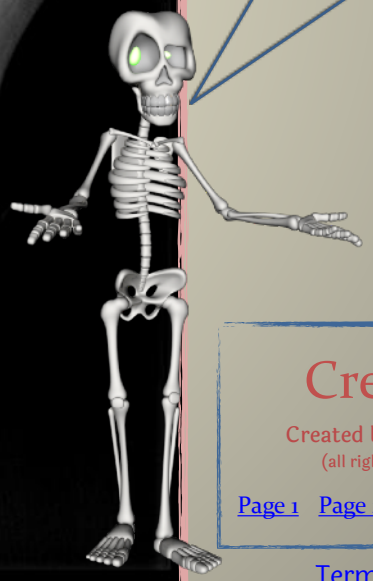
Diagnostic Radiology Lab



Welcome! So you want to be a doctor? Start with the Introduction and learn how to navigate through the Radiology Reference Guide. Once you've passed the "Radiology Board Exam", it's time to meet your patients! Go to the Intro now!

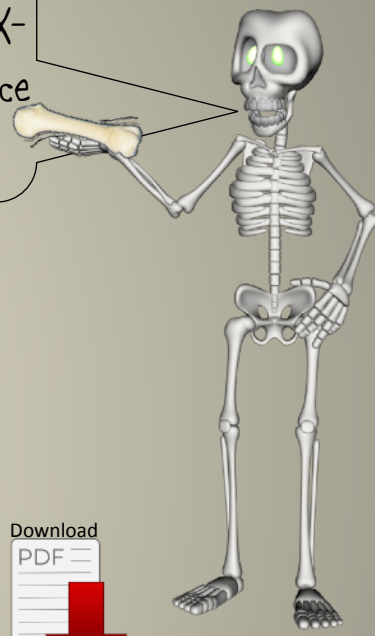
Credits:

Created by Jim Gonyo

Diagnostic Radiology Lab

Introduction

The Diagnostic Radiology Lab allows YOU to be the doctor! You will examine your patient's X-Ray images, consult your Radiology Reference Guide, and make your diagnosis!



Before you can call yourself a doctor, however, you're going to need to go through a bit of "medical school" and pass the little ole "Radiology Board Exam". Don't worry, you can use your Radiology Reference Guide every step of the way. Ready to get started? Just follow the steps below:

Step 1: Click on the Radiology Reference Guide (page 3) in the menu at the top of the page and skim through the comprehensive 52 page guide. This will give you an idea of what is in there and how it is organized. When you are done, come back here and go to Step 2.

Step 2: Welcome back! Throughout the Diagnostic Radiology Lab you will find links (and page numbers) to help you locate the information you need when you need it. If you are ready, ask your teacher for a copy of the Radiology Board Exam or download it from this page. Use your Radiology Reference Guide to help you complete it. When your teacher is satisfied with the results, go to the next step.

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Radiology Board Exam

Step 3: Congratulations, Doctor! Now that you have passed the Board Exam, you are ready to meet your patients. Pick up a Diagnostic Radiology Lab Answer Sheet from your teacher or download it from this page. Then click on the "Patients" tab (page 56) at the top of the page and start with Patient 1. Don't forget about the Radiology Reference Guide, you're going to need it. Good Luck!

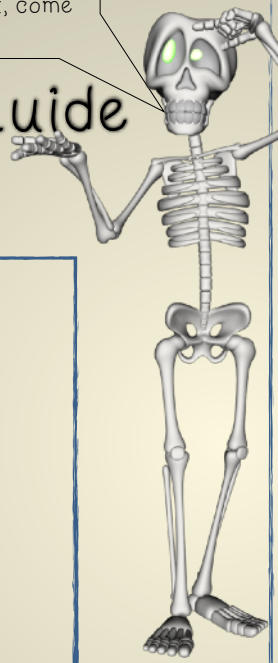
Download PDF

Student Answer Sheet

Note: if you are not doing this lab on a computer, you can still take advantage of all of the links to clues by following the page numbers (found in the upper left corner). If you are doing the lab on a computer, use the menus and links throughout the lab to navigate. Also, click here (page 86) to see how to zoom in on the X-ray images using various devices.

Everything you need to know to complete the Diagnostic Radiology Lab is in the pages of this reference guide. Use the index (links) below to navigate your way through the guide. If you get lost, come back here!

Radiology Reference Guide



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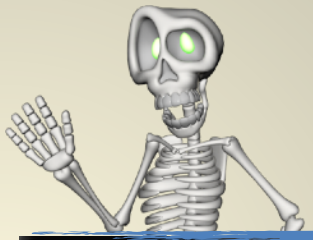
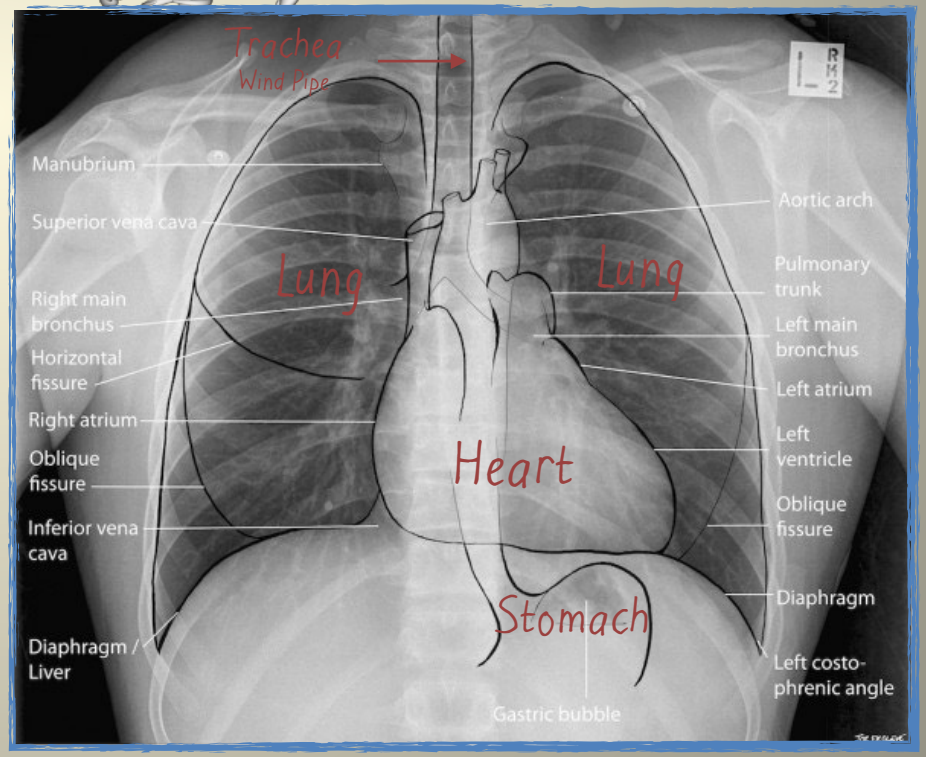
Radiology Reference Guide

Chapter 1: X-rays



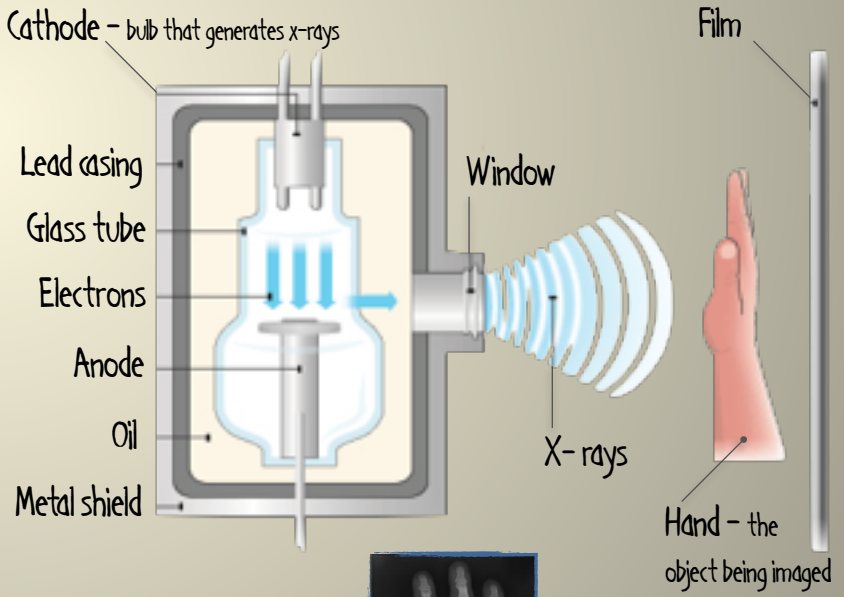


Radiology Reference Guide – Chapter 1

What is an X-Ray?

X-rays are a type of electromagnetic energy similar to visible light. Unlike visible light, however, X-rays are very high in energy, are invisible, and can penetrate through soft tissues like muscle, fat, etc. If a special film or a digital detector is placed behind the body part being filmed, the X-rays will be captured and will produce an image. When X-rays are used to produce images of objects such as the human body, they are called **Radiographs**. We often use the term "X-Ray" when referring to images but "Radiograph" is technically correct.

Radiographs are best known as a tool for identifying broken bones, but they are also useful in the diagnosis of pneumonia, lung cancer, intestinal obstructions, kidney stones, dental cavities and much more. X-ray film is clear before being exposed to x-rays. The x-ray radiation turns the film dark. The darkest areas are where most of the radiation hit the film. The whitest areas are where most of the x-rays were absorbed by the body and did not hit the film. Bones absorb x-rays so they show up as white areas on the film. Structures containing air will be black, while muscle, fat, and fluid will appear as shades of gray. Sometimes a special dye called a **contrast** is given to the patient to make soft tissues (blood vessels, nerves, intestines, etc.) show up better. The areas that absorb the contrast will appear white. Metal, such as surgical steel, will also appear white.



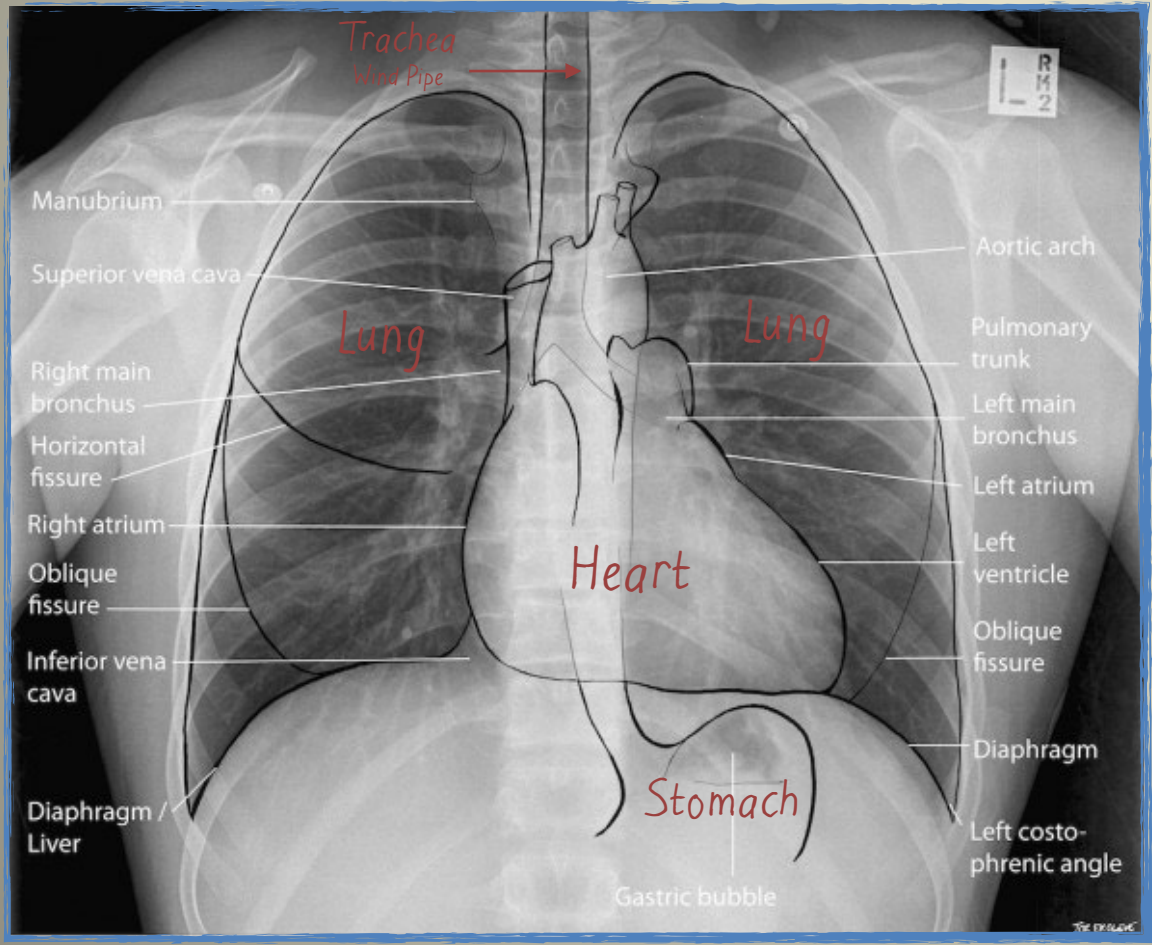
Radiograph – x-ray image of the hand showing bones. The image is developed from the film.

Next page (Normal Chest X-Ray)

Normal Chest X-Ray

Along with the bones of the upper body, this x-ray also shows structures of the lungs, heart, and stomach (outlined on x-ray). On a x-ray, these soft tissues can be difficult to identify. Study this image so you will recognize normal structures when you see them.

Next page (Chapter 2)



Explanation:

Manubrium - the sternum or breastbone
Superior vena cava - blood vessel (returns blood to heart)
R/L. Main Bronchus - carries air from windpipe to lungs
Right Atrium - upper chamber of heart
Inferior vena cava - blood vessel (returns blood to heart)
Diaphragm - muscle that controls breathing
Aortic arch - blood vessel (sends blood to body)
Pulmonary trunk - blood vessel (returns blood to lungs)
Left Atrium - upper chamber of heart
Trachea - windpipe (connects mouth to lungs)
Lungs - collects the air we breath.

Notes:

1. The ribs are actually outside of the lungs. They only appear to be inside the lungs because everything lies flat (in one plane) on an x-ray.
2. Normal lungs appear dark. Large gray to white areas could indicate fluid in the lungs (pneumonia, tumor).
3. The dark blotch in the stomach is a buildup of gastric juice, a normal part of digestion.
4. The heart's left ventricle lies to the left of the spine. Notice the patient's left side is on the right of the image. This is correct (think about it)!

Radiology Reference Guide

Chapter 2: The Skeletal System

Radiology Reference Guide – Chapter 2

Your Skeleton:

Your skeleton gives your body structure and support. It is made of living bone cells, living tissues, blood vessels, mineral deposits and water. Your skeleton also protects delicate organs, stores important minerals, and produces new blood cells. Your bones are connected to each other with ligaments and tendons and are moved with muscles. Places where bones meet are called joints and are cushioned by cartilage to protect the bone from wearing down. Most joints allow for various types of movement.

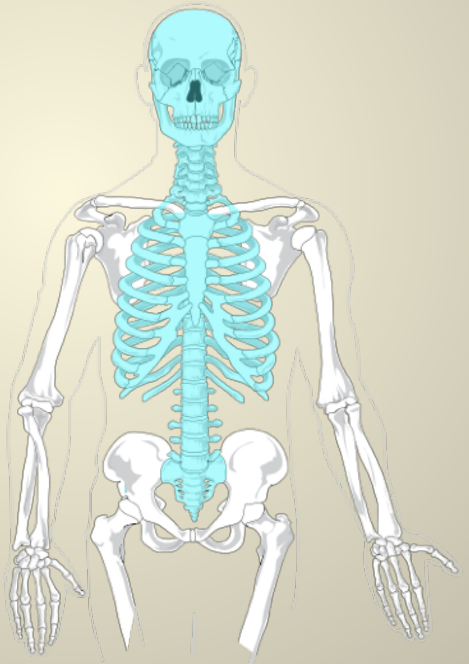
The 206 bones of the Human Skeletal System are divided into two main categories, the Axial Skeleton and the Appendicular Skeleton.

Axial Skeleton

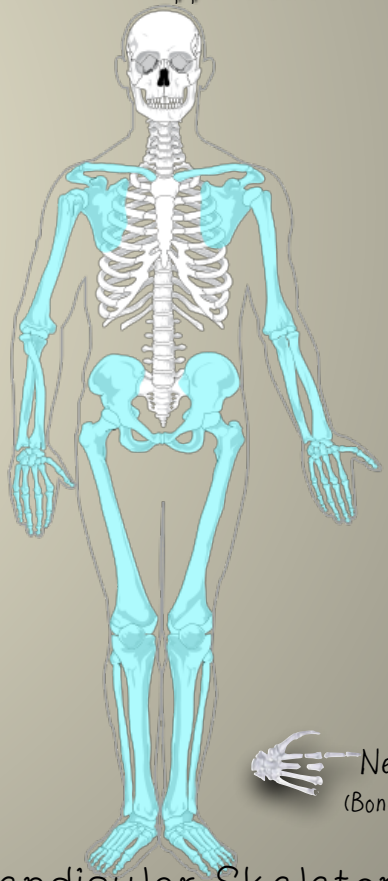
- Skull - 28 bones (including the bones of the ear)
- Hyoid Bone (throat) - 1 bone
- Vertebral Column (spine) - 26 bones
- Ribs - 24 bones
- Sternum - 1 bone

Appendicular Skeleton

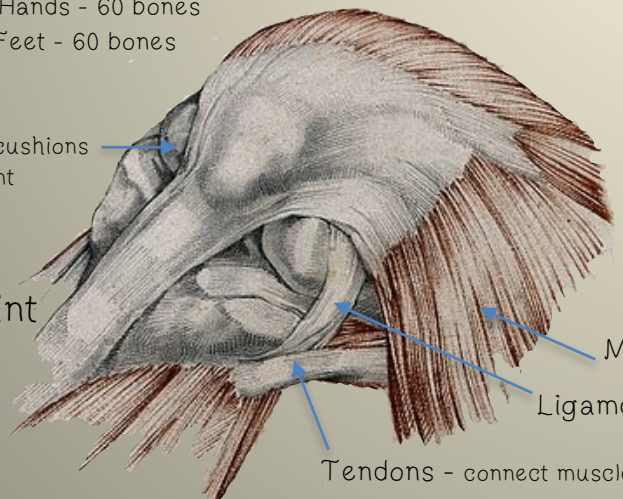
- Pectoral Girdle (collar bones, shoulder blades) - 4 bones
- Pelvic Girdle (hips) - 2 bones
- Arms and Hands - 60 bones
- Legs and Feet - 60 bones



Axial Skeleton



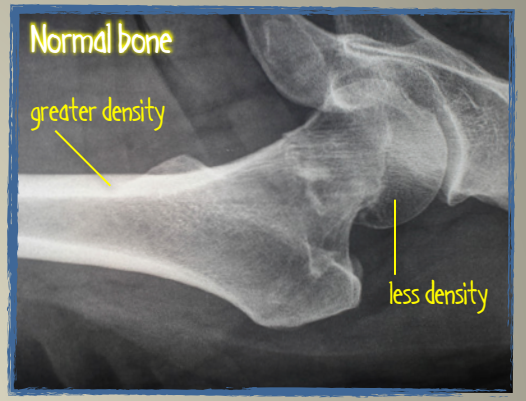
Appendicular Skeleton

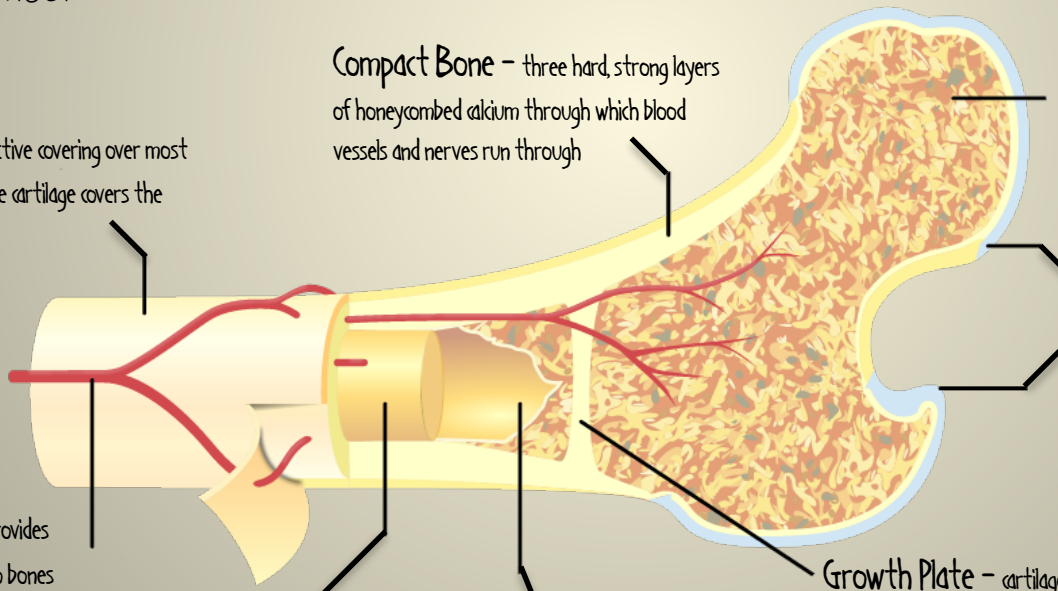


Next page (Bone Anatomy)

Bone Anatomy

Your bones are alive! They are made of living tissue that requires oxygen and nutrients to live and grow. Your bones give your body structure and support, protect delicate organs, store minerals and nutrients, and produce new red blood cells. When X-rays are used to diagnose broken bones or bone disease, the bone will show up as white or shades of gray depending upon the density of the bone. It is important to know where a healthy bone is more or less dense.





Periosteum - protective covering over most of the bone (except where cartilage covers the bone)

Compact Bone - three hard, strong layers of honeycombed calcium through which blood vessels and nerves run through

Spongy Bone - lighter and softer than compact bone. Contains red bone marrow which produces new red blood cells. Spongy bone is also the site of nutrient exchange

Cartilage - a firm, rubbery tissue that cushions the bones and allows for smooth movement at joints

Blood Vessels - provides oxygen and nutrients to bones

Growth Plate - cartilage that reproduces rapidly allowing bones to grow in children. The cartilage eventually turns to bone.

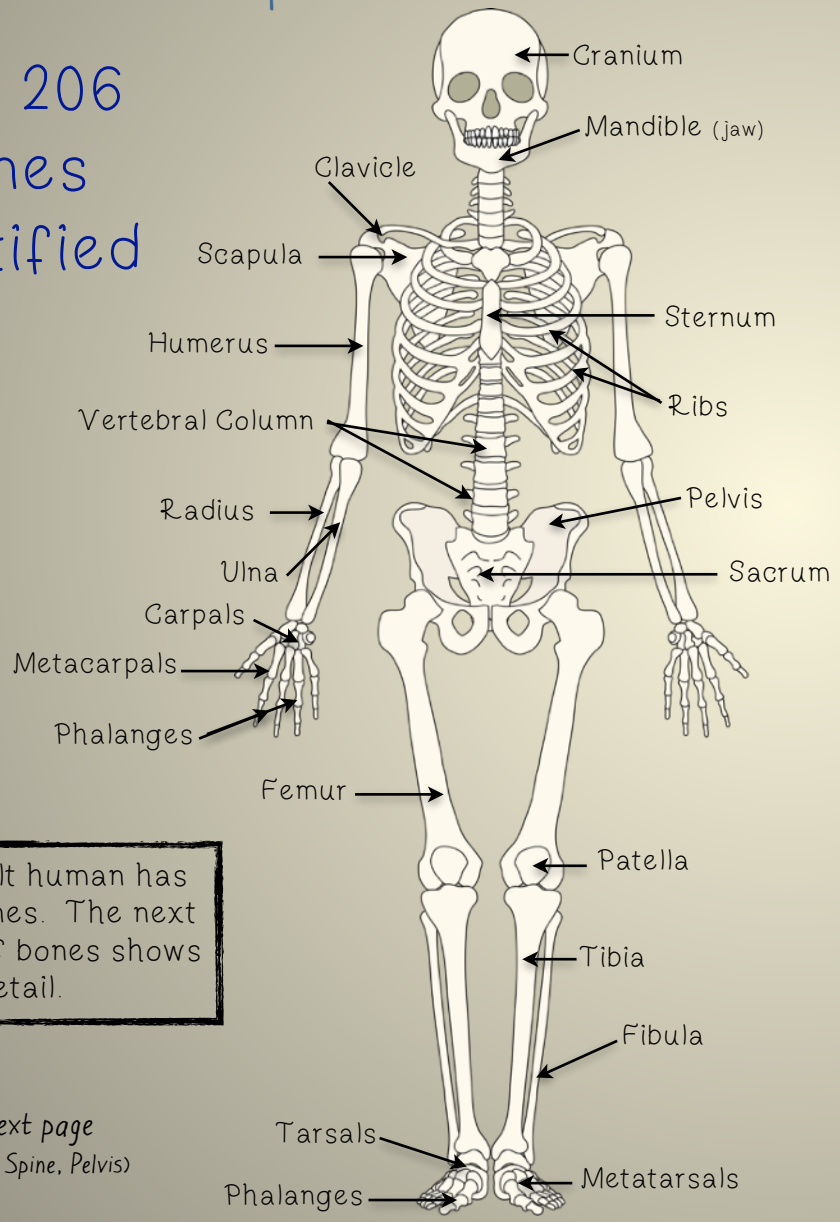
Bone Marrow - a flexible tissue in the center of bones that produces red blood cells

Medullary Cavity - a space in the center of the bone where bone marrow is stored.

