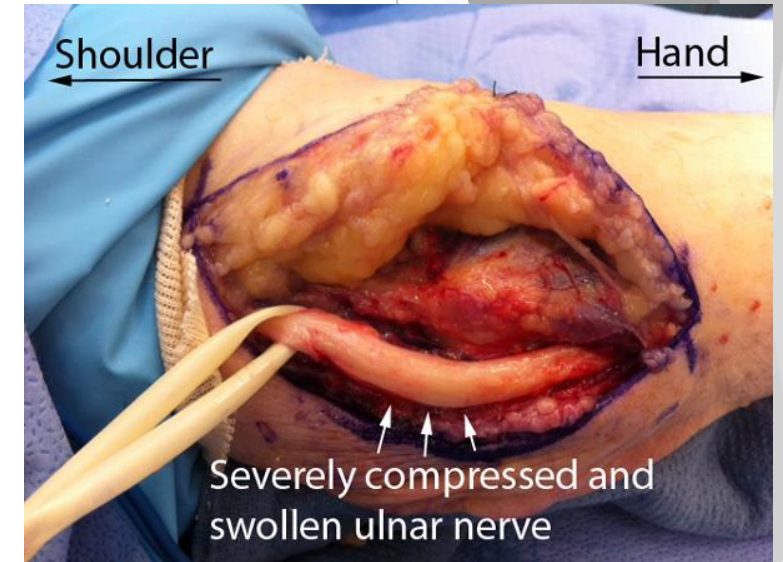
http://www.fprmed.com/Pages/Ortho/ULNAR_NERVE_COMPRESSION.html



<http://physioworks.com.au/injuries-conditions-1/rsi-repetitive-strain-injury>

Ulnar Nerve Entrapment

5. Physical examination is used to diagnose the problem.
 - ▶ This may involve manipulation of the joints in the affected extremity to determine symptoms of the condition
 - ▶ X-rays may be taken to look for bone spurs
 - ▶ A nerve conduction test may be conducted to see how well nerve impulses are transmitted down the arm
 - ▶ The patient may be advised simply to avoid movements that constrict the nerve
 - ▶ Anti-inflammatory drugs may be prescribed, as well as steroid injections
6. In the case of a severe problem that does not improve with non-surgical treatments surgery may be advised.
 - ▶ The exact type of surgery depends upon the area of compression
 - ▶ The most common compression site is the elbow, and therefore this is the most common surgical site
 - ▶ Surgery may be performed at the wrist, or at the wrist and elbow if necessary
 - ▶ Surgery around the elbow may involve cutting cubital tunnel
 - ▶ It may also involve the relocation of the nerve from its place behind the elbow to a place in front of the elbow
 - This procedure is known as an anterior transposition of the ulnar nerve.



http://www.fprmed.com/Pages/Ortho/ULNAR_NERVE_COMPRESSION.html

Kyphosis

- ▶ Refers to an exaggerated forward curve (rounding) - 50 degrees is deemed to be abnormal
- ▶ There are several types of kyphosis:
 - ▶ Postural kyphosis
 - ▶ Scheuermann's kyphosis
 - ▶ Congenital kyphosis

1. Postural kyphosis

- ▶ Most common type
- ▶ This is a flexible curve in the spine which often becomes evident during the teenage years
- ▶ Radiography reveals normal vertebrae and discs, and the condition is not painful.
- ▶ Does not lead to problems in adulthood