Next page
(206 Bone Identified)

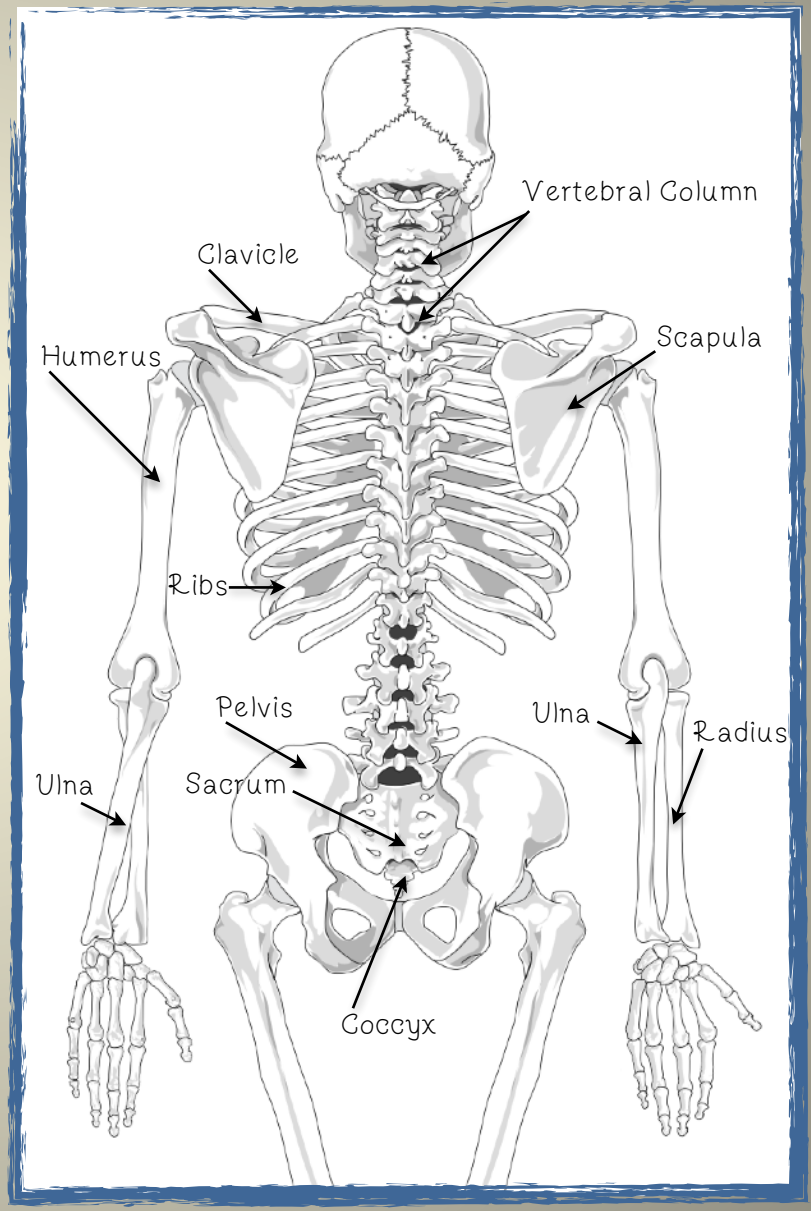
Radiology Reference Guide – Chapter 2

The 206 Bones Identified



An adult human has 206 bones. The next page of bones shows more detail.

Next page
(Skull, Spine, Pelvis)

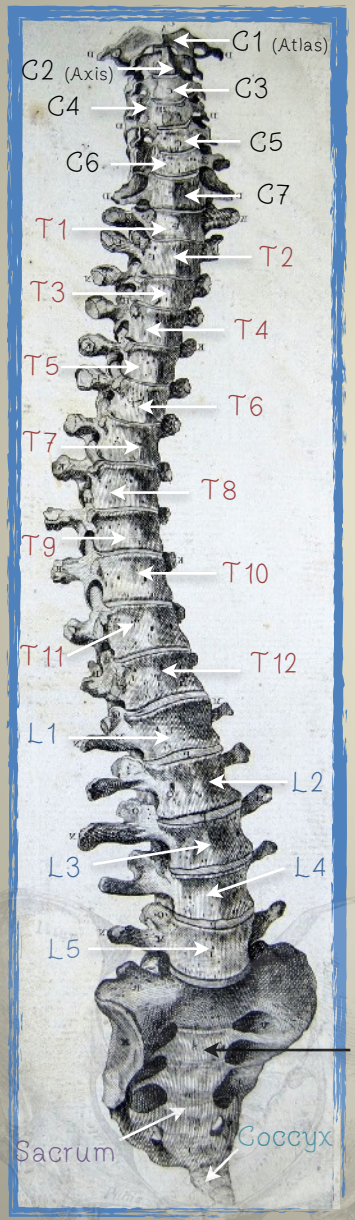


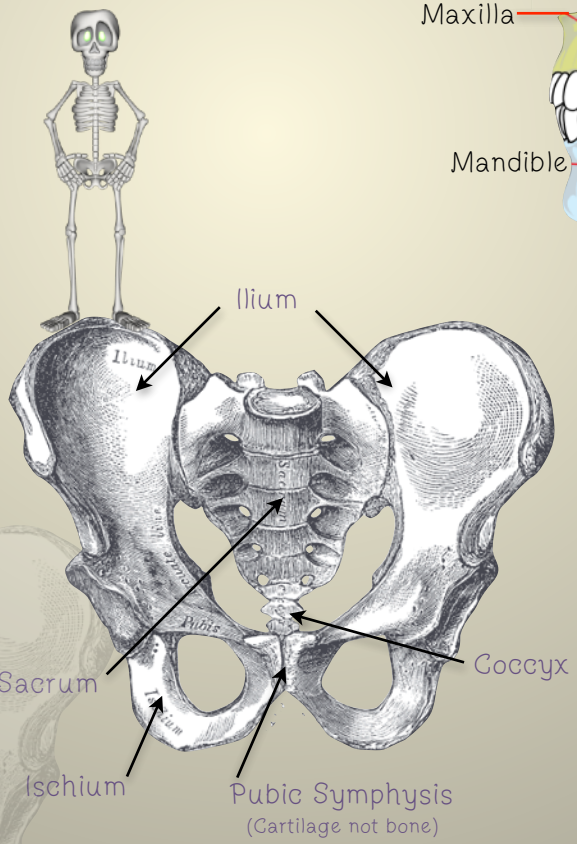
Radiology Reference Guide – Chapter 2

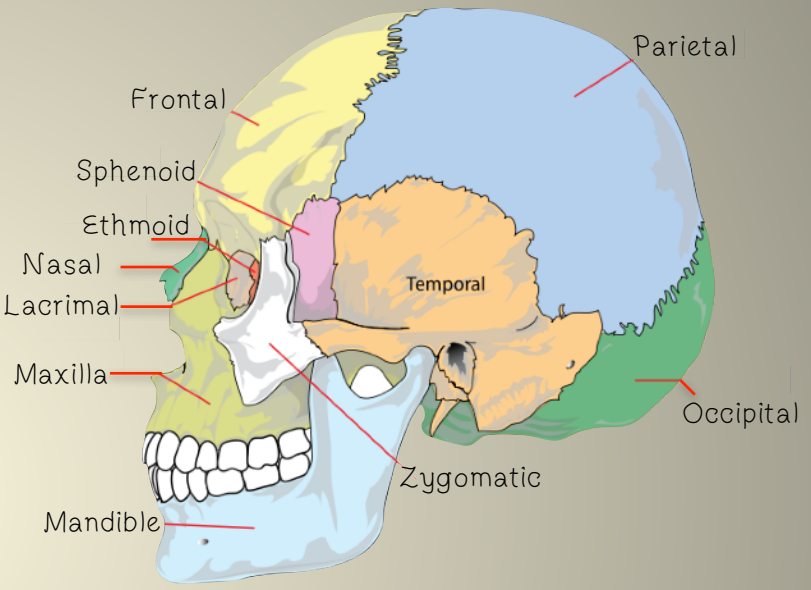
Cervical Vertebrae
C1 - C7 are vertebrae of the neck

Thoracic Vertebrae
T1 - T12 are vertebrae of the rib cage

Lumbar Vertebrae
L1 - L5 are vertebrae of the lower back





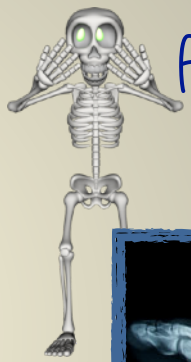


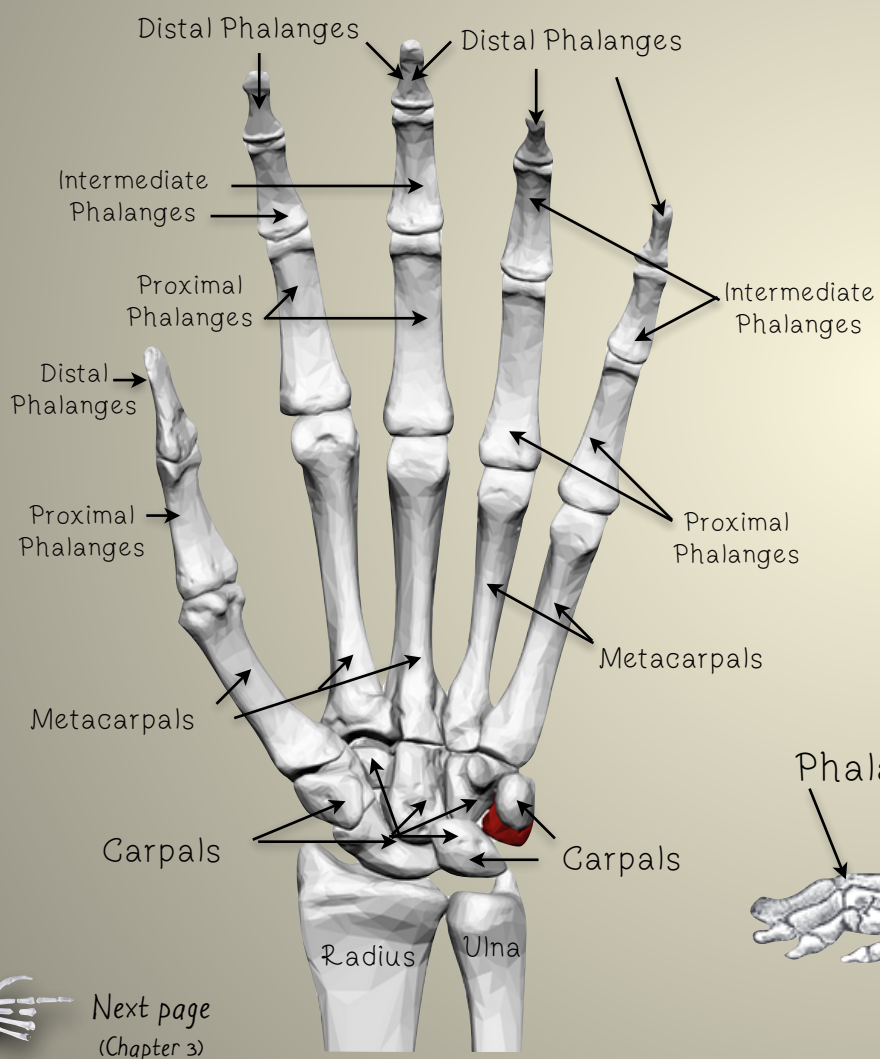
Skull, Spine, and Pelvis

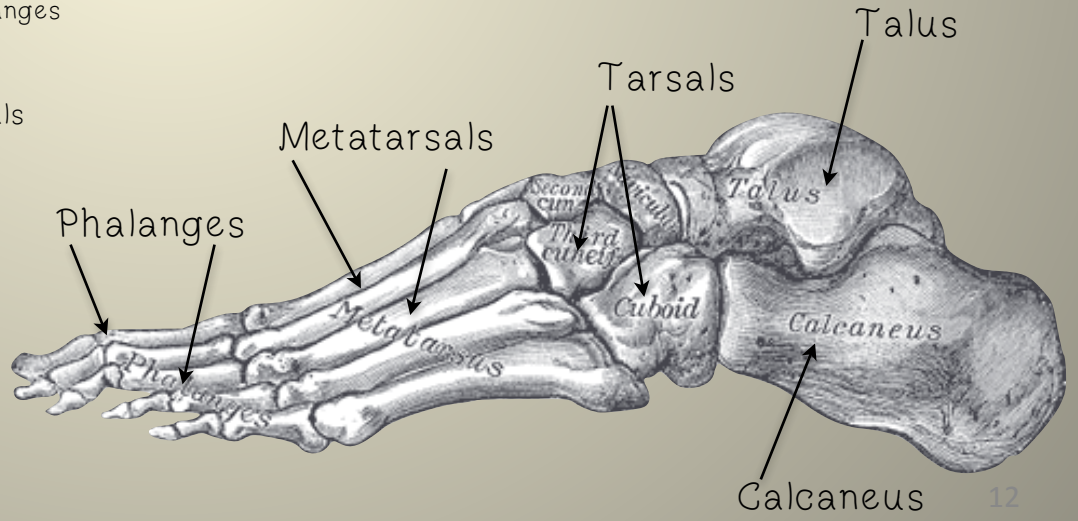
Next page
(Hands and Feet)

Radiology Reference Guide – Chapter 2

Hands and Feet







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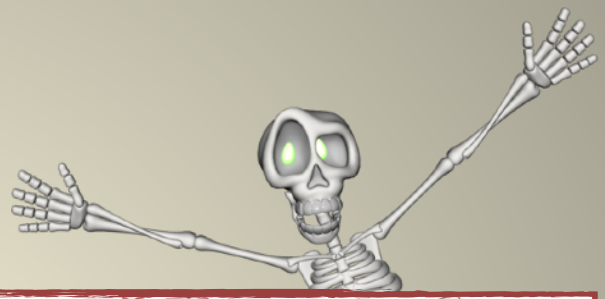
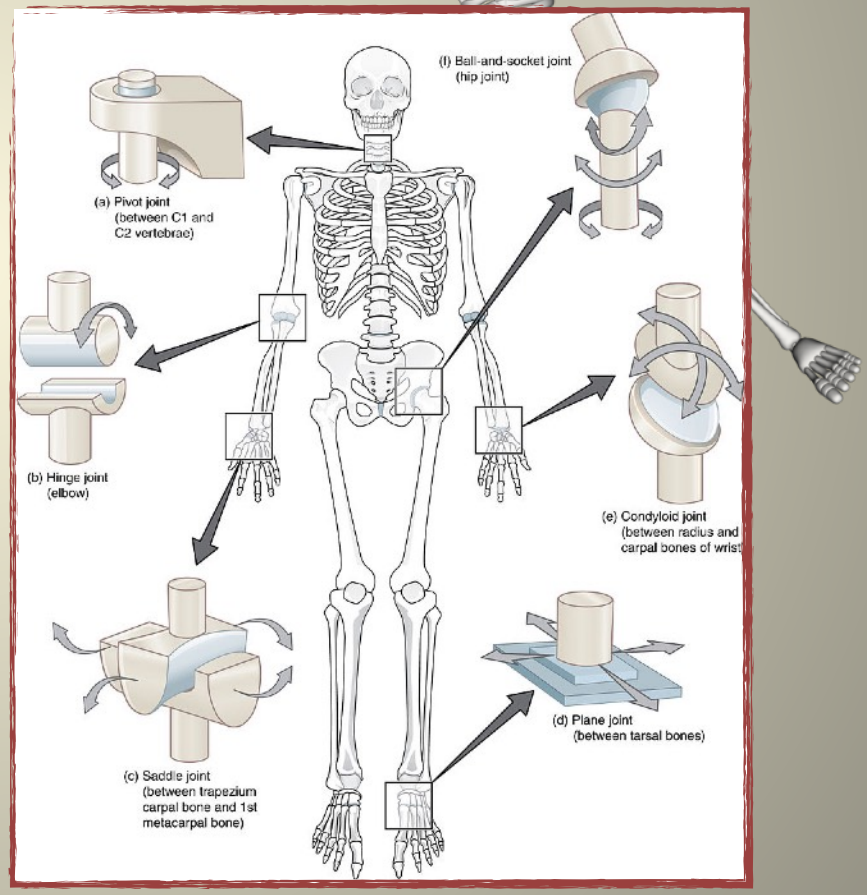
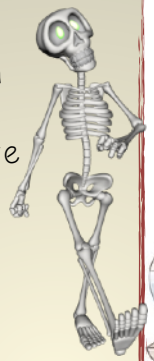
Radiology Reference Guide

Chapter 3: The Joints





Joints



All of the bones in your body (except the Hyoid bone in your neck) connect with one another to form **Joints**. There are several different types of joints and they are classified based on the type of movement they allow. There are three main types of joints:

Fibrous Joints

Also call called Immovable or Fixed Joints, these do not allow any movement. The bones are joined by fibrous connective tissue.

Examples: Bones of the Skull, and Teeth

Cartilaginous Joints

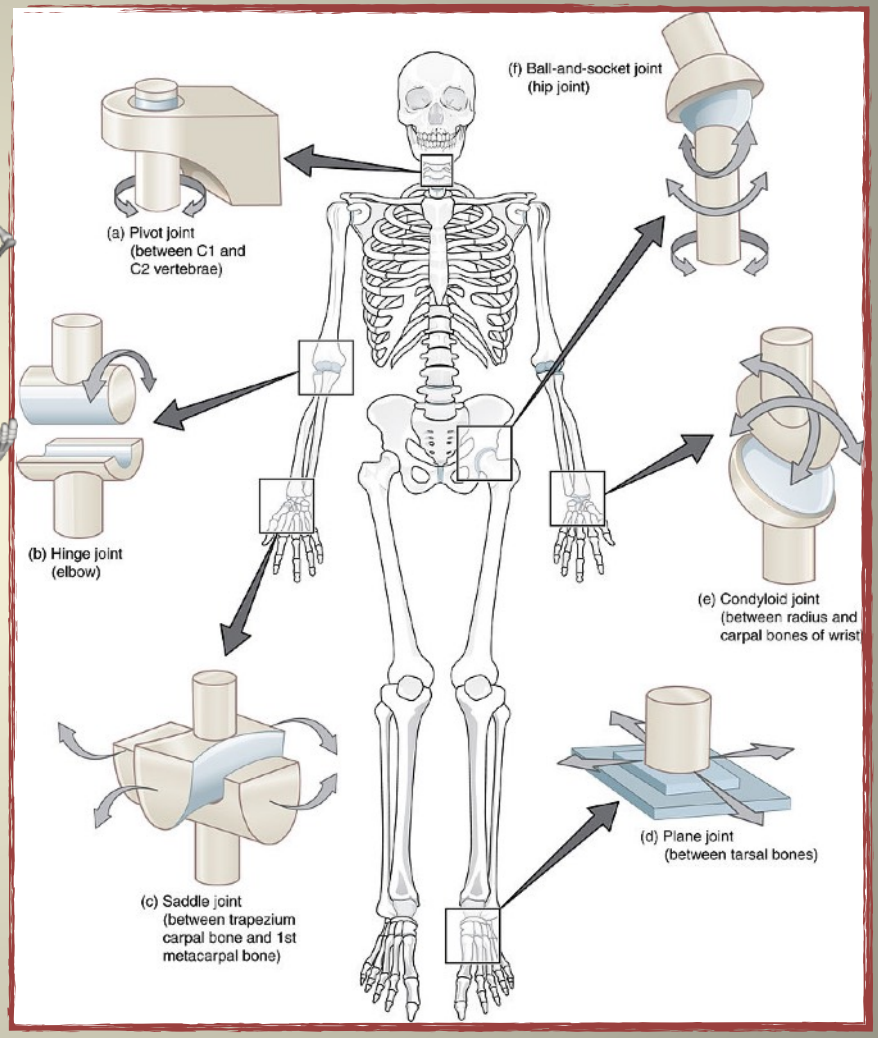
Also called Slightly Moveable Joints, these joints allow for a limited degree of movement. The bones are joined by cartilage with some help from ligaments.

Examples: Bones of the Spine, Sacrum and Hip, Pubic Bones in Pelvis

Synovial Joints

Also called Moveable Joints, these joints allow for the greatest degree of movement. The bones are joined by ligaments and tendons which are connected to muscle. There are several types of Synovial Joints including Gliding, Saddle, Hinge, Pivot, Ball and Socket, and Ellipsoid.

Examples: Hands, Feet, Elbow, Knee, Shoulder, Hip, Neck, Fingers, Toes, Rib Cage



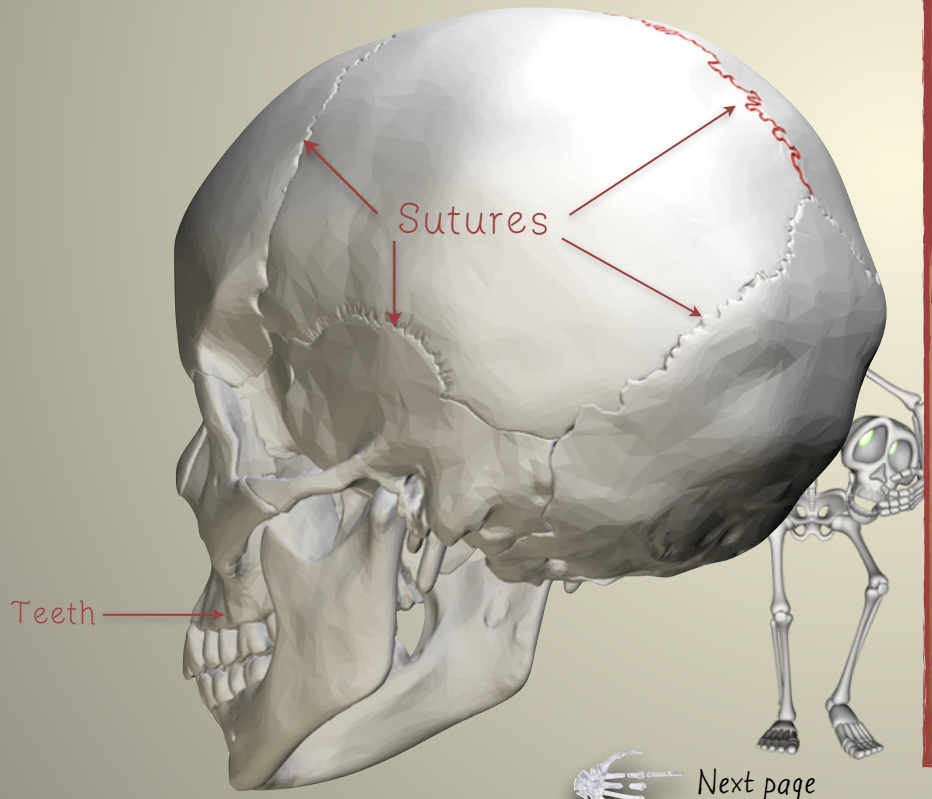
Next page
(Fibrous Joints)

Radiology Reference Guide - Chapter 3

Fibrous Joints (Immovable or Fixed Joints)

Also call called Immovable or Fixed Joints, these do not allow any movement. The bones are joined by fibrous connective tissue.

Examples: Bones of the Skull, and Teeth



Next page
(Cartilaginous Joints)

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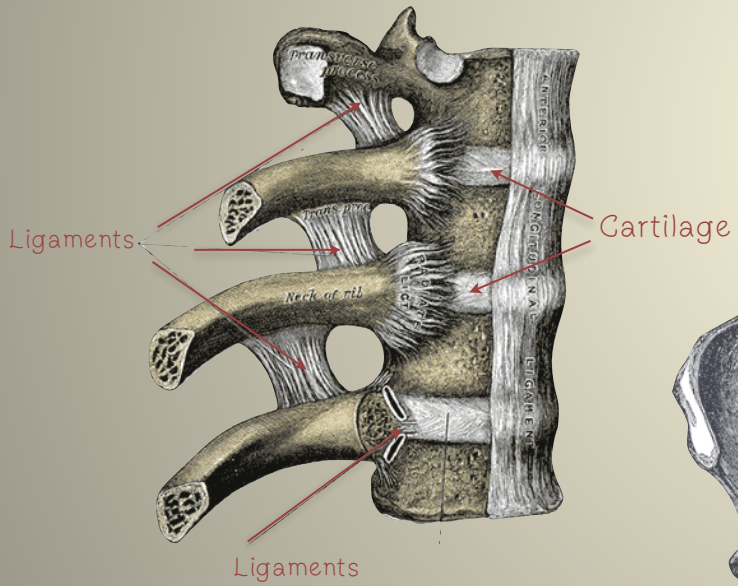
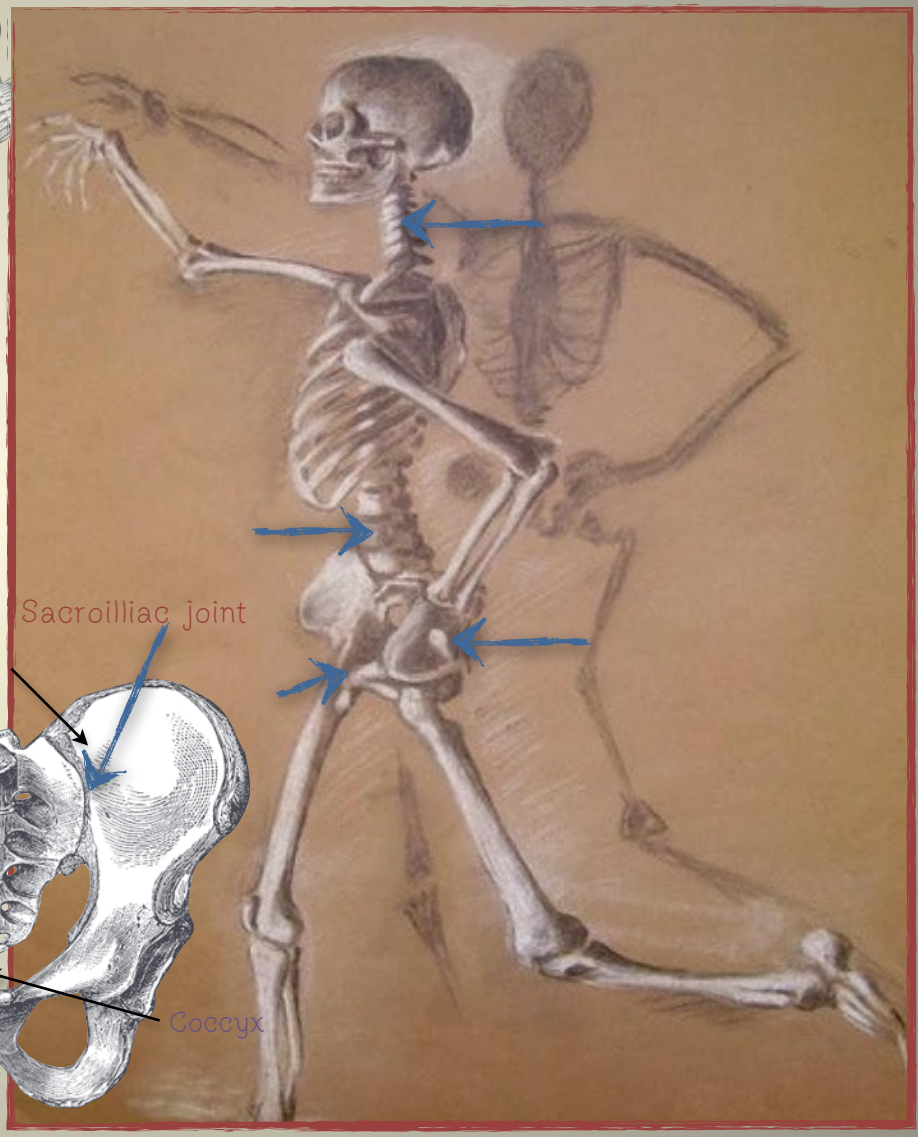
Cartilaginous Joints (Slightly Moveable)

Cartilaginous Joints

Also called Slightly Moveable Joints, these joints allow for a limited degree of movement. The bones are joined by cartilage with some help from ligaments.

Examples: Bones of the Spine, Sacrum and Hip, Pubic Bones in Pelvis





Next page
(Synovial Joints)

Synovial Joints (Moveable)

Synovial Joints

Also called Moveable Joints, these joints allow for the greatest degree of movement. The bones are joined by ligaments and tendons which are connected to muscle. Synovial Joints contain articular cartilage and Synovial fluid to reduce friction allowing easier movement of bones. There are several types of Synovial Joints. Click on each link below for more details.

Types of Synovial Joints

Gliding Joints – an even, or slightly even, surface of the two bones glide along each other. This type of joint allows for mobility in one direction without any circular motion

Examples: Hands (wrist), Feet (ankle), Ribs

Hinge Joints – a bone with a concave surface joins with a bone with a convex surface. Allow only back and forth motion like the hinge of a door.

Examples: Knees, Elbows

Pivot Joints– allows the rotation of one bone around another.

Examples: Neck, Swivel motion of forearm (radius and ulna)

Ball and Socket Joints - A bone with a ball shape fits into a bone with a socket shape.. Allows side to side, back and forth, and rotational movement.

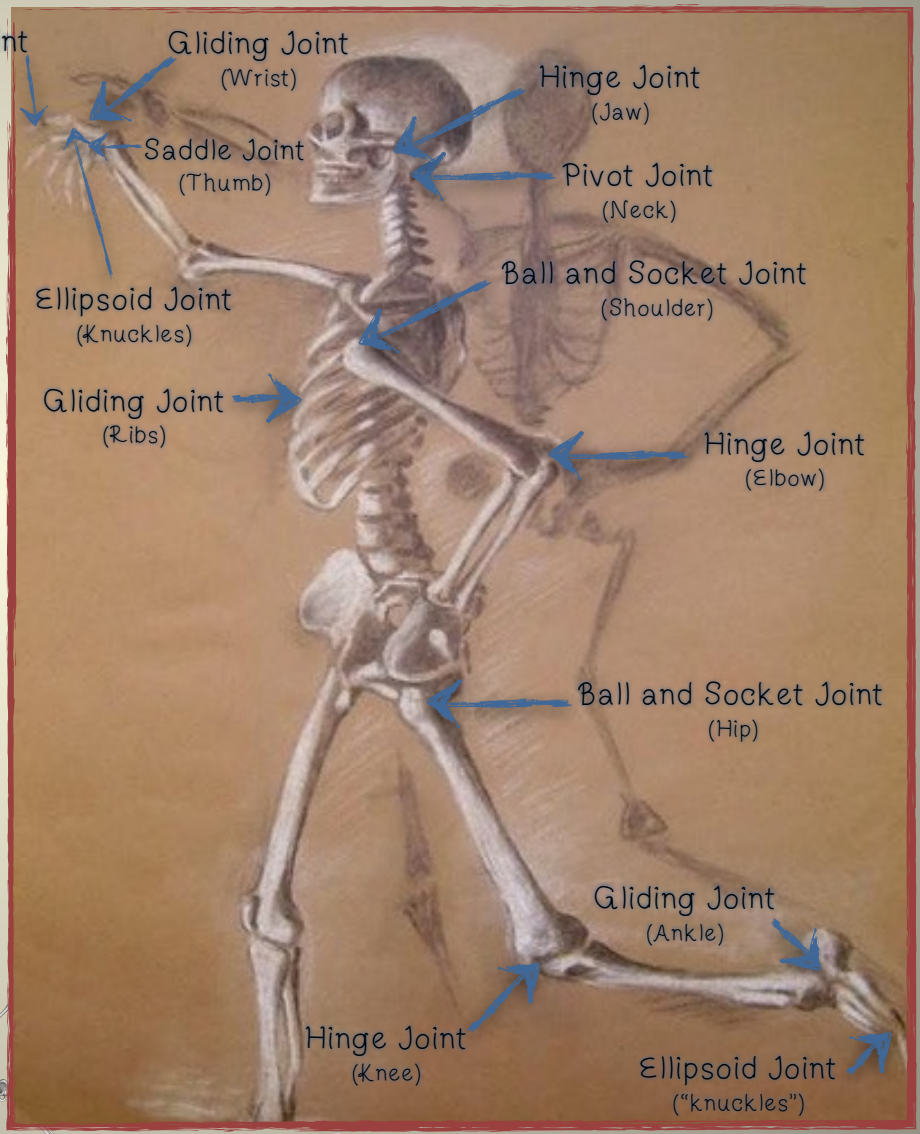
Examples: Shoulder, Hip

Saddle Joints - a bone with a concave surface joins with a bone with a convex surface. Allows for a wide range of motion.

Examples: The Thumbs

Ellipsoidal Joints (also know as Condyloid Joint) - the oval portion of a bone joins with the oval portion of another bone. Allows for angular motion without rotation.

Examples: knuckles of Hands and Feet,



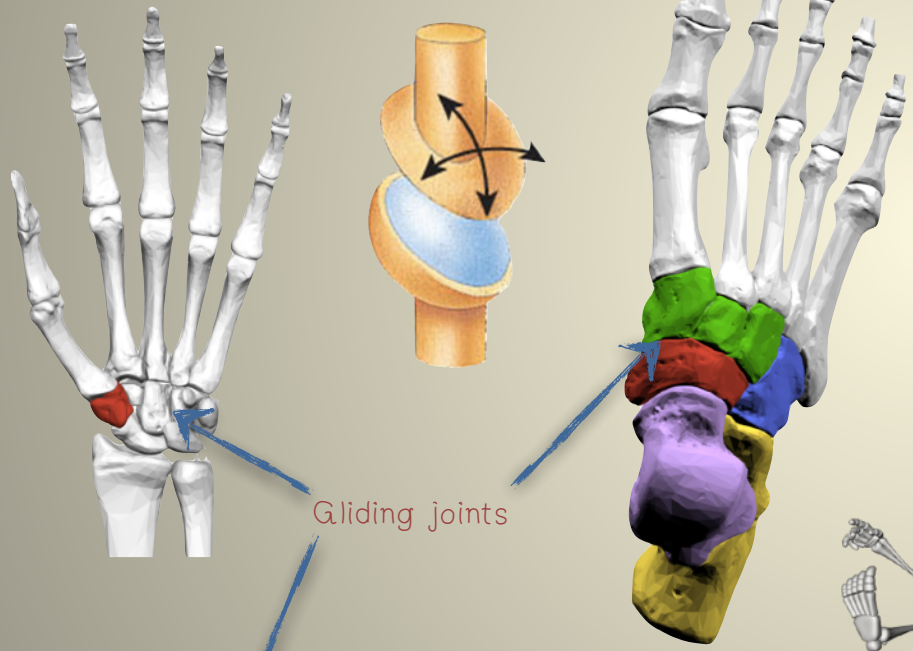
Radiology Reference Guide - Chapter 3

Types of Synovial Joints (Back to menu)

Gliding Joint (Plane Joint)

Gliding Joints - an even, or slightly even, surface of the two bones glide along each other. This type of joint allows for mobility in one direction without any circular motion

Examples: Hands (wrist), Feet (ankle), Ribs



Gliding joints

Next page (Hinge Joints)

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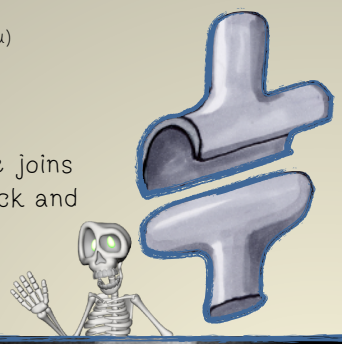
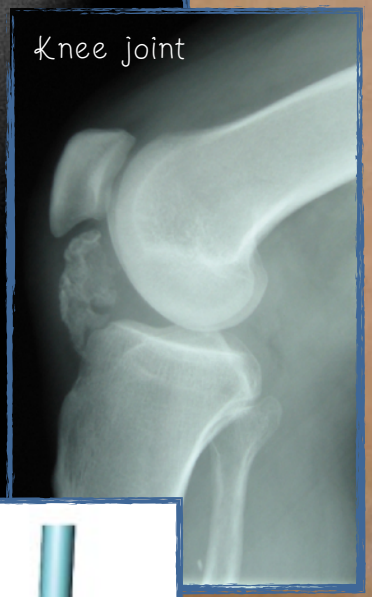
Types of Synovial Joints (Back to menu)

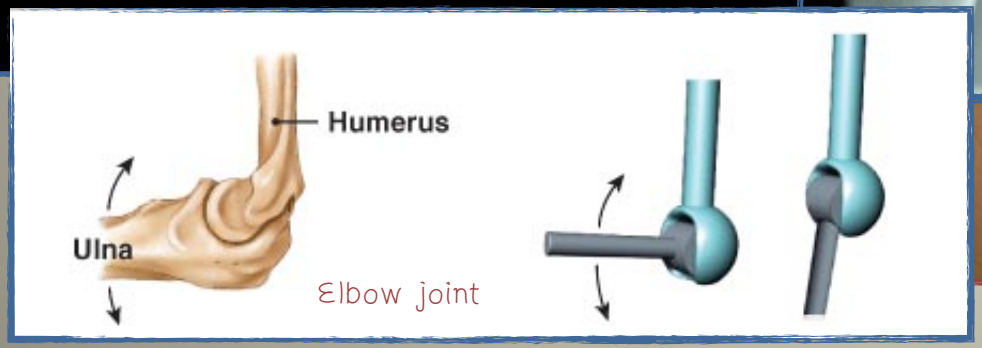
Hinge Joints

Hinge Joints – a bone with a concave surface joins with a bone with a convex surface. Allow only back and forth motion like the hinge of a door.

Examples: Knees, Elbows, Phalanges (fingers)







Next page (Pivot Joints)

Radiology Reference Guide – Chapter 3

Types of Synovial Joints

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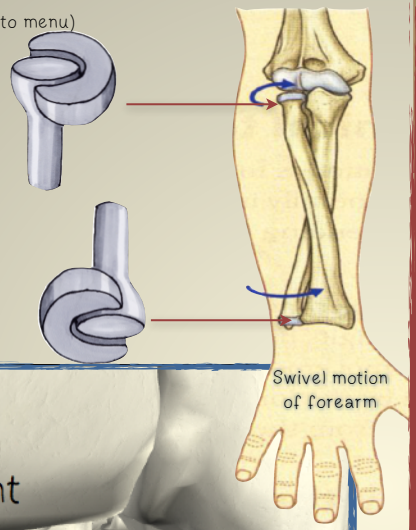
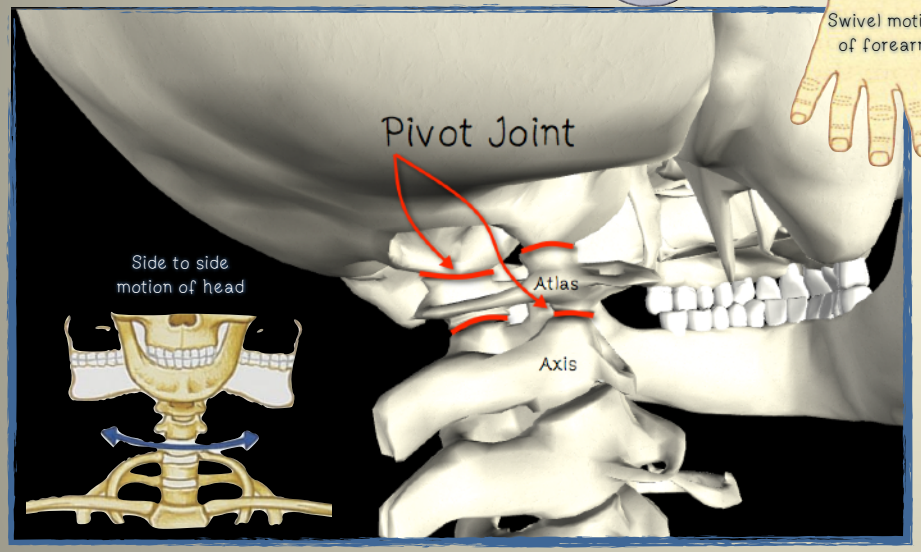
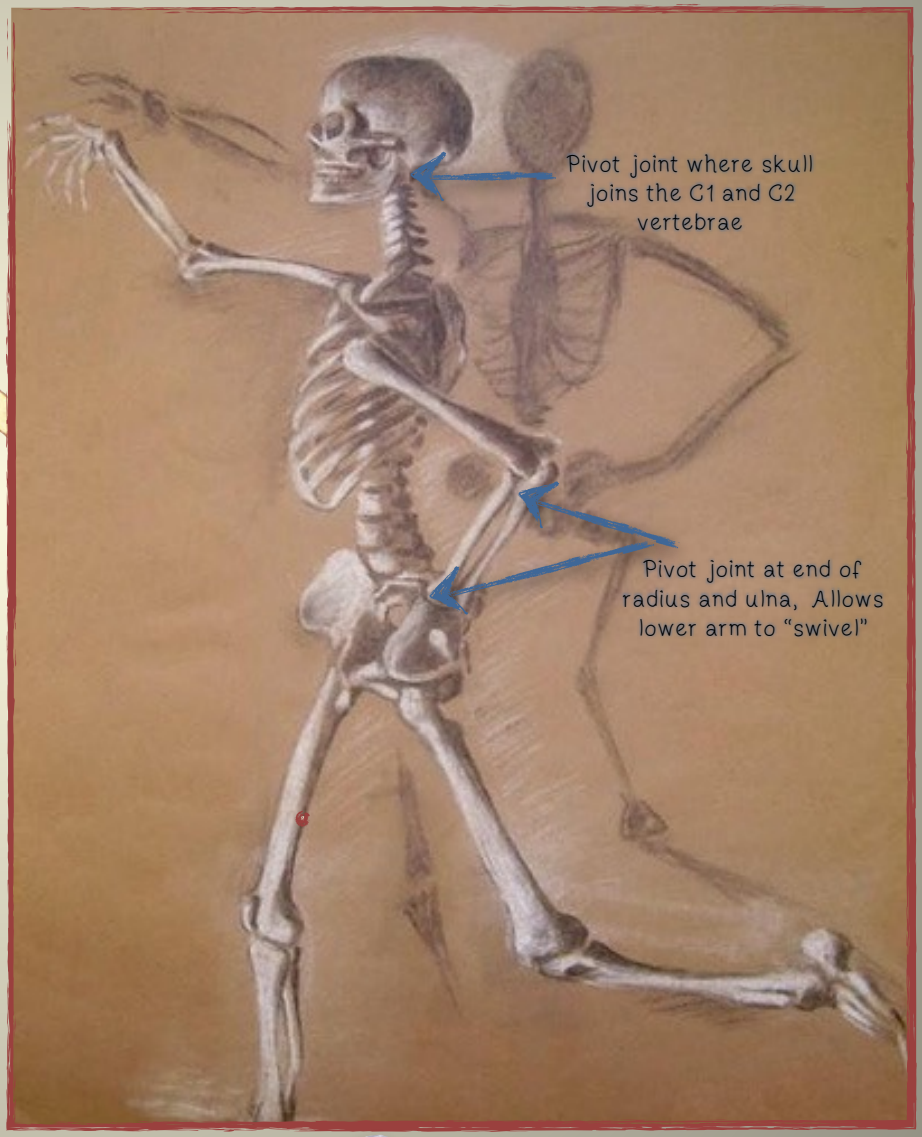
Pivot Joint (Rotary Joint)

Pivot Joint (Rotary Joint) – one bone rotates around another. Only rotary motion is possible.

Examples: Neck, Radius and Ulna







Next page (Ball and Socket Joints)

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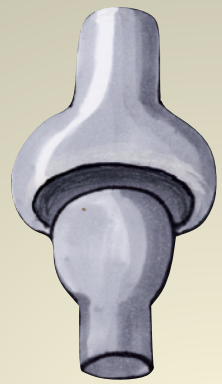
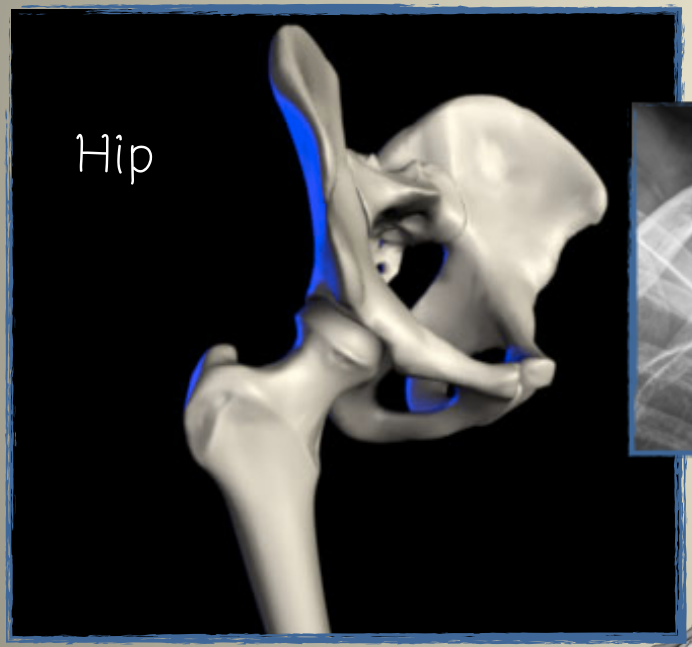
Types of Synovial Joints (Back to menu)

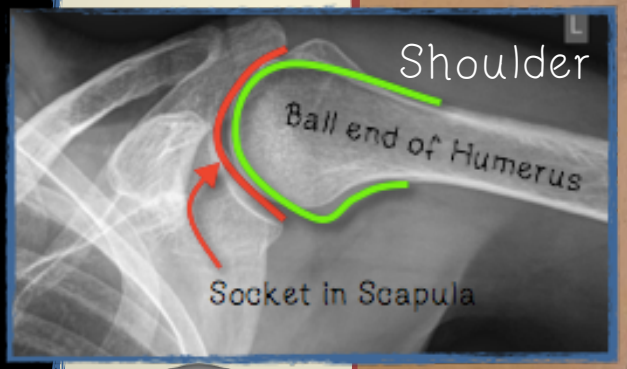
Ball and Socket Joints

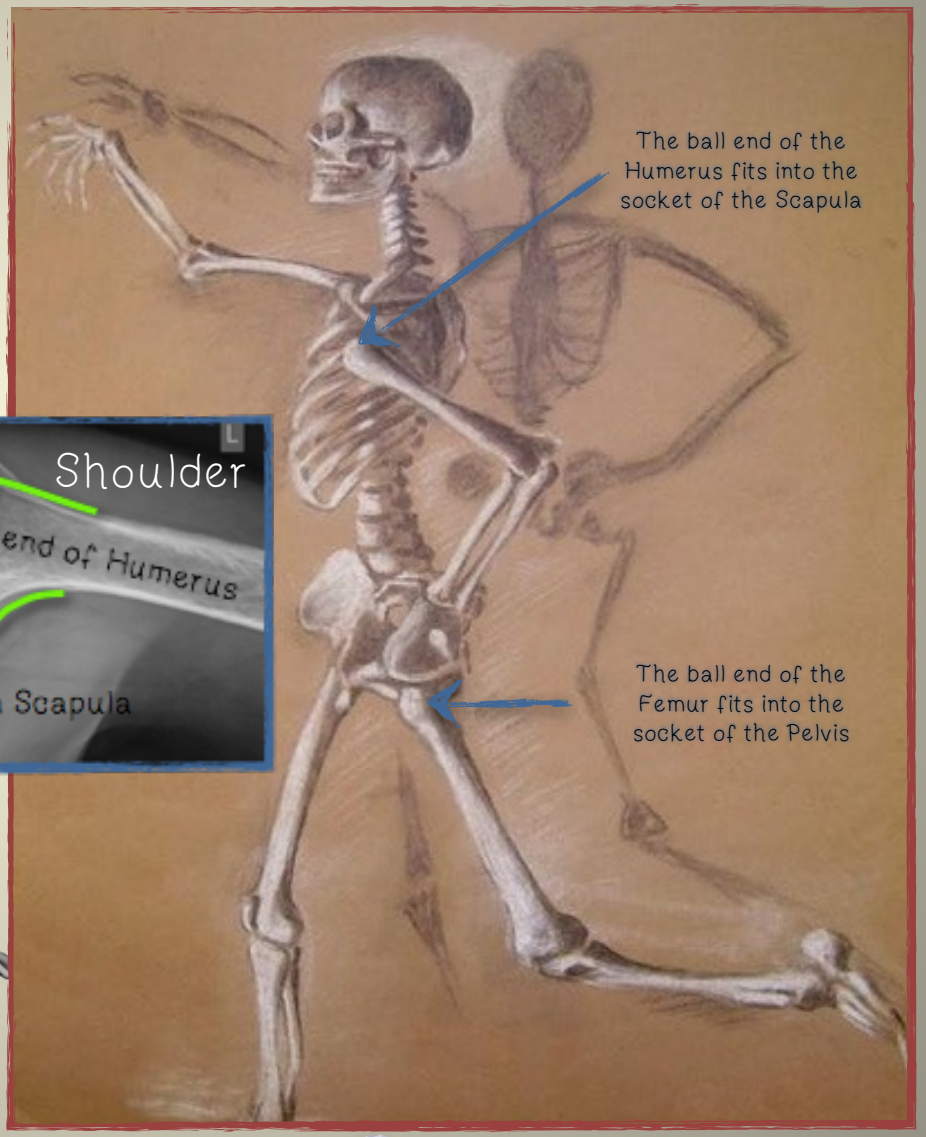
Ball and Socket Joints - A bone with a ball shape fits into a bone with a socket shape.. Allows side to side, back and forth, and rotational movement. This is the most maneuverable type of joint.