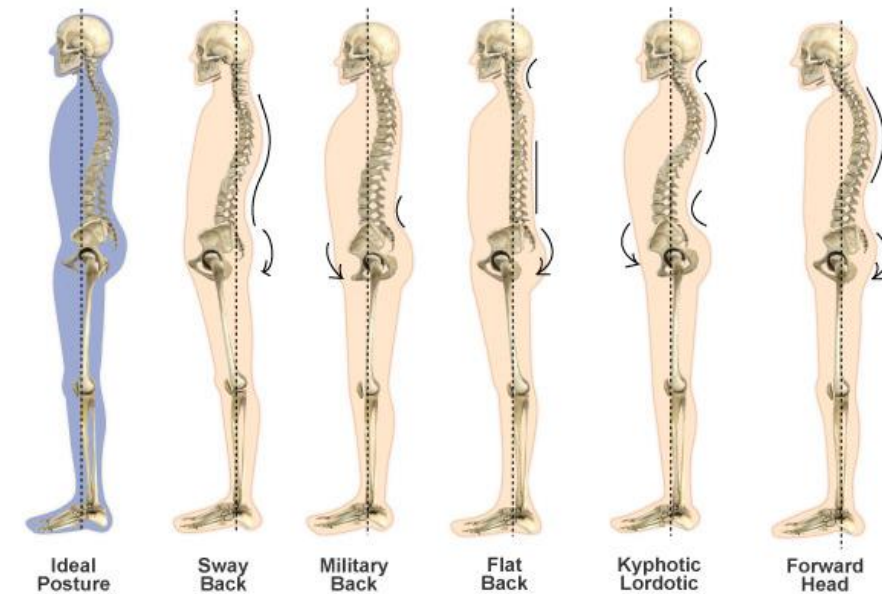
2. Scheuermann's kyphosis

- ▶ Becomes evident in teens
- ▶ Involves a more extreme curve than that seen in postural kyphosis
- ▶ The condition affects the thoracic, or lumbar, section of the vertebral column
- ▶ Radiography reveals irregular and wedge-shaped vertebrae and discs

Congenital kyphosis

- ▶ Results from the abnormal development of the vertebrae
- ▶ The vertebrae may not form properly, or several vertebrae may be fused

Common Postural Problems



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Kyphosis

http://www.spine.org/professionals/conditions_and_treatment/kyphosis_in_the_adolescent_and_young_adult/Scheuermanns_kyphosis_disease.htm

6. Causes of Kyphosis

- ▶ Trauma to the spine
- ▶ Muscular dystrophy
- ▶ Infection
- ▶ Developmental disorders and tumors

7. Cases of adult kyphosis may be the result of compression fractures caused by osteoporotic changes to the bone, or degenerative diseases of the vertebrae and disks, such as arthritis

8. Treatment for kyphosis

- ▶ Postural kyphosis
 - There is no real treatment for postural kyphosis
 - Rarely causes pain, and exercise does little to straighten the back
 - This condition may improve over time on its own
- ▶ Scheuermann's kyphosis
 - May cause pain which is worsened by activity
 - The condition is often treated with exercises and anti-inflammatory drugs
 - A brace may be advised until the skeleton is mature
- ▶ Congenital kyphosis
 - May be progressive, and early surgical intervention is often indicated to help develop a more normal curve to the spine
 - Continued monitoring is necessary

Surgery may be recommended for a case of kyphosis if the curvature of the spine is greater than 80 degrees

- ▶ The abnormal vertebrae may be straightened and fused

Kyphosis caused by infection or tumor may require surgery as well as treatment by medication of various kinds.

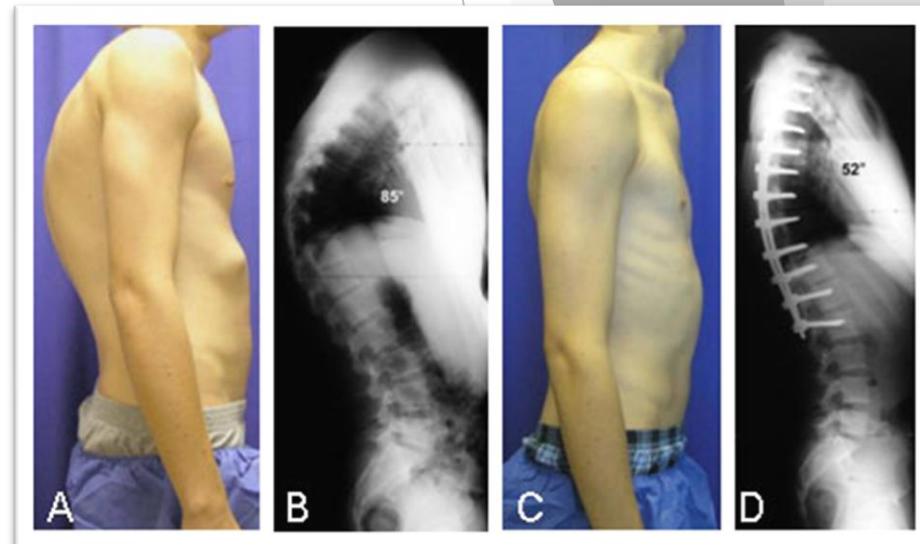


Figure 4A: Preoperative photo of patient with severe kyphosis secondary to Scheuermann's disease.

Figure 4B: Preoperative x-ray of the same patient.

Figure 4C: Postoperative photos of the same patient one year after surgical correction of the kyphosis.

Figure 4D: Postoperative x-ray of the same patient.