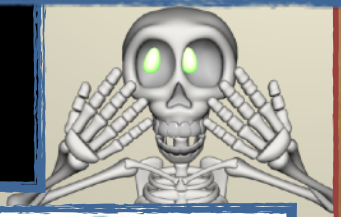
Examples: Shoulder, Hip

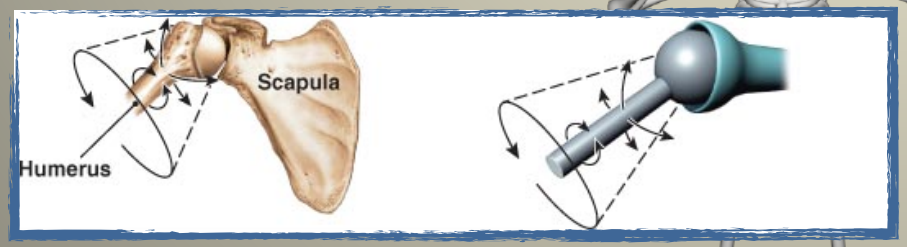








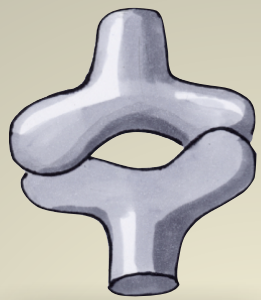


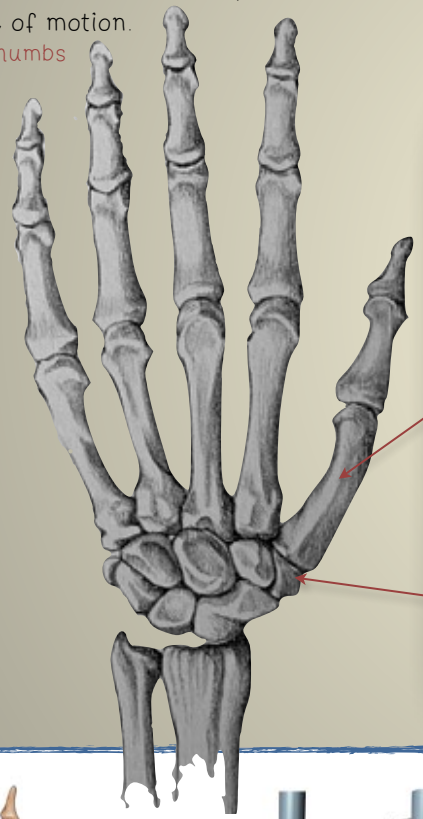


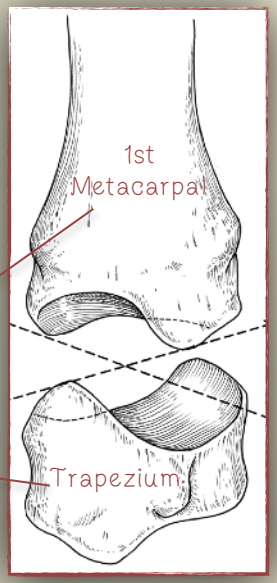
Saddle Joints

Saddle Joints - a bone with a concave surface joins with a bone with a convex surface. Allows for a wide range of motion.

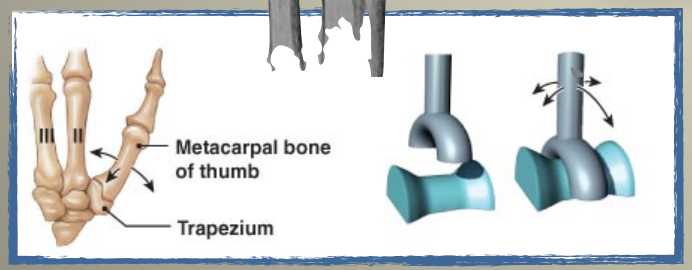
Examples: The Thumbs

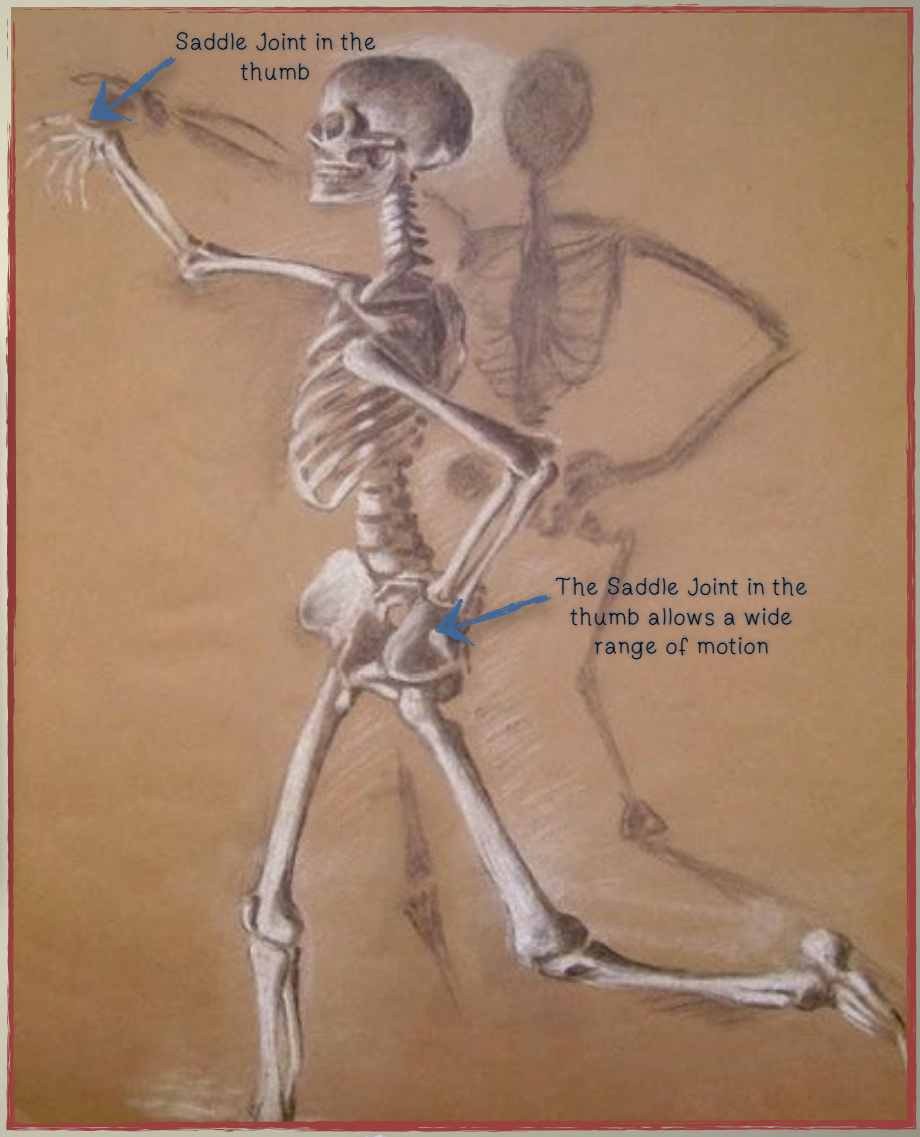






Saddle Joint (in thumb)





Next page (Ellipsoidal Joints)

Radiology Reference Guide – Chapter 3

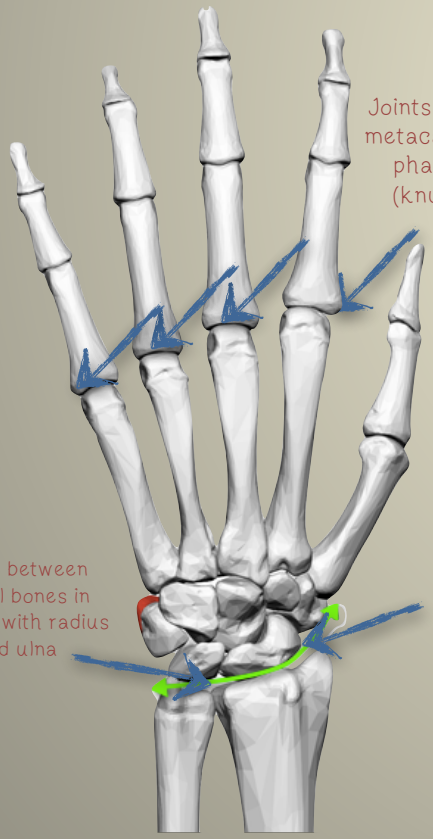
Types of Synovial Joints

(Back to menu)

Ellipsoidal Joints (Condyloid)

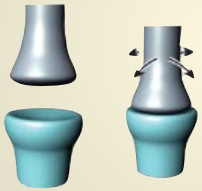
Ellipsoidal Joints (also know as Condyloid Joint) - the oval portion of a bone joins with the matching the oval shaped depression of another bone. Allows for side to side angular motion but does not allow for rotation.

Examples: knuckles of Hands and Feet, Wrist bones (touching radius and ulna), and Ankle bones (touching tibia and fibula)



Joints between metacarpal and phalanges (knuckles)

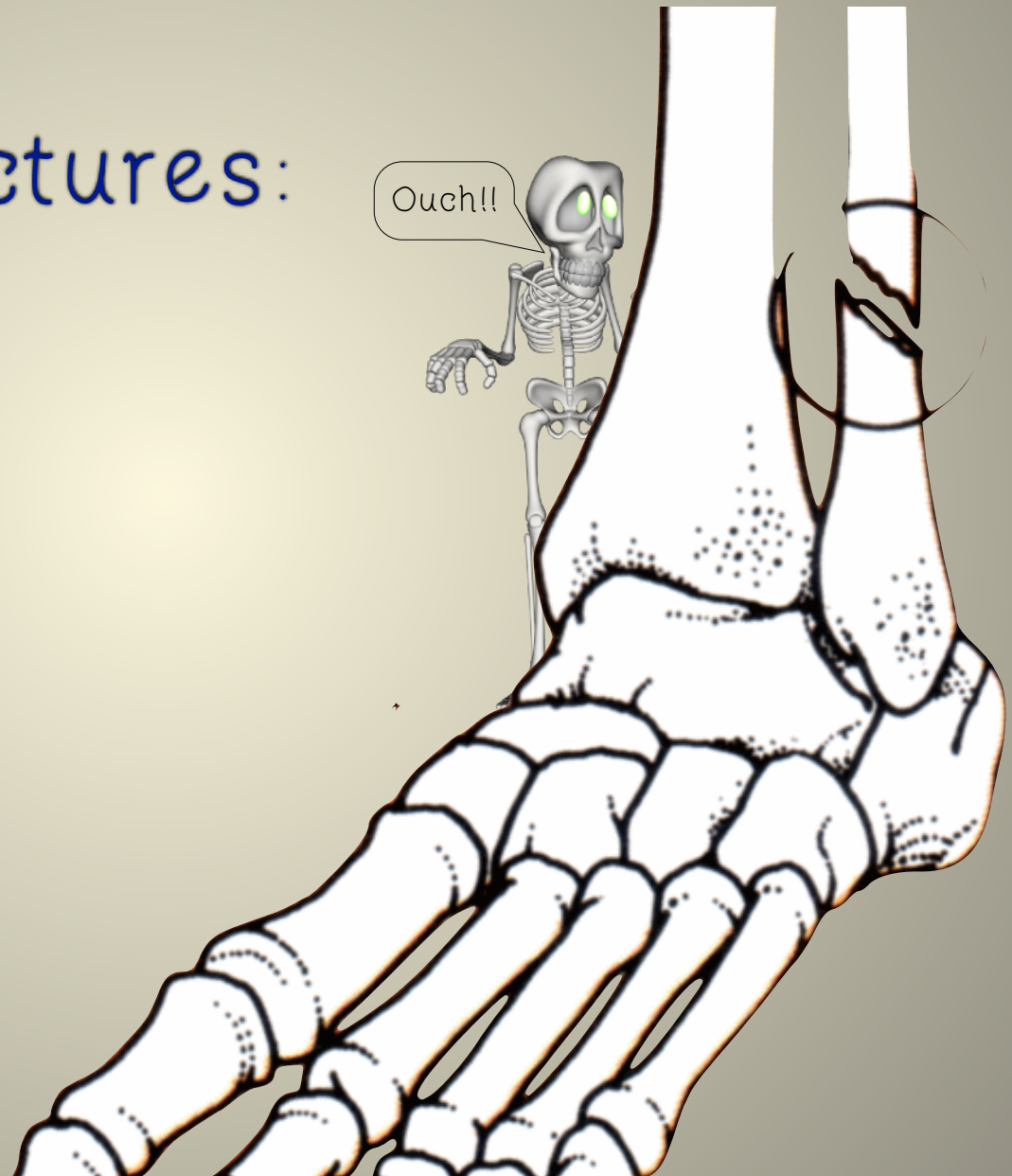
Joints between Carpal bones in contact with radius and ulna



Note: the ankle is actually made of 3 different joints but the "true" ankle joint is a hinge joint

Next page (Chapter 4)

Chapter 4: Fractures:



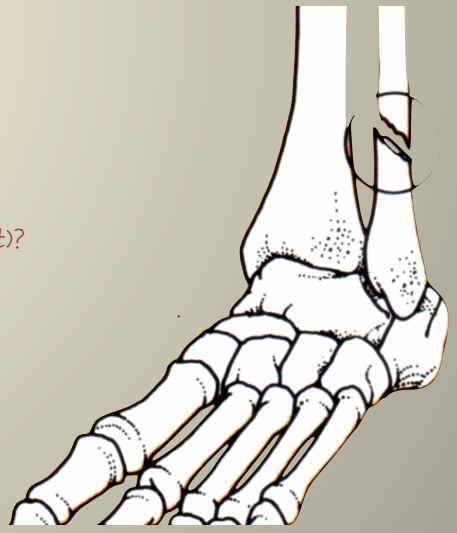
Fractures: General Classification

Although bones are very strong they sometimes break or **Fracture**. Fractures can occur from trauma such as from a fall or car accident (Traumatic Fractures), or they can occur from a disease that weakens the bone such as osteoporosis (Pathologic Fractures). Fractures can also be a result of bone weakness caused by an implant such as an artificial hip joint (Periprosthetic Fractures). Whatever the cause, fractures are classified by several general factors:

Open vs. Closed -Does the bone puncture through the skin?)

Displaced vs. Non-Displaced -Has the bone been moved from it's normal position (Displacement)?

Complete vs. Incomplete -Did the bone break partially or completely?

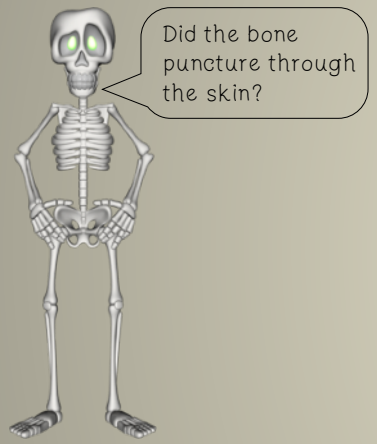


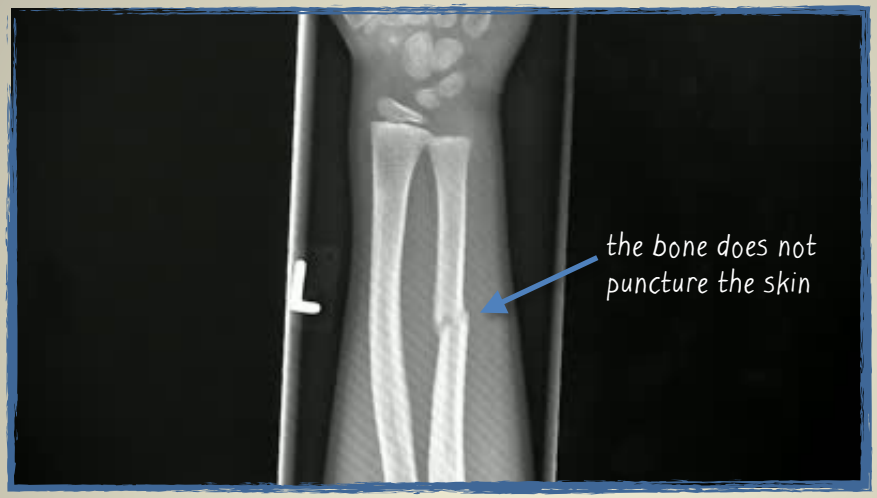
The next few pages will examine these general factors more closely.

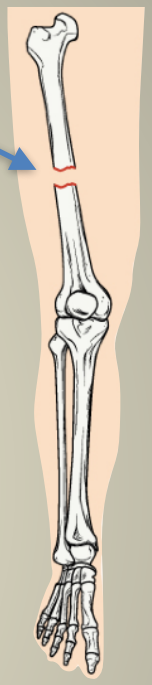
Next page (Open vs Closed Fractures)

Open vs Closed - Does the bone puncture through the skin?

Closed Fracture - a fracture in which the bone does not puncture through the skin







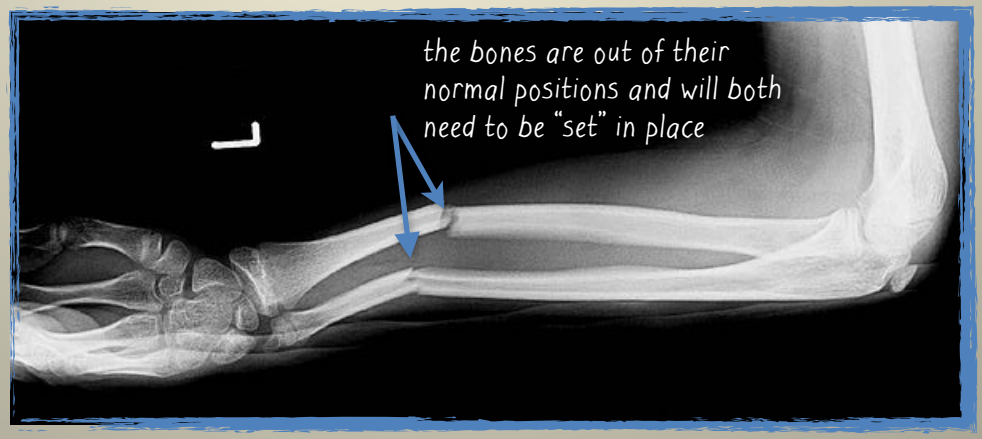
Open (Compound) Fracture - a fracture in which the bone does puncture through the skin

Next page (Displaced vs Non-Displaced Fractures)

Displaced vs Non-Displaced -has the bone been moved from it's normal position?

Non-Displaced Fracture - the bone is still in it's normal position and will not need to be "set"

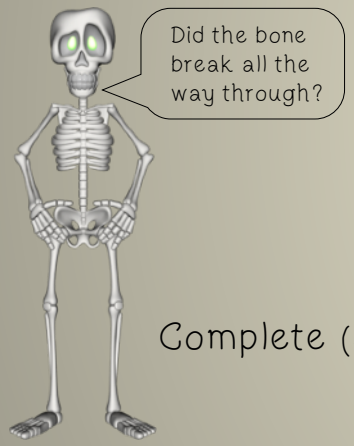
Displaced Fracture - the bone is no longer in it's normal position and will need to be moved or "set" in place.

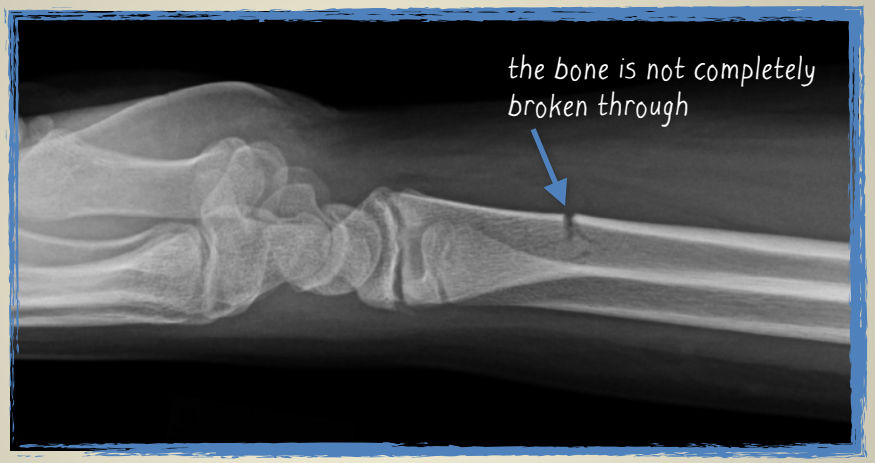


Next page (Complete vs Incomplete Fractures)

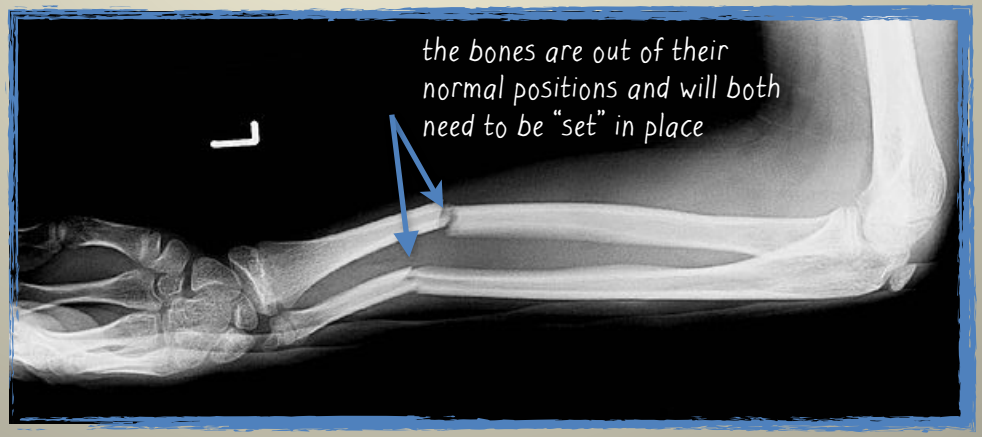
Complete vs Incomplete -Did the bone break partially or completely?

Incomplete Fracture - the bone is cracked or not completely broken. It is still partially joined together



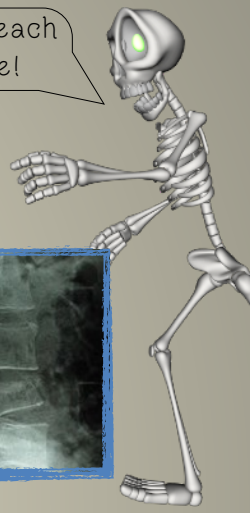


Complete (Simple) Fracture - the bone is broken completely through. The parts are separated.



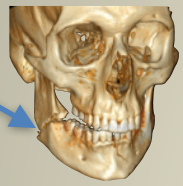
Next page (Specific Types of Fractures)

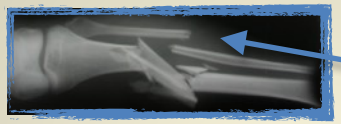
Specific Types of Fractures



Fractures are further classified by the way the bone has broken (fracture pattern) and the specific bone that has broken. There are many, many specific fracture types that are often named after the original doctor(s) that first described them. The following are some common fractures: (click each to read more)

Linear Fracture
page 30





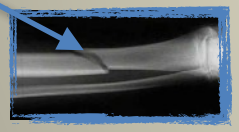
Comminuted Fracture
page 35

Compression Fracture
page 39

Transverse Fracture
page 31

Impacted Fracture
page 36

Oblique Fracture
page 32

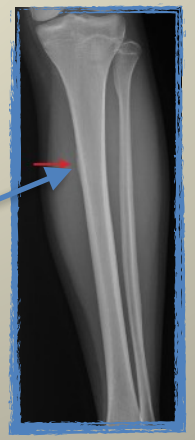


Avulsion Fracture
page 37

Greenstick Fracture
page 40

Spiral Fracture
page 33

Hairline / Stress Fracture
page 38

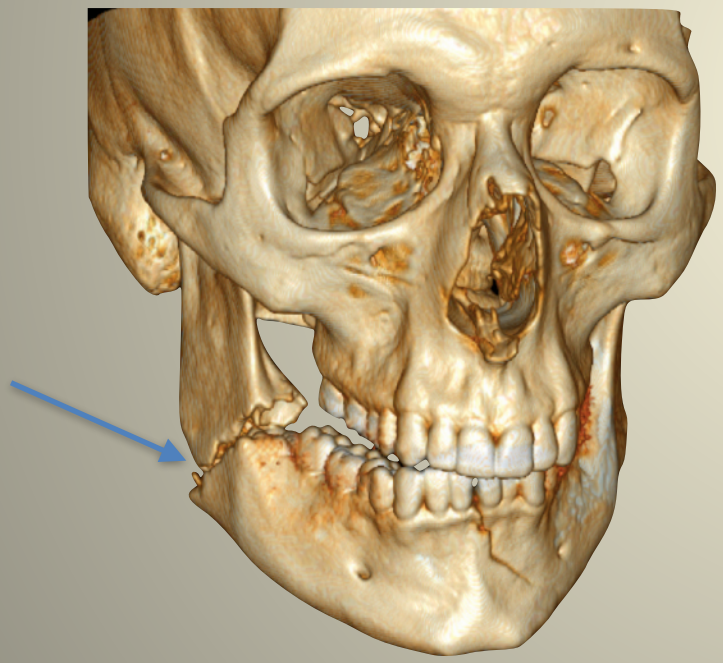


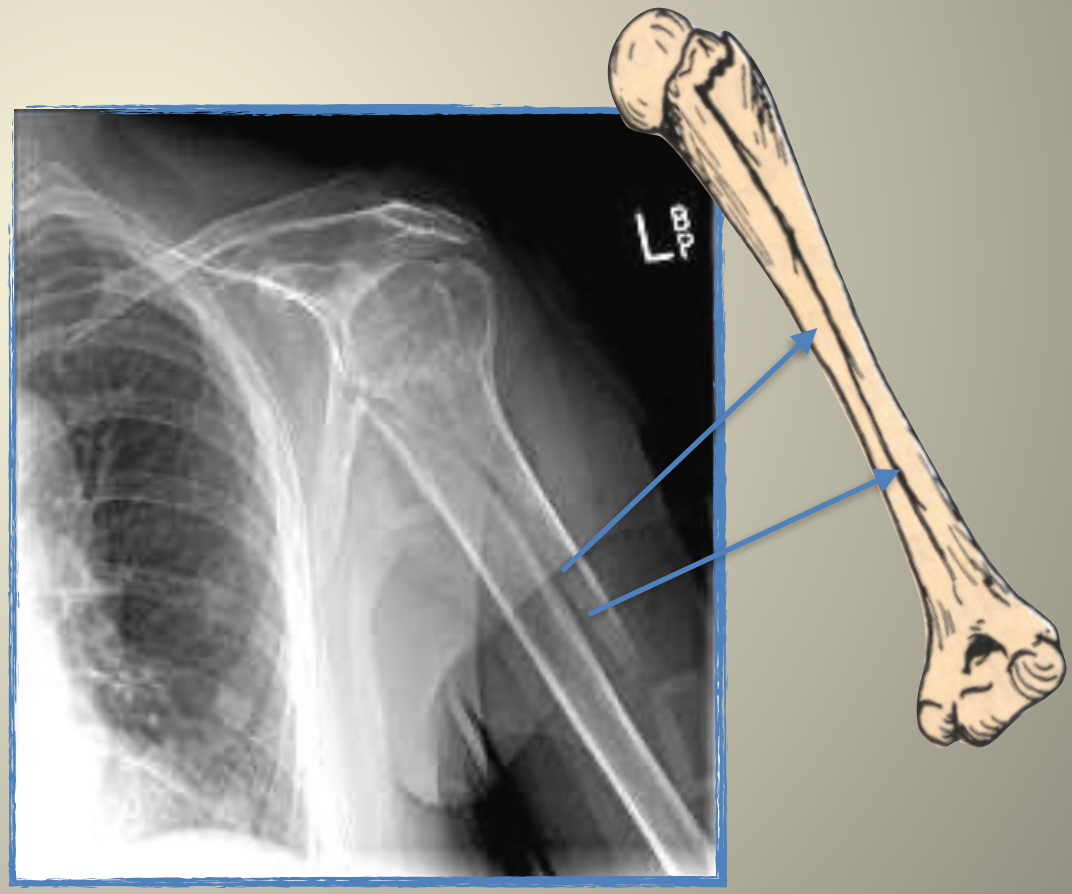
Torus (Buckle) Fracture
page 41

Segmental Fracture
page 34

Linear Fracture

The bone has broken along the length of bone (parallel to the long axis). Also called a Fissured or Longitudinal fracture.

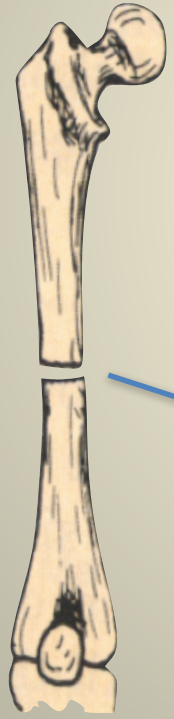




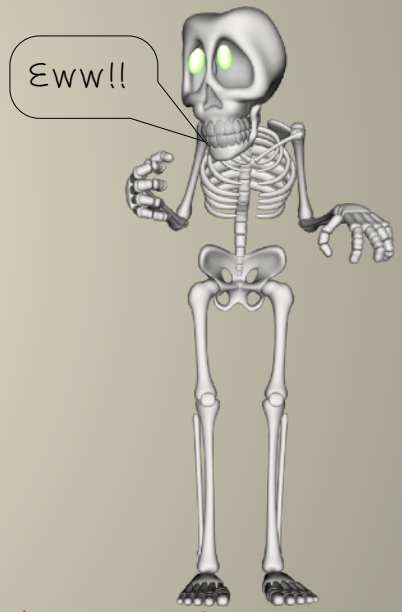
Next page (Transverse Fracture)

Transverse Fracture

The bone has broken across the width of the bone (at a right angle to the length of the bone).



a transverse fracture is broken across the width of the bone.

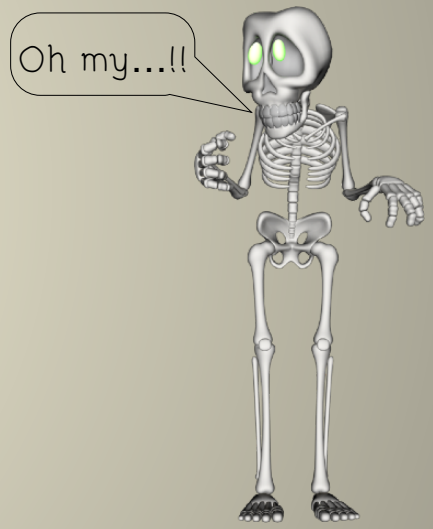


Note: this transverse fracture is also a displaced fracture because the bone has moved from it's normal position and will need to be "set" in place.

Oblique Fracture

The bone has broken diagonally across the bone.

an oblique fracture is broken diagonally across the bone.



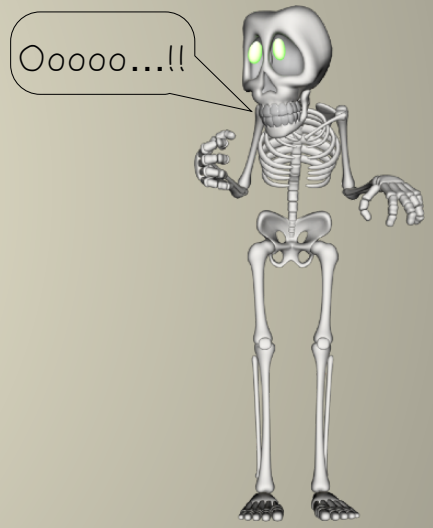
Note: this oblique fracture is also a displaced fracture because the bone has moved from it's normal position and will need to be "set" in place.

Next page (Spiral Fracture)

Spiral Fracture

The bone has broken (or cracked) in circular pattern around the bone. This type of injury is caused by a twisting motion.

a spiral fracture is broken in a circle around the bone (caused by a twisting motion).



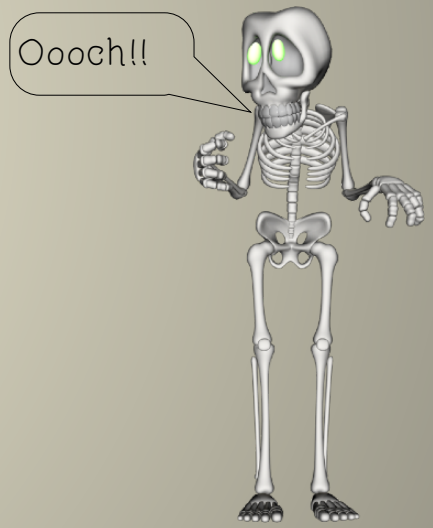
Note: this spiral fracture is also a displaced fracture because the bone has moved from it's normal position and will need to be "set" in place.

Next page (Segmental Fracture)

Segmental Fracture

The bone has broken in two places in the same bone.

a segmental fracture is broken in two places in the same bone.

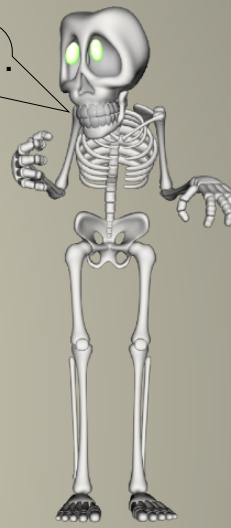


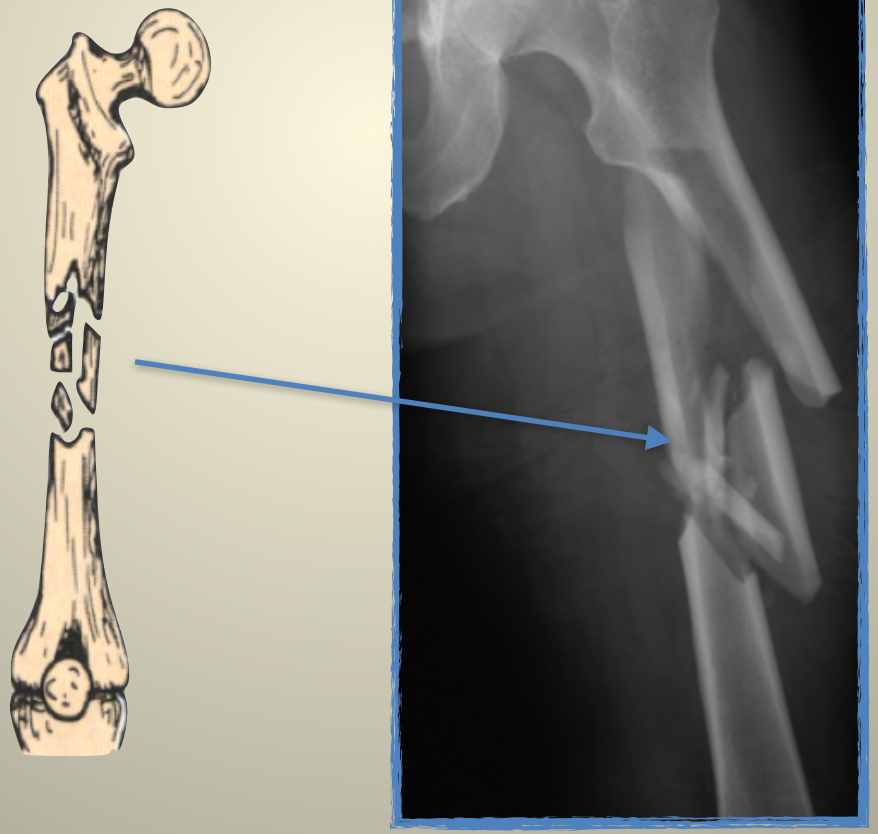
Note: this segmental fracture is also a displaced fracture because the bone fragment has moved from it's normal position and will need to be "set" in place.

Next page (Comminuted Fracture)

Comminuted Fracture

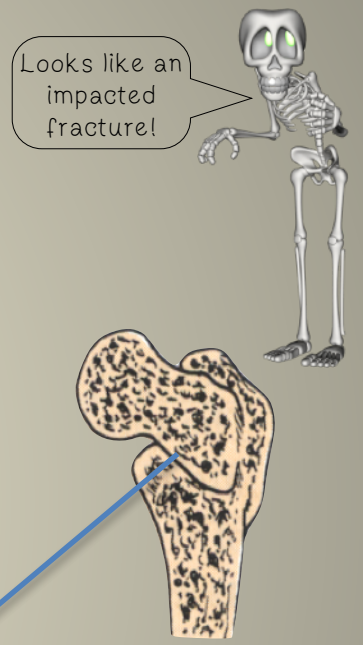
The bone has broken into several pieces or fragments.





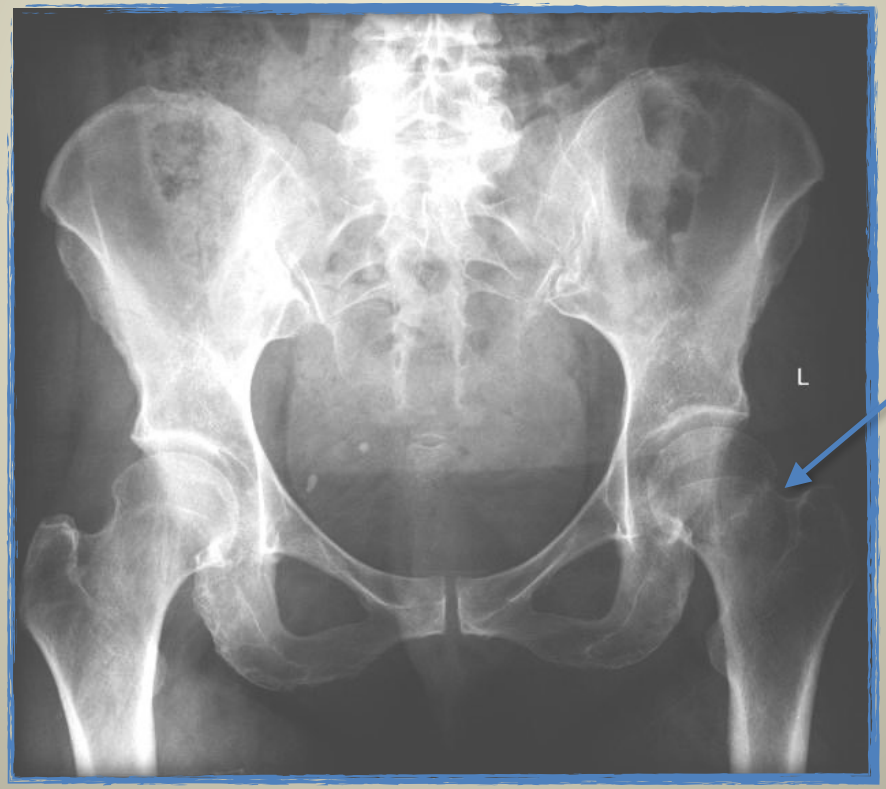
a comminuted fracture is broken into several pieces or fragments

Note: this comminuted fracture is also a displaced fracture because the bones have moved from their original position and will need to be "set" in place.



Impacted Fracture

The bone has broken into fragments that have been driven into one another.

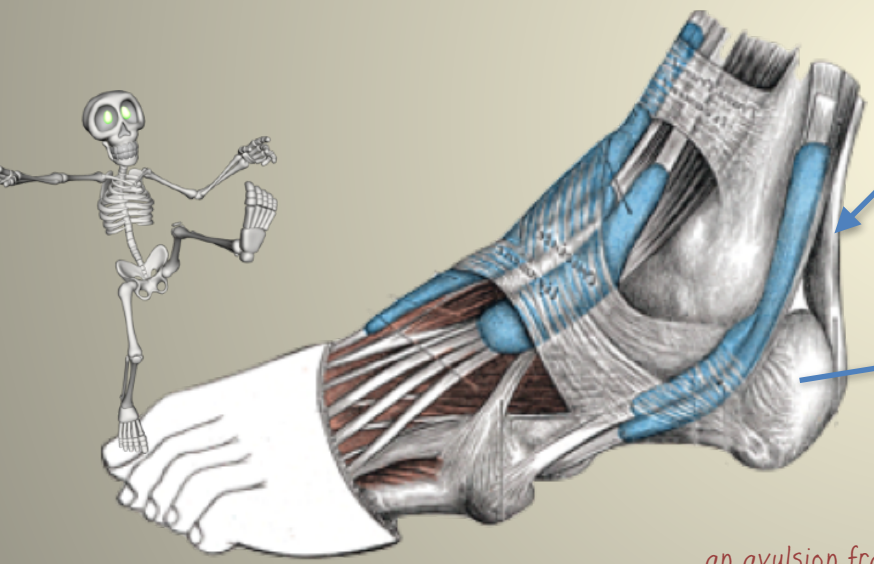


Note: this impacted fracture is also a displaced fracture because the bone has moved from it's original position and will need to be "set" in place. In elderly patients, a hip replacement would be recommended.

an impacted fracture has bone fragments driven into one another. Here the head of the femur is the site of the fracture.

Avulsion Fracture

A piece of bone has broken and separated from the main body of the bone. Usually it is attached to a ligament or tendon.



Tendo calcaneus (tendon)

an avulsion fracture has a bone fragment(s) separated from the main body of bone (usually the bone fragment is still attached to a tendon)

Next page (Hairline / Stress Fracture)

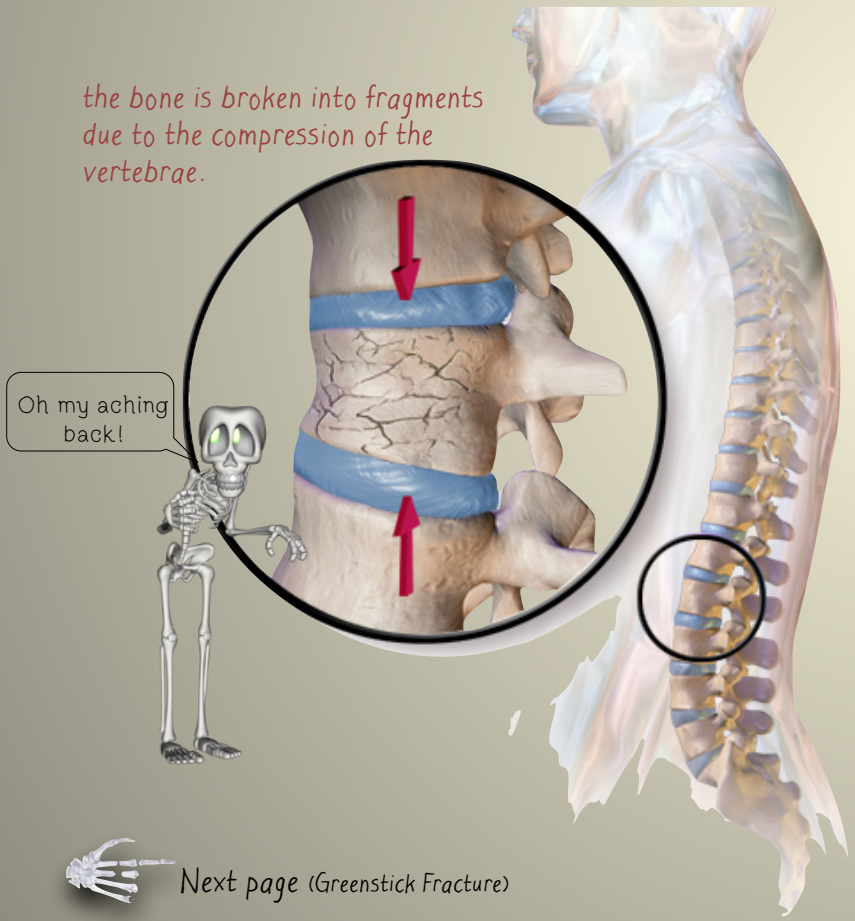
Hairline / Stress Fracture

The bone is cracked in a thin line that is often difficult to see on an X-ray. If the fracture occurred gradually over time it is called a Stress fracture.

a hairline fracture can be difficult to see on an X-ray. Sometimes it is not visible until after it has healed.

Compression Fracture

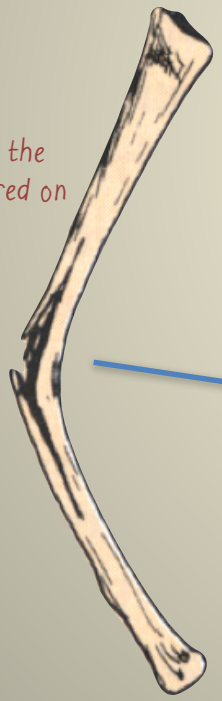
The bone is compressed out of shape. It may be squeezed out of shape or broken into fragments.



Next page (Greenstick Fracture)

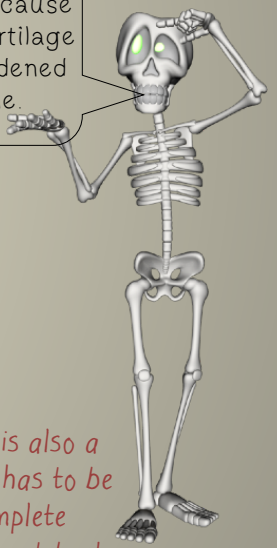
Greenstick Fracture

A Greenstick fracture is common in children with soft, bendable bones. The bone breaks and splinters on one side but not the other. The bone is usually visibly bent (the appearance is similar to that of a soft tree branch that has been bent and splintered).



with a greenstick fracture, the bone is bent and is splintered on one side but not the other.