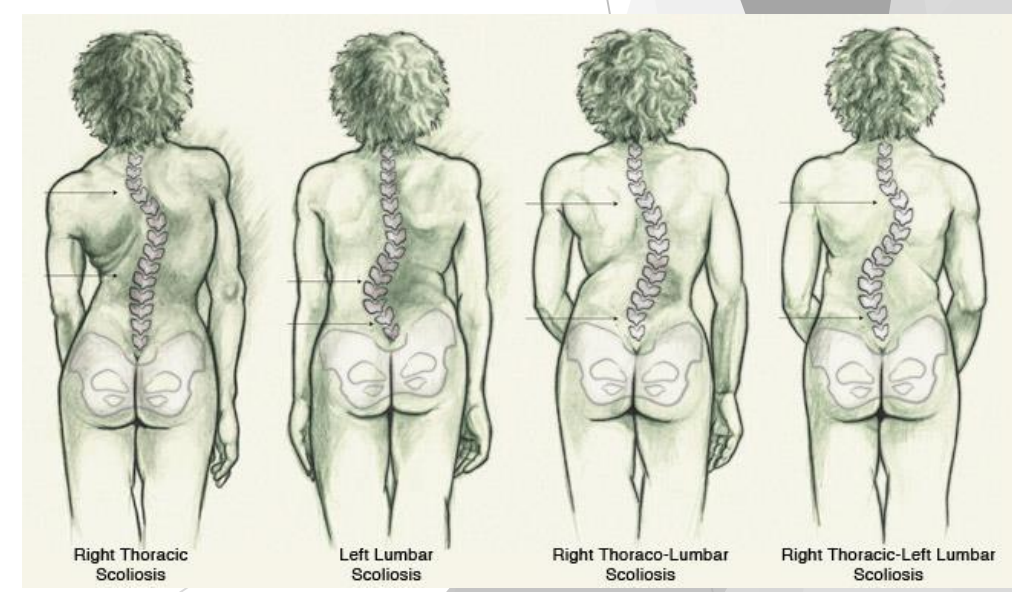
Scoliosis

1. Scoliosis
 - ▶ The curvature of the spine from side to side
2. In a case of scoliosis, the vertebral column looks like the letters "S" or "C".
 - ▶ In this condition, some of the vertebra may be rotated
3. The disease can be congenital, idiopathic, or the result of another condition
4. Scoliosis has a hereditary component, but in most cases the cause of the condition is unknown
 - ▶ The disease can occur as a result of other disorders, but most often the condition occurs in healthy spines
5. The disease often originates in childhood, but can develop in adults.
 - ▶ A case of scoliosis in adulthood may have begun in childhood, but gone undiagnosed
 - ▶ Other cases of adult scoliosis may be the result of degenerative conditions involving the vertebral column