The bones of children are soft and bendable because they have a lot of cartilage that has not yet hardened into compact bone.

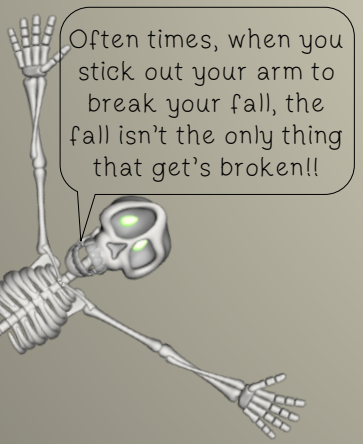


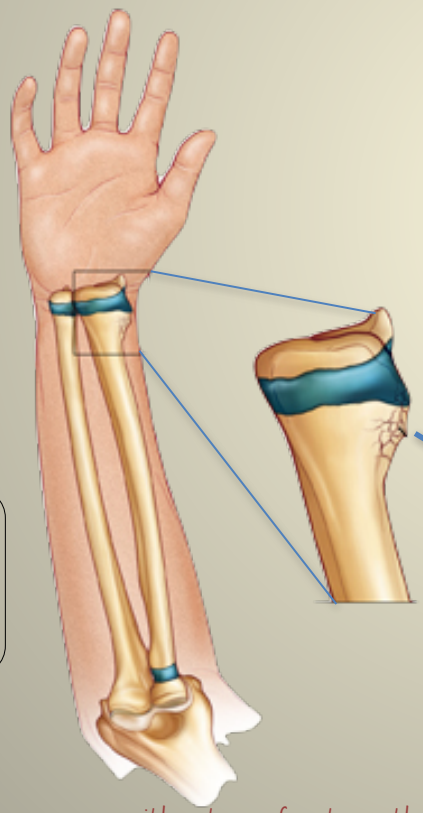
a greenstick fracture is also a displaced fracture (it has to be set) and it is an incomplete fracture because it is not broken all of the way through.

Next page (Torus (Buckle) Fracture)

Torus (Buckle) Fracture

Also common in children. a Torus or Buckle fracture forms when one side of the bone bends causing a bulge or "buckle" to form on one or both sides of the bone.



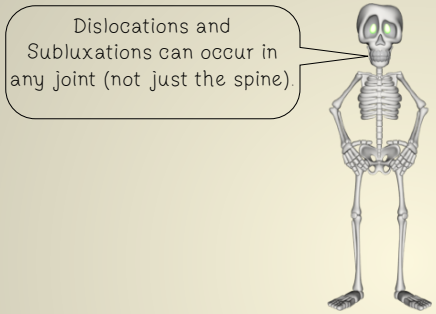


with a torus fracture, the is bone is bent and a bulge or "buckle" forms on one or both sides of the bone.

a torus fracture is also a an incomplete fracture because it is not broken all of the way through.

Next page (Chapter 5)

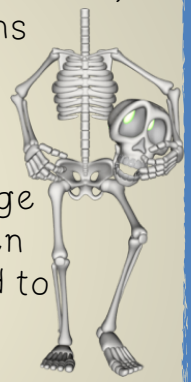
Chapter 5: Spine and Joint Conditions

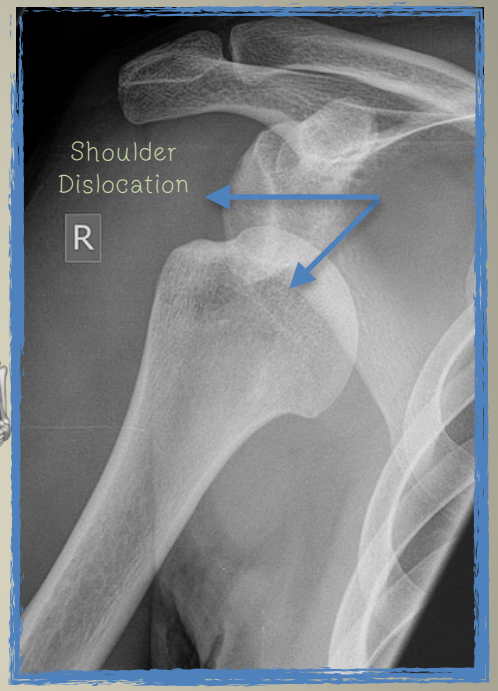


Radiology Reference Guide - Chapter 5

Dislocation

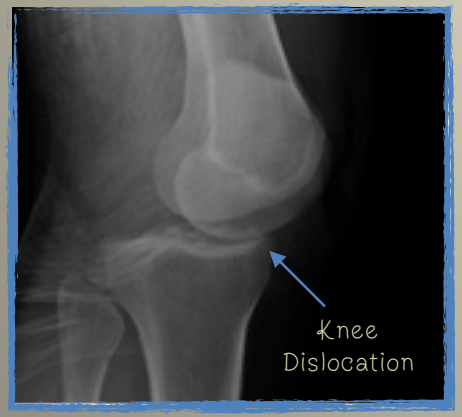
A **Dislocation** occurs at a joint when two or more bones are moved out of their normal position. Usually, a sudden force from a blow or a fall is required for a joint to become dislocated. Some people, however, have a condition in which one or more joints will become easily dislocated. Often, surgery to shorten the ligaments (connect bone to bone) and/or tendons (connect muscle to bone) will make the joint more stable.

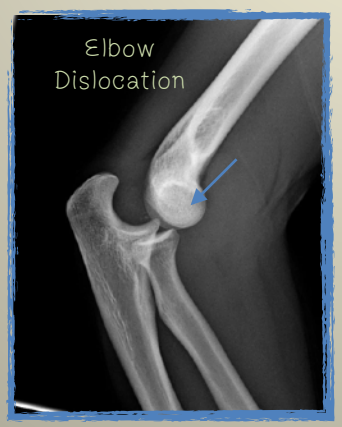


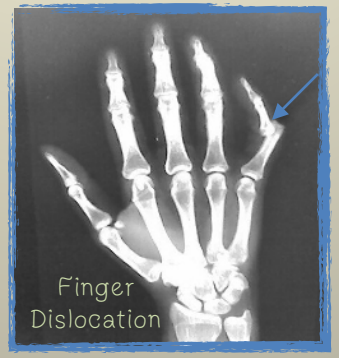


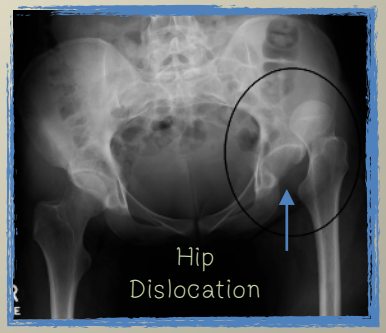
X-rays are usually taken to better understand the extent of the damage and to determine the treatment. Sometimes there is damage to ligaments, tendons, muscles or even the bones (fractures). When the bones are manipulated back into position, the dislocation is said to be "reduced".

Although any joint can be dislocated, the most common dislocation is to the shoulder followed by the knees, elbows, wrists, fingers, hips, and ankles.







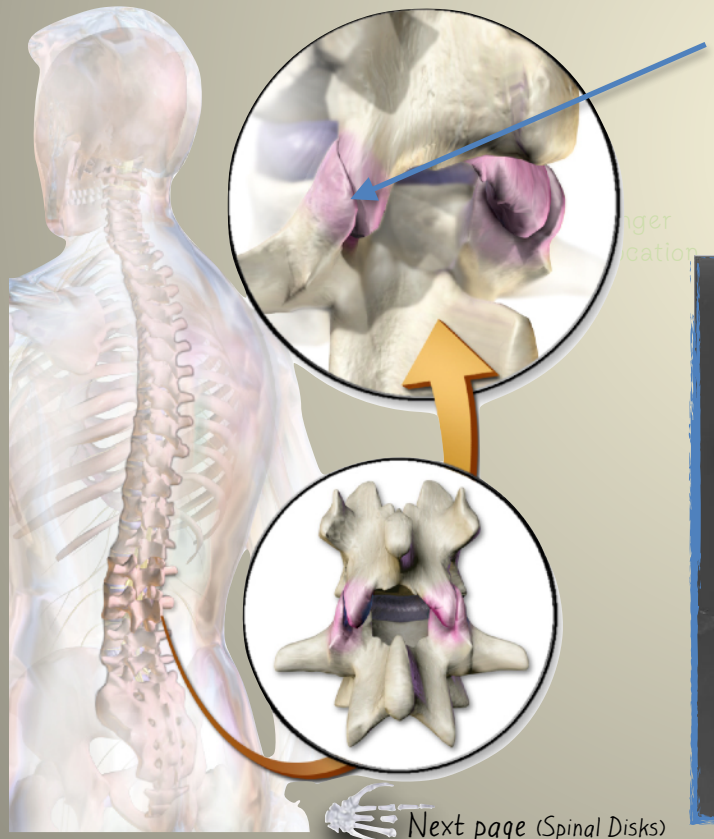


Next page (Subluxation)

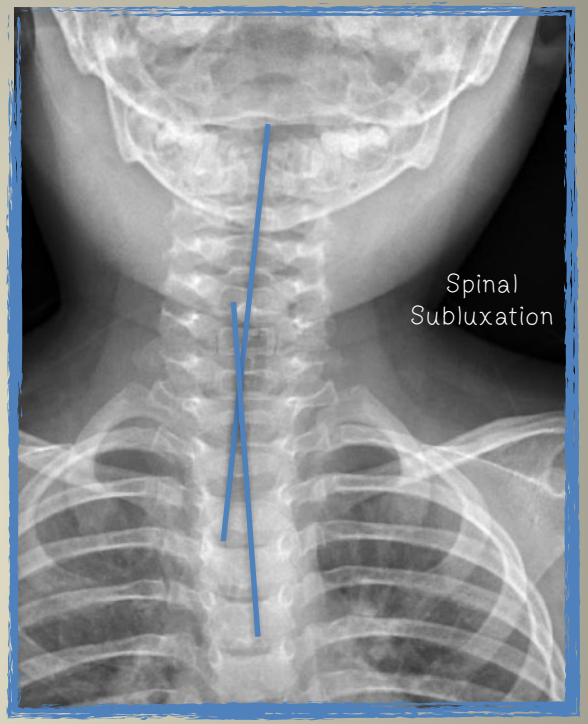
Radiology Reference Guide - Chapter 5

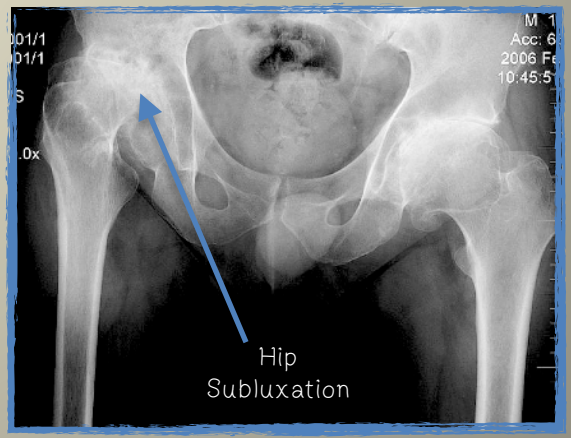
Subluxation

A **Subluxation** is a partial or incomplete dislocation of a joint. A Medical Subluxation refers to more serious structural displacements whereas a Chiropractic Subluxation refers to less serious displacements of the spinal vertebrae. Usually a subluxation requires manipulation to reposition the bones but in more serious cases, surgery is needed.



a spinal subluxation exists when the normal joint is slightly out of place. Here the facets of the vertebrae of the lumbar spine are not properly aligned.



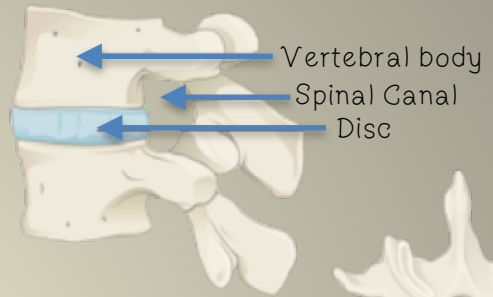


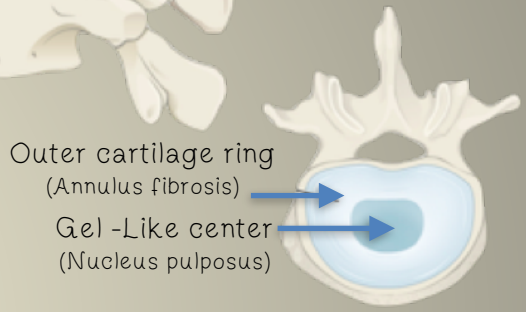
Next page (Spinal Disks)

Radiology Reference Guide – Chapter 5

Intervertebral Discs

Except for the first cervical vertebra (the atlas) there is an Intervertebral Disc located between each pair of vertebrae. All together, there are 23 discs in the human spine: 6 in the neck (cervical), 12 in the middle back (thoracic), and 5 in the lower back (lumbar). The discs act as shock absorbers and allow for slight independent movement of the spinal column. Each disc is made of an outer ring of cartilage and a gel-like center (nucleus pulposus). Normal X-rays will not show the discs but will show the disc space. Special X-rays called use a dye to make the disc visible. MRI (Magnetic Resonance) scans are the best way to see discs.



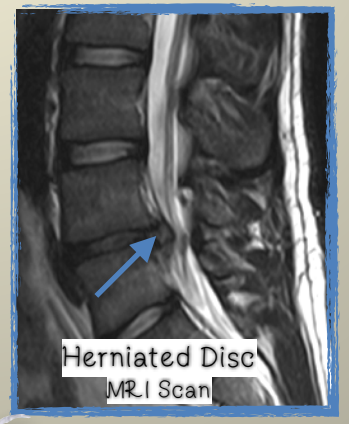


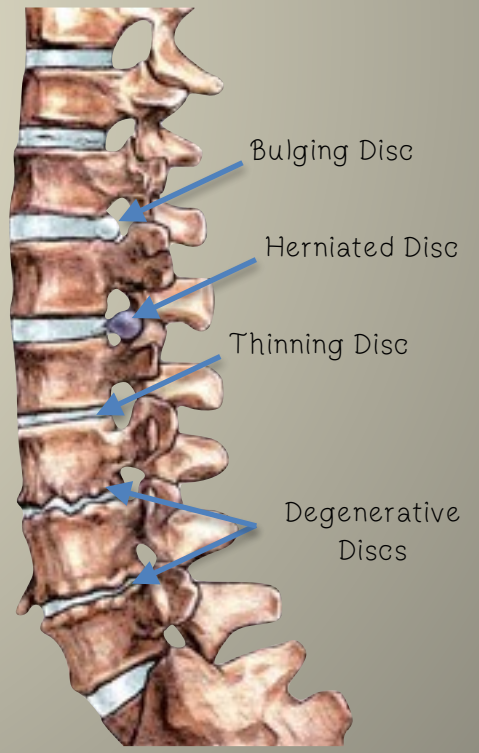
Bulging Disc

A **Bulging Disc** occurs when the outer cartilage ring (annulus fibrosis) of a disc is slightly flattened and and a small bubble has squeezed out beyond the vertebra and into the spinal canal (see diagram above). The bulging disk may eventually rupture or herniate.

Herniated or Ruptured Disc

A **Herniated or Ruptured Disc** occurs when the outer ring of the disc breaks open and the inner gel-like center squeezes out into the spinal canal. This is a more serious condition than a bulging disc and will often result in severe pain. Treatment ranges from rest, to physical therapy, medication, or even surgery.





Thinning Disc

A **Thinning Disc** occurs with age as water and protein is lost from the disc. . An X-ray will identify the reduced disc space between vertebrae.

Degenerative Disc

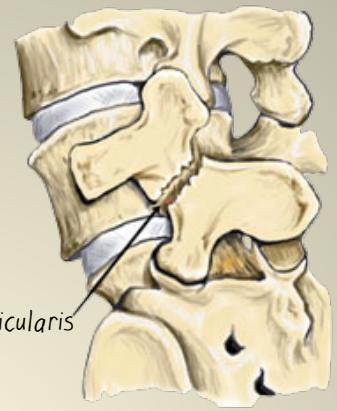
A **Degenerative Disc** occurs as discs continue to thin and bone spurs form on the vertebral body. These bone spurs (osteophytes) can put pressure on the spinal nerves causing pain. Surgery is an option.

Next page (Spondylolisthesis)

Radiology Reference Guide - Chapter 5

Spondylolysis (spon-dee-LOW-lye-sis)

A **Spondylolysis** occurs when the bones that connect two vertebra (pars interarticularis) break or fracture. The vertebra are no longer stable and are at risk of shifting out of place. This usually occurs at the 5th lumbar vertebra and may be a result of stress caused by overuse or it may be due to a hereditary weakness of the bone.

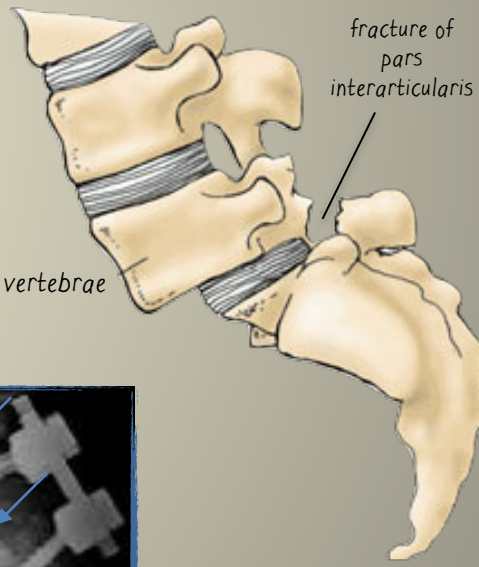


Spondylolysis

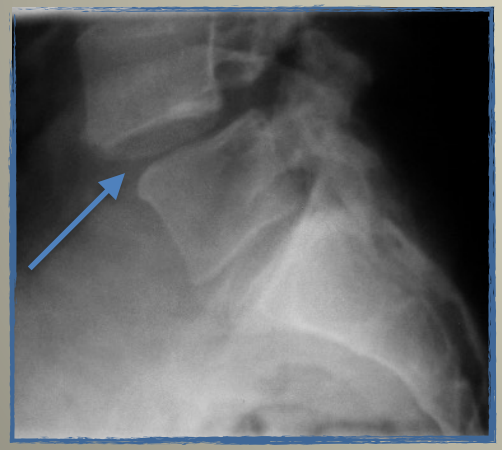
2nd degree spondylolisthesis (MRI image)

Spondylolisthesis (spon-dee-LOW-lis-thee-sis)

A **Spondylolisthesis** occurs when a spondylolysis weakens the bone so much that it is unable to maintain its proper position. The vertebra above the fracture will slip forward and often put pressure on spinal nerves causing pain. A spondylolisthesis is described according to the amount or degree of slippage. It is usually repaired with Spinal Fusion surgery.

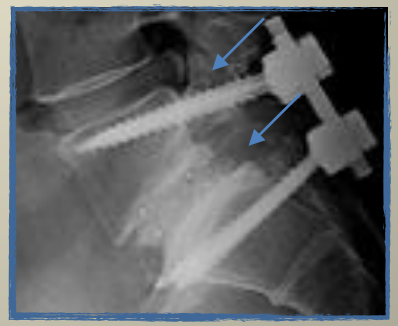


Spondylolisthesis



1st degree spondylolisthesis

2nd degree spondylolisthesis



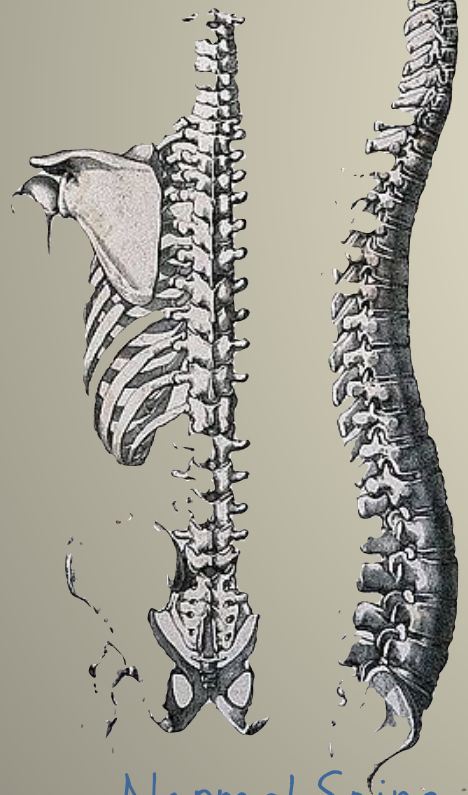
spinal fusion repair

Next page (Scoliosis)

Radiology Reference Guide - Chapter 5

Scoliosis (sko-lee-O-sis)

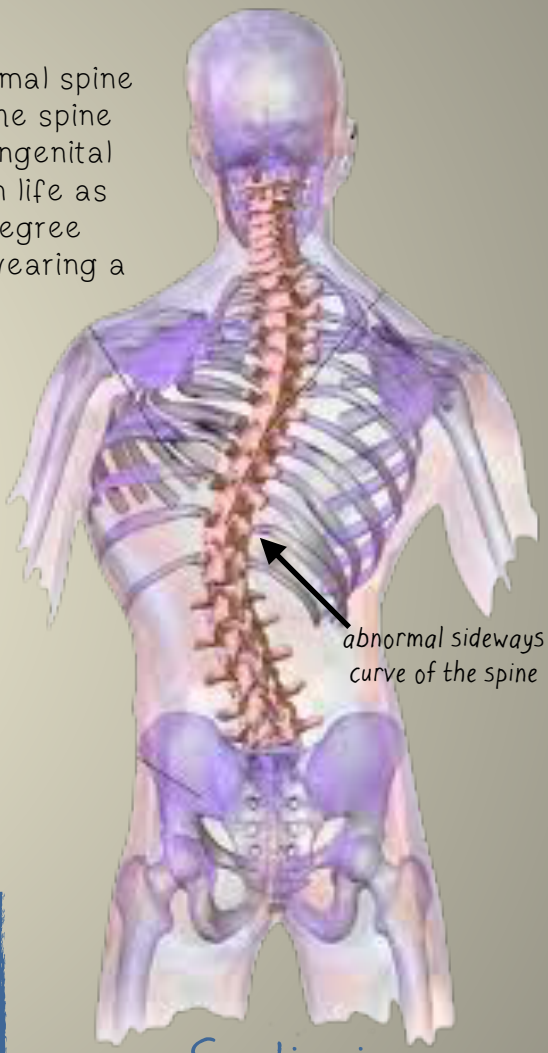
Scoliosis is an abnormal sideways curve of the spine. When viewed from the side a normal spine has an s-shaped curve but it is straight when viewed from the behind. With scoliosis, the spine is abnormally curved laterally (sideways) when viewed from behind. Scoliosis can be congenital (from birth) but most cases develop during childhood. Scoliosis can also develop later in life as the bones in the joints degenerate. Scoliosis can me minor to severe depending on the degree and complexity of the curvature. Treatment ranges from observation in mild cases to wearing a back brace to surgery in the most severe cases.