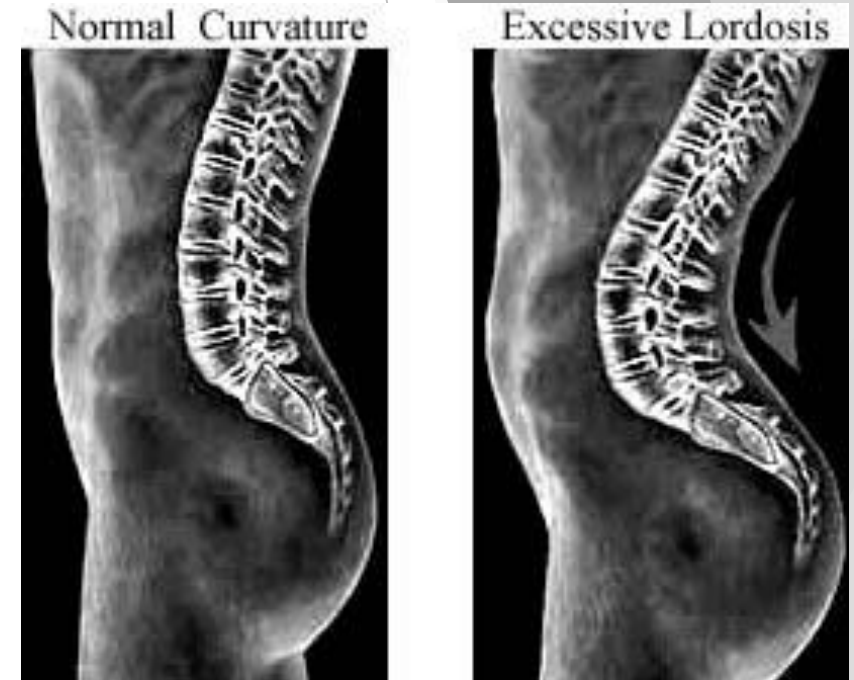
Scoliosis

6. The symptoms of scoliosis include:
- ▶ Shoulders that aren't level
 - ▶ A listing posture
 - ▶ Raised hips
 - ▶ Prominent shoulder blades
7. A physical examination for scoliosis includes Adam's Bend Test
- ▶ In this test, the patient bends forward.
 - If a hump on the back is present, scoliosis is suspected, and radiographs involving full length standing spine views are indicated
8. Although scoliosis does not usually cause problems in childhood, untreated scoliosis can result in continuing and severe back pain, deformity, and respiratory problems.
9. Most curvatures of the spine require only monitoring, but if the curvature progresses, bracing of the spine is indicated.
- ▶ This can prevent the condition from becoming worse.
 - ▶ A body cast may be advised
10. If the curvature is severe, or if an orthopedic brace does not prevent the worsening of the condition, surgery is indicated.
- ▶ Surgical techniques include spinal fusion, and internal fixation with rods and screws



Lordosis

1. Lordosis
 - ▶ Excessive inward curvature of the spine
 - ▶ Commonly called swayback
2. These curves serve to position the head over the pelvic region, and act as shock absorbers
 - ▶ When the curves become too pronounced, the condition is called lordosis
3. Lordosis affects individuals of all ages.
4. Although it is usually seen in the lumbar section of the vertebral column, it does occur in the cervical vertebrae.
5. Lordosis in the lumbar region of the spinal column causes the buttocks to stick out excessively
 - ▶ Lordosis in the lumbar region can be painful, and can affect movement



<https://erickaduftonyoga.files.wordpress.com/2012/11/lordosis.jpg>

Lordosis

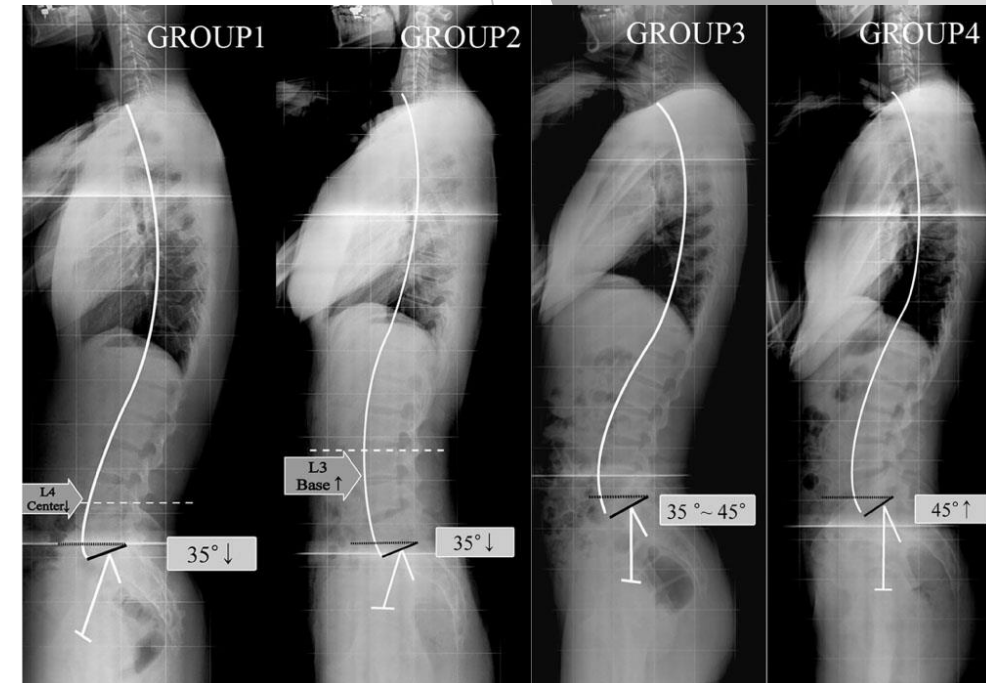
6. The curvature of the spine can be affected by certain diseases:

- ▶ Achondroplasia
 - A hereditary disorder of bone growth causing dwarfism
- ▶ Diskitis
 - An inflammation of the space between discs
- ▶ Kyphosis
 - Which may cause a curve in the lower back to compensate for a curve higher in the back
- ▶ Obesity
 - May cause lordosis by causing a backward leaning posture
- ▶ Osteoporosis
 - May cause the vertebrae to weaken
- ▶ Spondylolisthesis
 - Can cause the vertebrae to overlap

7. Lordosis can also be a benign juvenile condition.

8. Lordosis does not always require medical intervention.

- ▶ If the curve is flexible, the condition is not generally of concern.
- ▶ If the curve is fixed, the condition should be evaluated medically



<http://synapse.koreamed.org/DOLx.php?id=10.4184/jkss.2010.17.2.66&vmode=PUBREADER#!po=7.14286>