Normal Spine

Scoliosis
(befor surgery)

After surgery



Scoliosis
(back view)

Next page (Chapter 6)

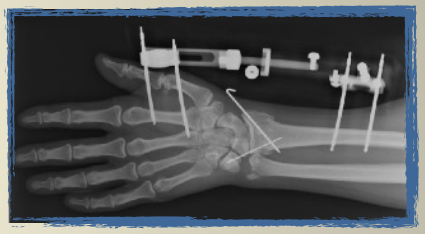
Radiology Reference Guide

With simple closed fractures, doctors can often set (reduce) the bone into position without surgery. A cast is then applied to keep the bones in position while they heal. In more serious injuries, however, surgery is required. There are two main categories of surgery:

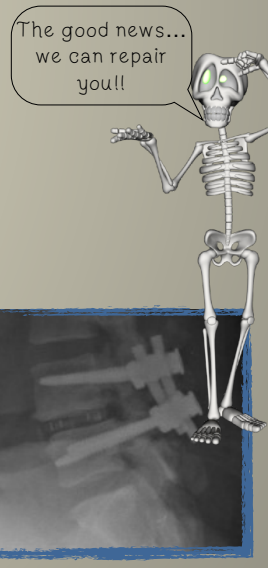
Non-surgical cast

Chapter 6: Surgical Techniques

External Fixation (the use of hardware that fits outside of the skin) page 49



External Fixator



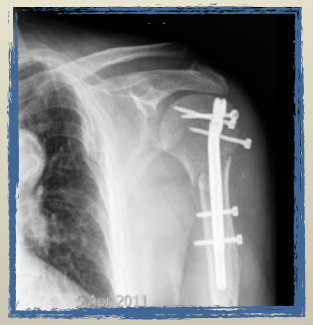
Open Reduction and Internal Fixation (the use of hardware attached underneath the skin) page 50

Types of Internal Fixation:

- Pins page 51
- Plates and Screws page 52
- Rods and Nails page 53
- Dynamic Hip Screw page 54
- Spinal Fusion Rods and Screws page 55

Pins

Plates and Screws

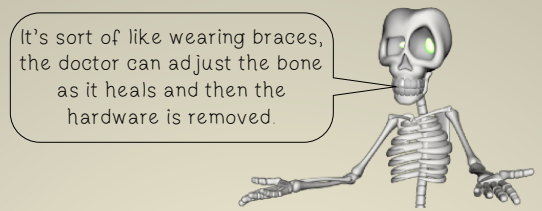


Rods

Nails

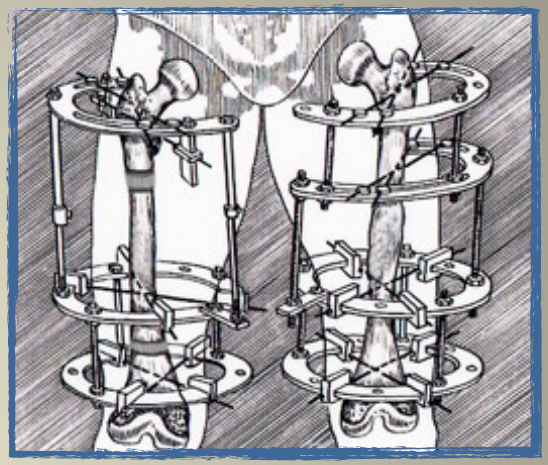
Dynamic Hip Screw

Spinal Fusion

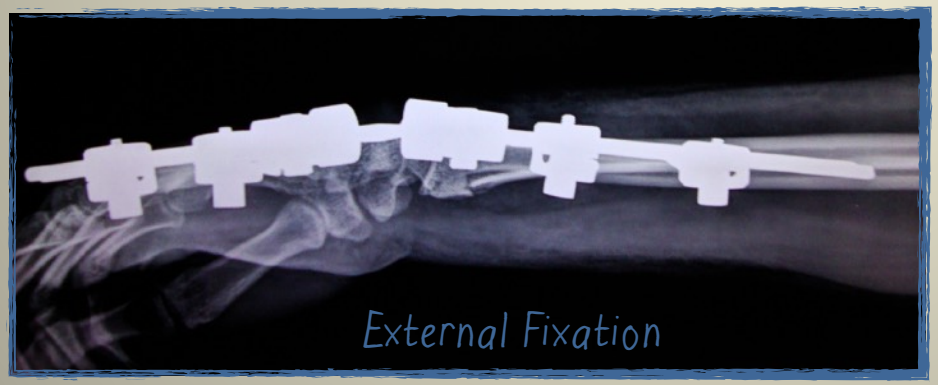


External Fixation

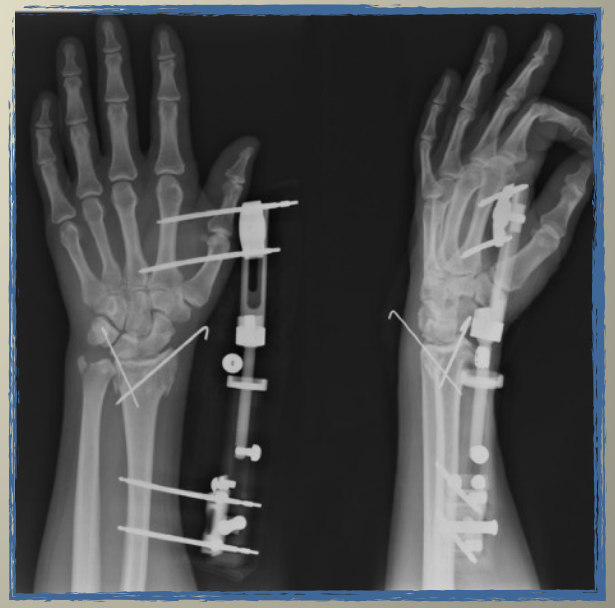
External Fixation refers to the use of hardware that fits outside of the skin. Metal pins or screws are first placed into the bone and then connected to a metal bar or ring (external fixator) that attaches to the outside of the skin. The external hardware will stabilize the bone until it heals. This hardware will later be removed. Some external fixation is very complex allowing doctors to adjust the length of a bone as it heals. This is often used where a comminuted fracture has so badly damaged a bone that new bone needs to grow to fill in the space. Sometimes followup surgery is needed after the external fixation hardware is removed.



Ilizarov apparatus



External Fixation



External Fixation w/pinnings

Next page (Open Reduction and Internal Fixation)

Open Reduction and Internal Fixation

Sometimes broken bones require the attachment of special hardware underneath the skin.(directly to the bone). Open Reduction refers to surgically setting (reducing) the bones back in place while Internal Fixation refers to the use of hardware attached directly to the bone (under the skin). There are a variety of hardware options depending upon the specific type and seriousness of the injury. Click on each below for more detail.

Types of Internal Fixation Hardware:

Pins

Pins or K-wires that are placed into the bone and extend outside of the skin.

Plates and Screws

Dynamic Compression plates are placed across a fracture and screwed to each side of the bone.

Rods and Nails

Intermedullary Rods and Nails are placed into the soft center of long bones. Nails are stronger than Rods and are usually attached with interlocking screws for greater strength.

Dynamic Hip Screw

Dynamic Hip Screws attach the femur to the broken neck (ball shaped end that fits into the pelvis).

Spinal Fusion Rod and Screws

Spinal fusion surgery is used to temporarily stabilize vertebrae of the spine to give bone from a bone graft time to heal..

A Broken Broken Hip

This patient fell and broke her hip. Six months later she fell again and broke the Dynamic Hip Screw from the first repair!

Next page (Pins)

Radiology Reference Guide – Chapter 6

Types of Internal Fixation Hardware

(Back to menu)

Pins

Pins or K-wires that are placed into the bone and extend outside of the skin. After 4-6 weeks, these pins are easily removed at the doctor's office.

Right Ulna Fracture
before surgery

Right Ulna Repair
after surgery

Metacarpal repair
(Boxer's Fracture)

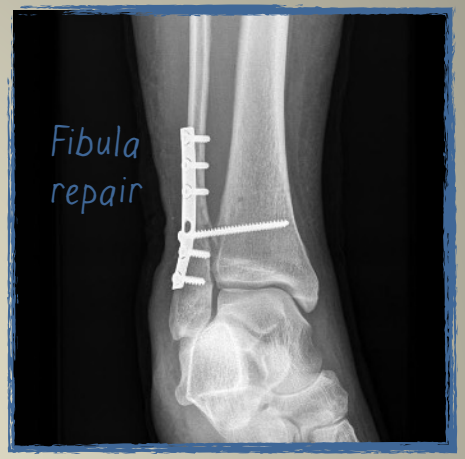
portion of pin
outside the ski
(used to remove pin)

Next page (Plates and Screws)

Radiology Reference Guide – Chapter 6

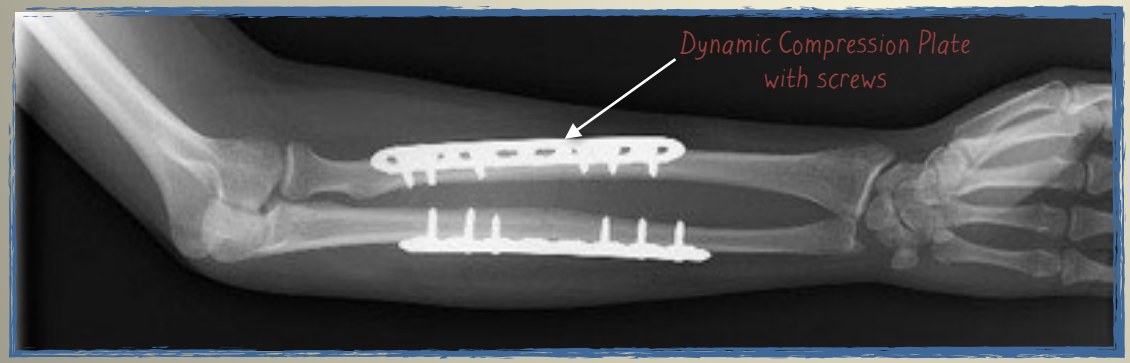
Types of Internal Fixation Hardware

(Back to menu)

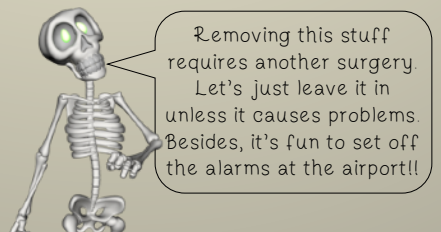


Plates and Screws

Dynamic Compression plates are placed across a fracture and screwed to each side of the bone. Once the bone has healed the hardware is no longer needed. Usually, however, the hardware is not removed unless there is discomfort, restrictions to movement, or the hardware affects bone growth in the case of a child or young adult. The decision to remove hardware is made on a case by case basis.



Radius and Ulna repair

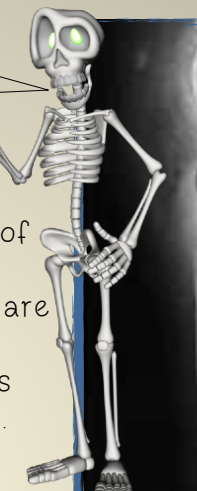


Next page (Rods and Nails)

Radiology Reference Guide - Chapter 6

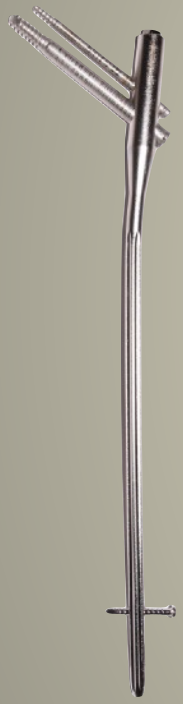
Types of Internal Fixation Hardware

(Back to menu)

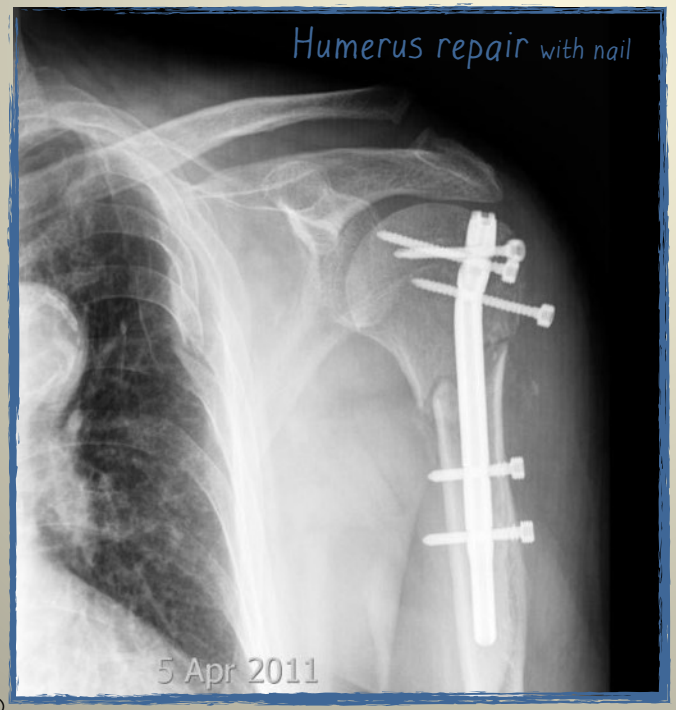


Rods and Nails

Intermedullary Rods and Nails are placed into the soft center of long bones. Nails are stronger than Rods and are usually attached with interlocking screws for greater strength. Rods are softer and more bendable than nails and are used when it is important to mold the rod to the shape of the bone. Some rods and nails are designed to be removed while others may stay in.



Intermedullary nail

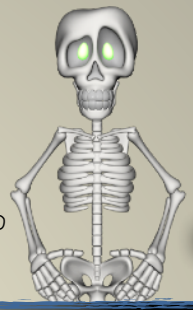


Tibia and Fibula repair with Rods

Next page (Dynamic Hip Screw)

Radiology Reference Guide – Chapter 6

Types of Internal Fixation Hardware (Back to menu)

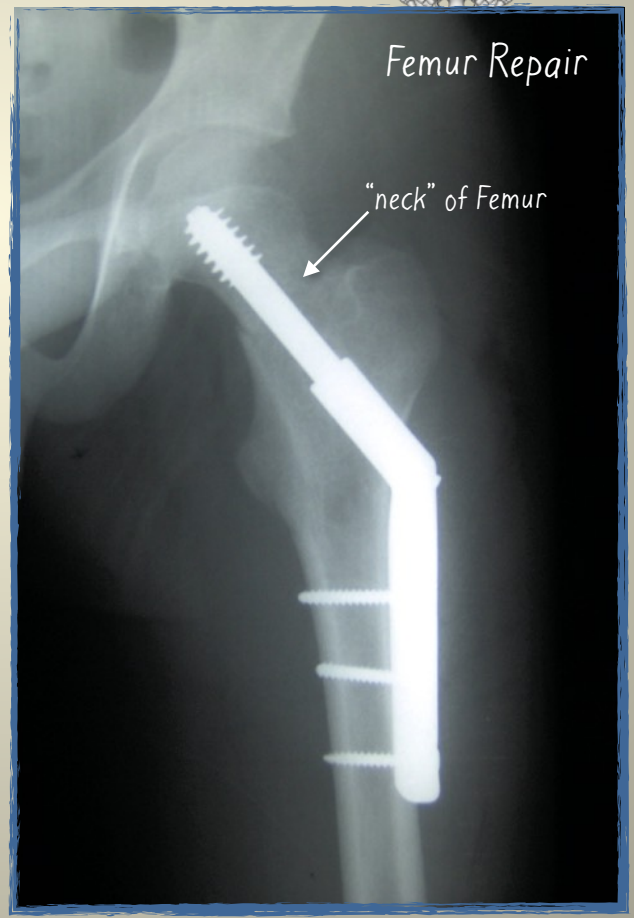


Next page (Spinal Fusion)

Dynamic Hip Screw

Dynamic Hip Screws attach the femur to the broken neck (ball shaped end that fits into the pelvis). They are designed to use compression to keep the bones in position for healing.

Dynamic Hip Screw



Dynamic Hip Screw

Radiology Reference Guide - Chapter 6

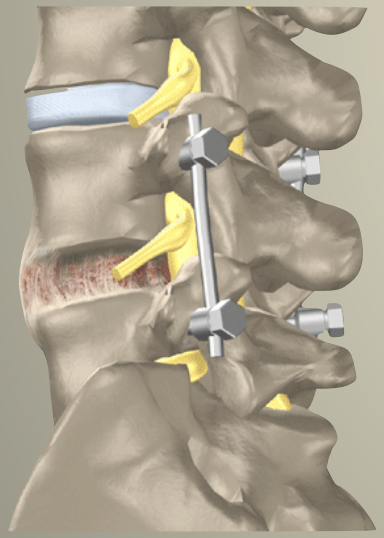
Types of Internal Fixation Hardware

(Back to menu)

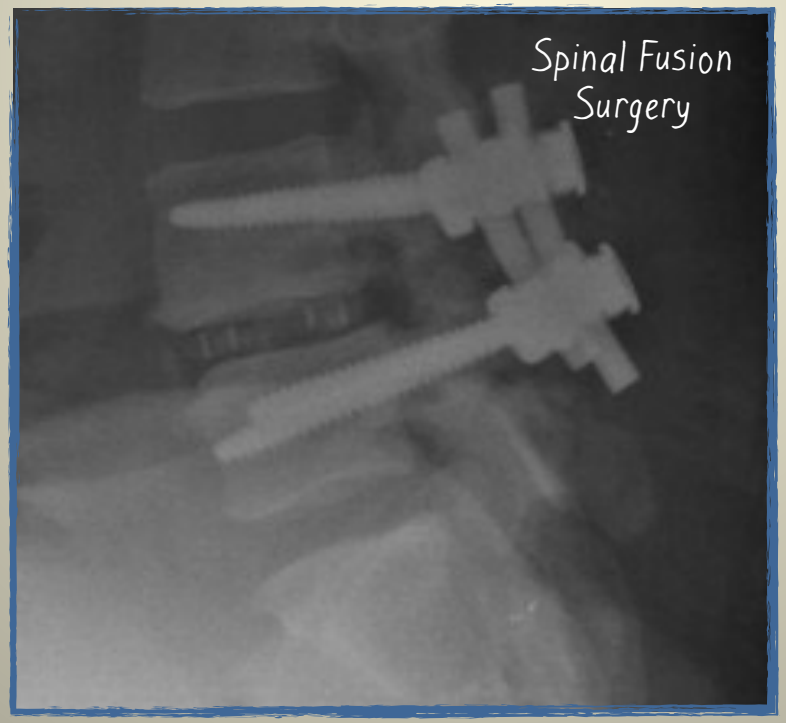
Spinal Fusion Rods and Screws

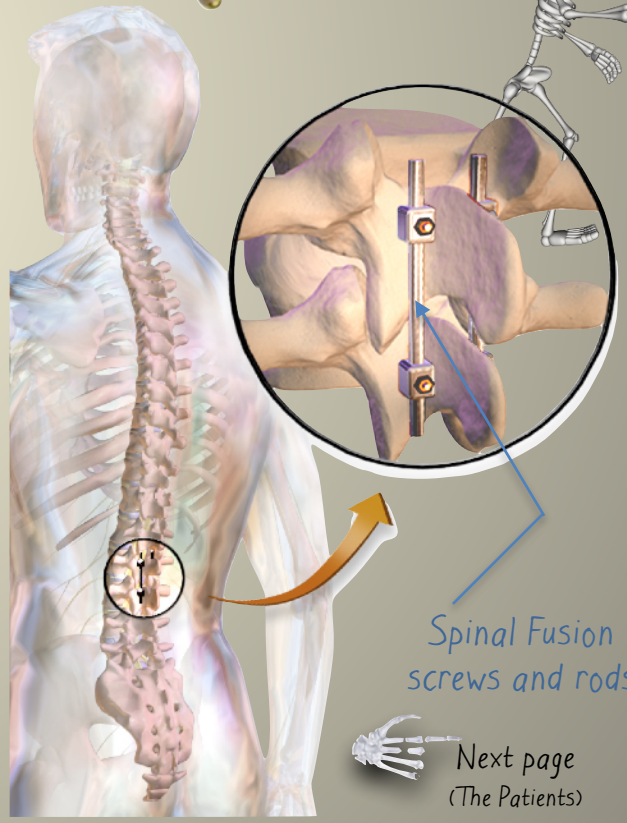
Spinal Fusion Rod and Screws

Spinal fusion surgery is used to temporarily stabilize vertebrae of the spine to give bone from a bone graft time to heal. Once the bone is throughly healed the hardware is no longer needed. Most of the time, however, the hardware is left in place. A spinal fusion is commonly used to repair vertebrae of the lumbar (lower back) and cervical (neck) spine but can be used on any vertebrae. Fractures of the spine, spondylolisthesis, and degenerative disk disease, are sometimes treated with spinal fusion surgery.



Lumbar Spinal Fusion





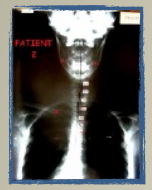
Spinal Fusion screws and rods

Next page (The Patients)

The Patients:

The doctor who specializes in reading x-rays and other imaging media is called a **Radiologist**. For the next few days YOU will be the radiologist. You will be reading x-rays and consulting your Radiology Reference Guide. You will be responsible for making the diagnosis that determines the treatment of your patients. Click on the links below to visit each patient. Good luck!


Patient 1 p57


Patient 2 p58


Patient 3 p59


Patient 4 p60


Patient 5 p61


Patient 6A p62

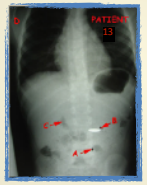

Patient 6B p63


Patient 7 p64


Patient 8 p65

Patient 9 p66

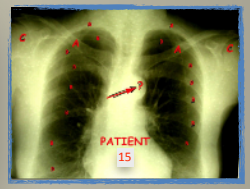

Patient 10 p67

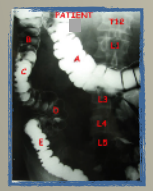

Patient 11 p68


Patient 12 p69


Patient 13 p70


Patient 14 p71


Patient 15 p72

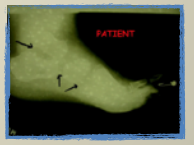

Patient 16 p73


Patient 17 p74


Patient 18A p75


Patient 18B p76


Patient 19 p77


Patient 20 p78

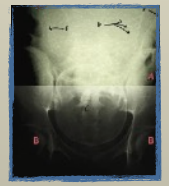

Patient 21 p79

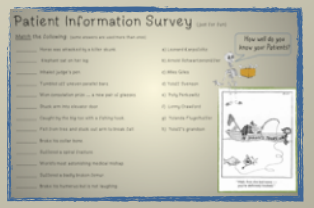

Patient 22 p80


Patient 23 p81


Patient 24 p82


Patient 25 p83


Patient 26 p84



Patient Information Survey (just for fun) p85

Patient 1

The bones of the spine are identified by number. This x-ray shows the vertebrae of the lumbar spine (lower back). Notice how they are labeled L1 to L5.

1. Which vertebra is closest to the sacrum? (give the letter and number)

2. Which vertebra seems to be out of alignment from the others?

3. What is the name of the bone labeled "A"?
   Ilium / Ischium / Sacrum / Coccyx (pick one)

4. What is the name of the bone labeled "C"?

5. What type of joint is labeled "B"?

6. Look at the area where the arrow (D) is pointing. Is this a fracture (broken bone) or is it normal?

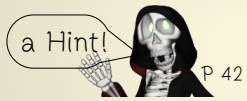
7. What fills the space between between these bones (from question 6)?
   Cartilage / Muscle / Ligament / Tendon (pick one)

Next Patient

Patient 2

Your patient has been complaining of headaches and a stiff neck. After examining this x-ray you are confident you have discovered the problem..

8. The line drawn on the x-ray indicates the spine is not properly lined up. The patient is suffering from ...
   - a linear fracture
   - a subluxation
   - a dislocation
   - scoliosis

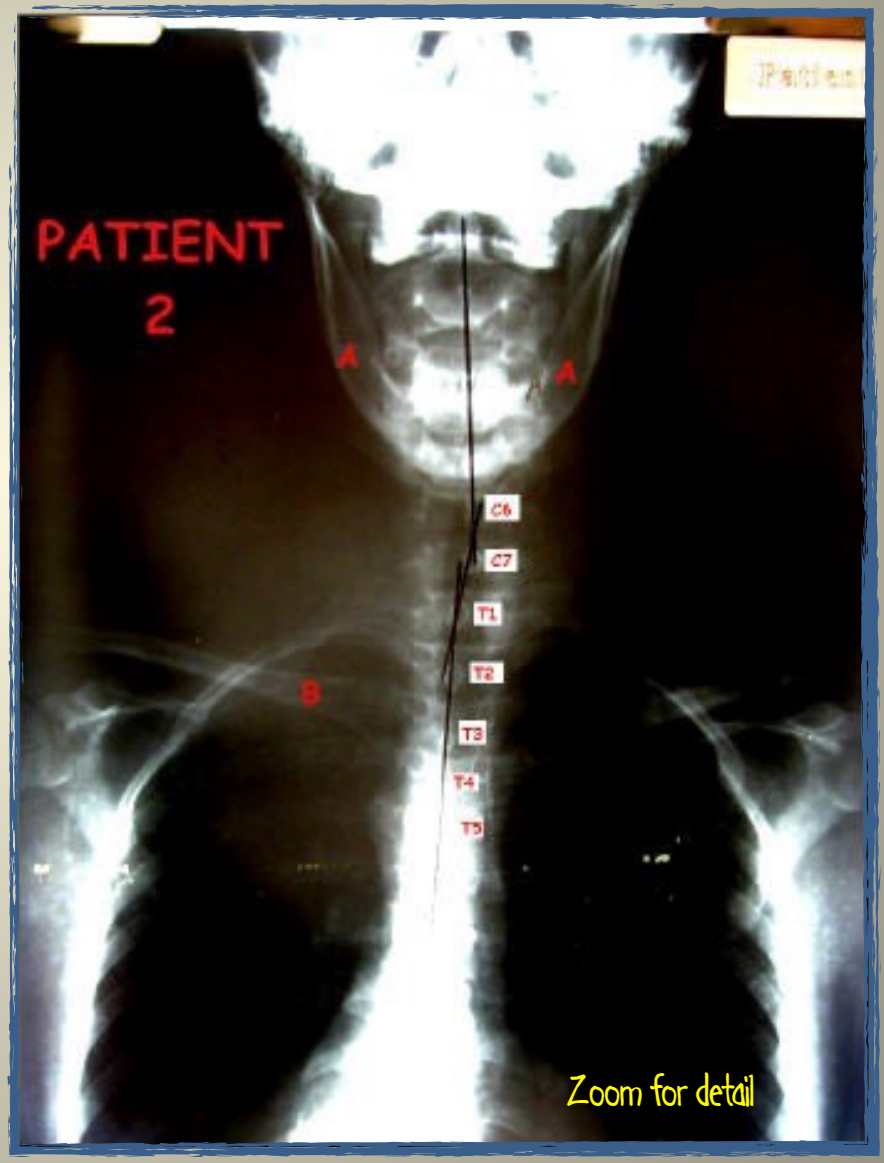


9. At which two vertebrae does the twist (misalignment) occur? (choose)
   - C7 and T1
   - T1 and T2
   - T2 and T3
   - T4 and T5

10. What is the name of the bone marked "A"?

11. What is the name of the bone marked "B"?

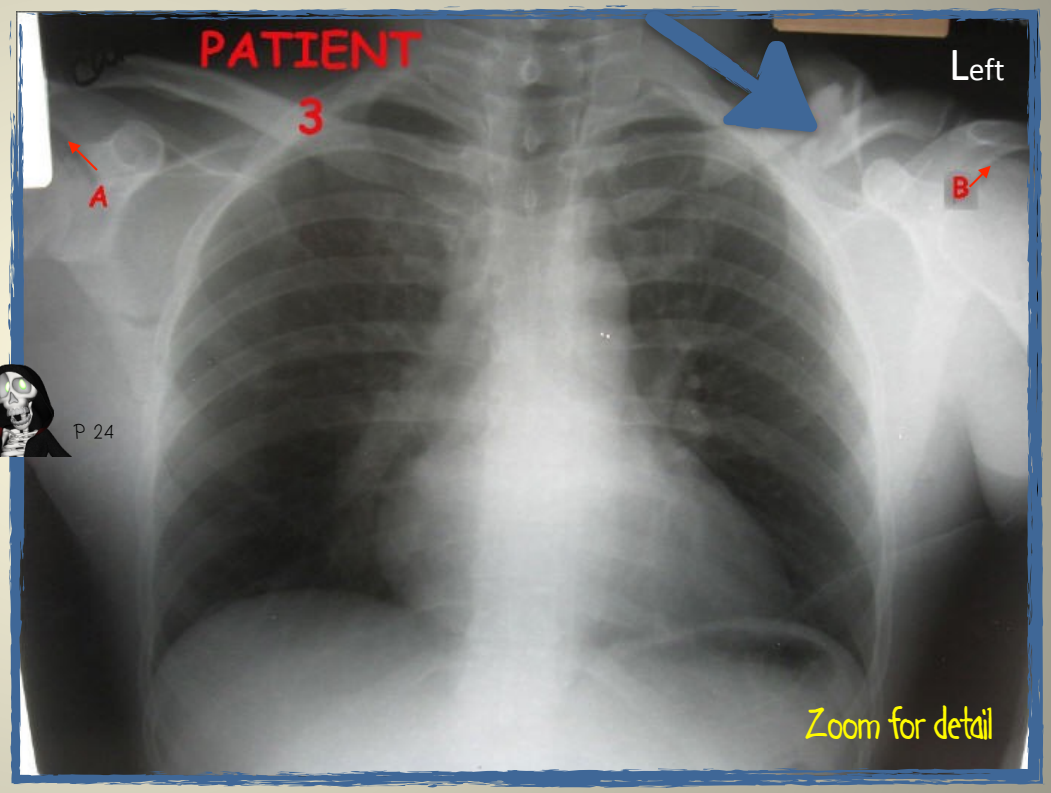
12. What treatment would you recommend for this patient?
   - adjust the spine (manipulation)
   - surgery
   - amputation (remember, this is a neck problem)



Next Patient

Patient 3

Leonard Karpofolitz was riding his horse when a mutant killer skunk jumped out of the brush causing the horse to rear. Leo fell off of the horse and landed on his **left shoulder**.



13. The large blue arrow points to a fracture. Which bone is broken?

14. Which best describes this type of fracture?
non-displaced / linear / displaced / greenstick

P 24

15. Notice the right side of the X-ray is labelled "Left". Do you think this is correct or do you think the X-ray is labelled incorrectly? Explain.

P 6

16. The letter "A" shows the normal space where cartilage is found in the shoulder joint. How is the other shoulder (letter "B") different?

17. Whats wrong with the left shoulder?
-it is dislocated
-compression fracture of the humerus
-it is subluxated but will move back to a normal position once the broken bone is set.

Next Patient

Patient 4

Polly Perkowitz took a tumble off the uneven parallel bars but like any good gymnast she landed on her feet. She landed while her body was still twisting, however, and suffered a rather unusual fracture to her left leg.

18. Identify the bones:
    a. b. c. d.

19. The arrows point to the fracture (almost missed it didn't you)? What is the name of the broken bone?

20. The thin fracture circles around the bone. What type of fracture is it?
    avulsion / impacted / hairline spiral / open oblique

21. This fracture will require
    -a cast but no surgery
    -open reduction with pins
    -open reduction with plates and screws

Next Patient

Patient 5

X-rays are not only for bones. Doctors can find out about soft tissues as well by injecting a **contrast** or dye into the area to be examined. The dye shows up as white areas on the film.

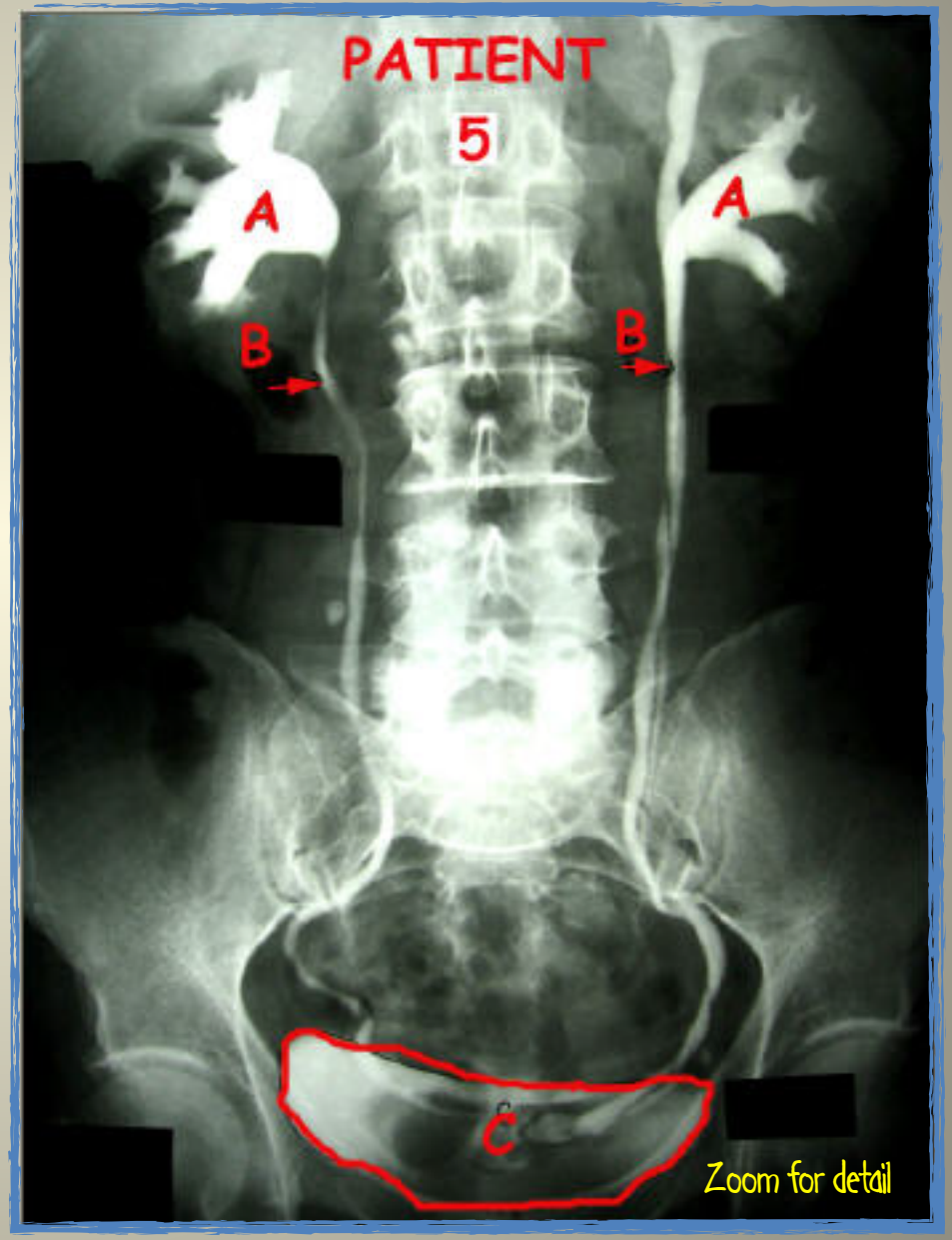
22. Letter "A" shows the location of the kidneys, organs which clean the waste from the blood. Is there any dye in the kidneys?

23. Letter "B" shows the ureters, tubes which lead from the kidneys to the urinary bladder. Is there any dye in the ureters?

24. Letter "C" shows the urinary bladder which stores urine. Is there any dye in the bladder?

25. If there were a problem in the Urinary System there would be obstructions and the dye would not go through the system. Do you see any obstructions?

26. Your diagnosis, doctor? (choose one)
-normal urinary system
-obstructed urinary system



Next Patient

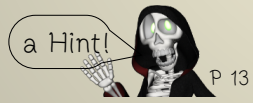
Patient 6A (Before Surgery)

After sticking his arm in a closing elevator door, **Miles Giles** required 3 1/2 hours of orthopedic surgery to repair the damage. This film shows the injury before surgery. The next page (patient 6B) shows Miles after surgery.

27. What is the name of the bone that has broken?

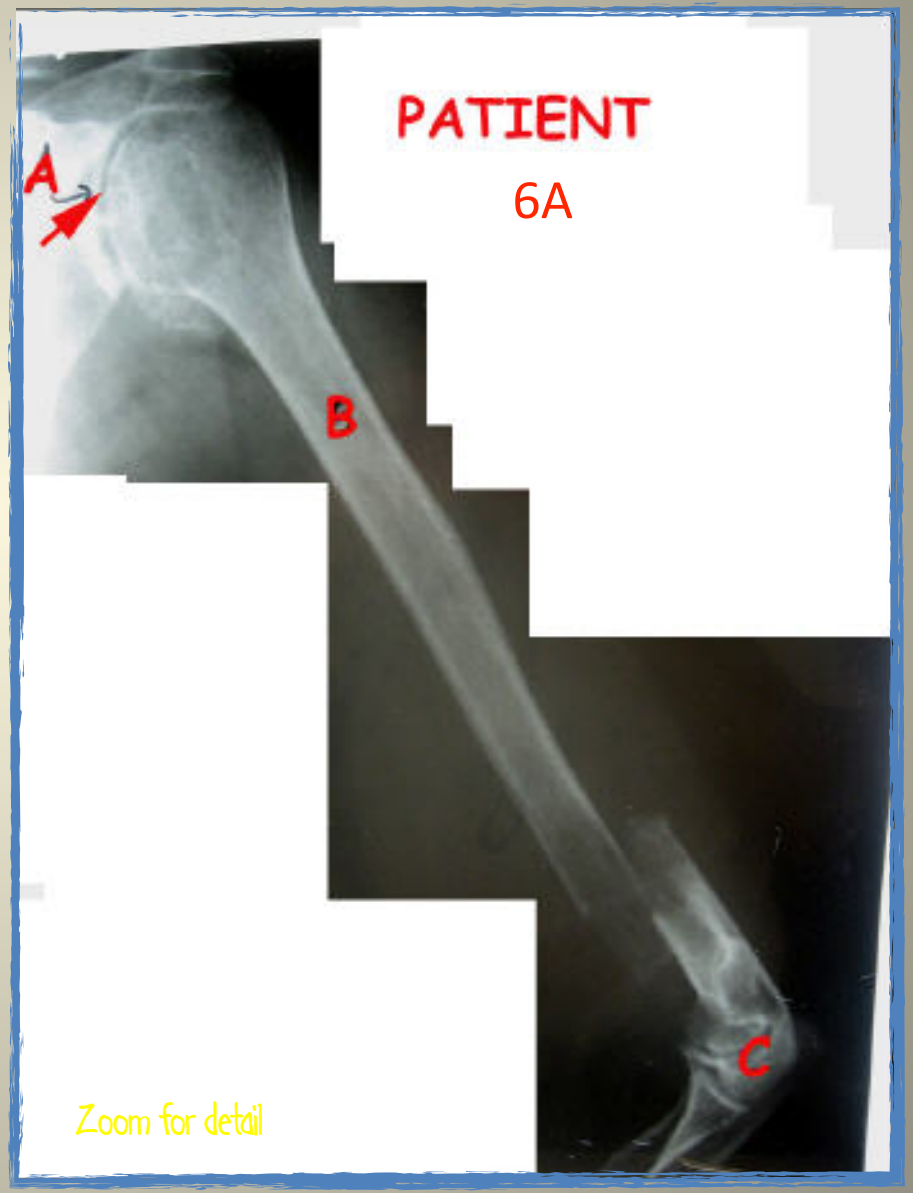
28. Which of these best describes this injury?
    - a non-displaced oblique fracture
    - a non-displaced comminuted fracture
    - a displaced transverse fracture
    - a displaced segmental fracture

29. What type of joint is at "A"?
    - fibrous
    - cartilaginous
    - synovial



30. What type of joint is at "C"?
    gliding / hinge / pivot / ball and socket / saddle / ellipsoidal

31. What type of movement is allowed by joint "C"?
    - side to side and angular but no rotational motion
    - side to side, back and forth, and rotational motion
    - only back and forth motion



Next Patient

Patient 6B (After Surgery)

Miles Giles has some new shiny hardware and a more stabilized arm following more than 3 hours of surgery. (Visit Patient 6A to see his before surgery images)

a Hint! P 48

32. What type of Internal Fixation hardware was used?
plate and screws / rods and nails / dynamic hip screw

33. What is the name of bone "A"?

34. What is the name of bone "B"?

35. What type of joint is at "C"?
Fibrous / Cartilaginous / Synovial

a Hint! P 13

36. How many screws were used to repair the bone?
Note: the side view will be more useful.

Next Patient

Patient 7

OH! My aching back!!

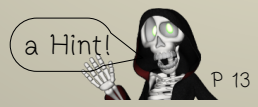
This type of x-ray is called a Myelogram (mile-O-gram). It shows the condition of the spinal cord. The spinal cord appears white due to an injection of dye. This patient has a ruptured disk which is applying pressure to the spinal cord.

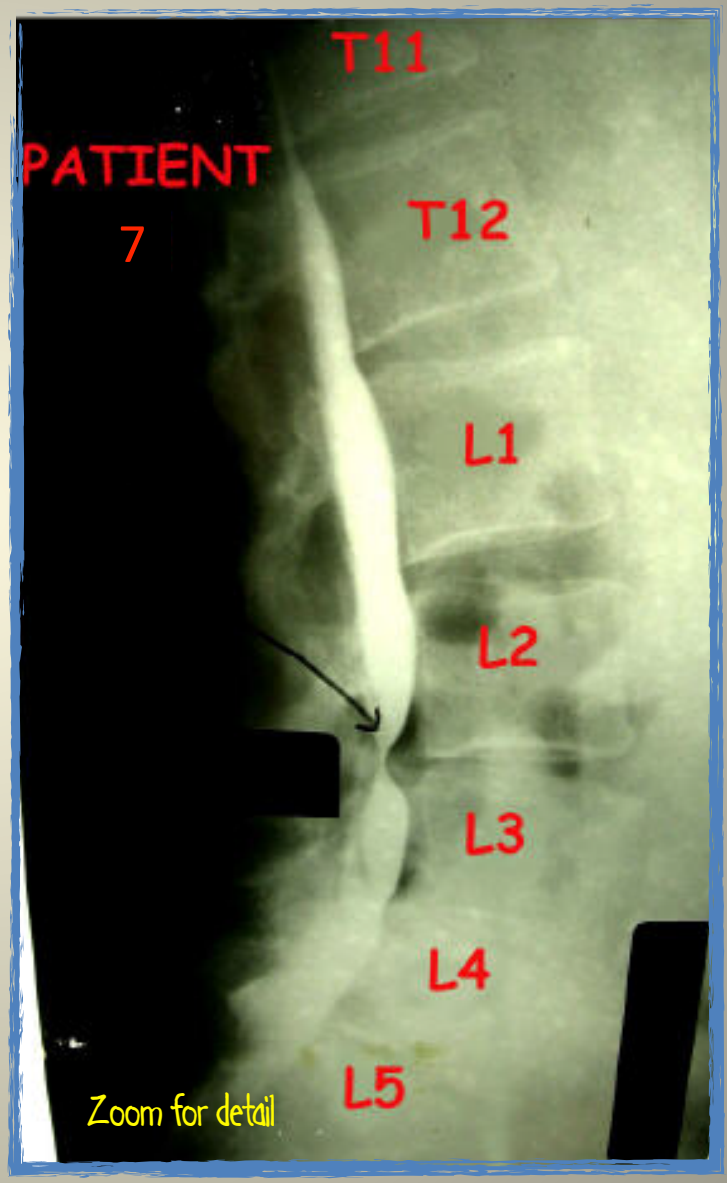
37. Between which two vertebrae is the bulging disk located?

38. This patient is suffering pain in the _____ (pick one)

-upper back
-lower back
-neck
-foot

39. What type of joint is found in the spine?
Fibrous / Cartilaginous / Synovial





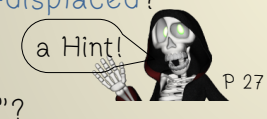
Next Patient

Patient 8

Yolanda Flugelhoffer, premier elephant trainer for the Barnum and Bailey Circus, suffered this injury when her newest elephant confused the command "Go Forward" with "Sit Down". The flight for life helicopter removed the elephant and Yolanda was taken to the nearest hospital by ambulance.

40. What is the name of the bone that has been broken?

41. Is this fracture Displaced or Non-displaced?



P 27

42. What type of joint is at letter "A"?
Gliding / Hinge / Pivot / Ball and Socket / Saddle

P 17

43. What type of treatment do you think will be required to fix Ms. Flugelhoffer? (pick one)

-a simple plaster cast
-simple surgery to set the bone
-open reduction and internal fixation
-a new job training toy poodles

Next Patient

Patient 9

The arm bone's disconnected to the shoulder bone ...

44. Bone "A" is the _____.

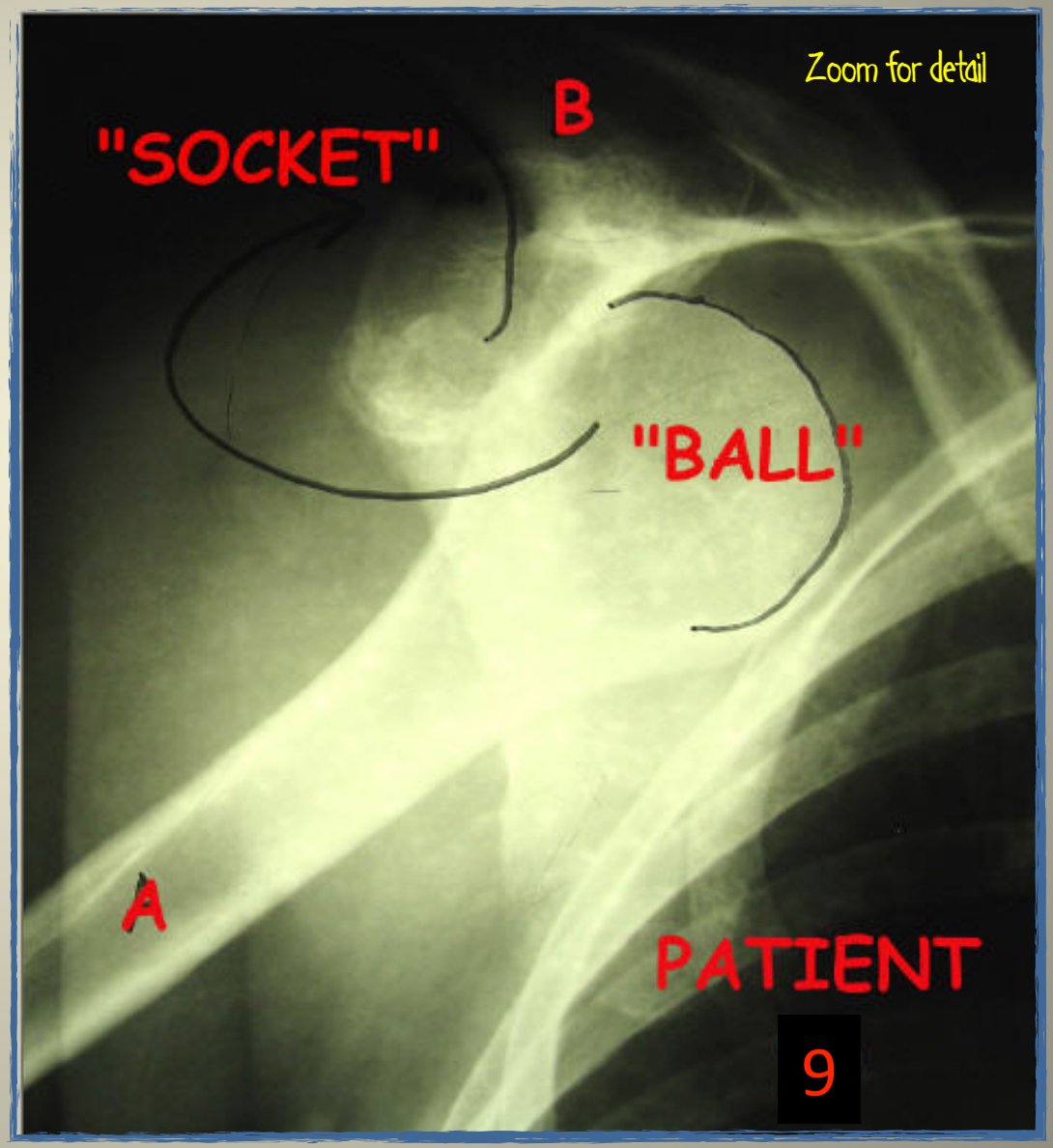
45. Bone "B" is the _____.

46. Bone "A" fits into bone "B" but it has popped out of its socket. What is this type of injury called?

P 42

47. This type of joint is known as a
Gliding / Hinge / Pivot / Ball and Socket / Saddle

48. Are there any other injuries on this x-ray? If yes, describe.



Next Patient

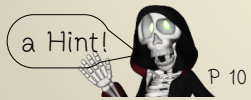
Patient 10

This small child decided she didn't trust the local banks so she deposited her nickel in a "safer place".

49. According to the x-ray, the nickel is lodged somewhere in the
- -head
- -neck
- -chest
- -stomach
- -all of the above

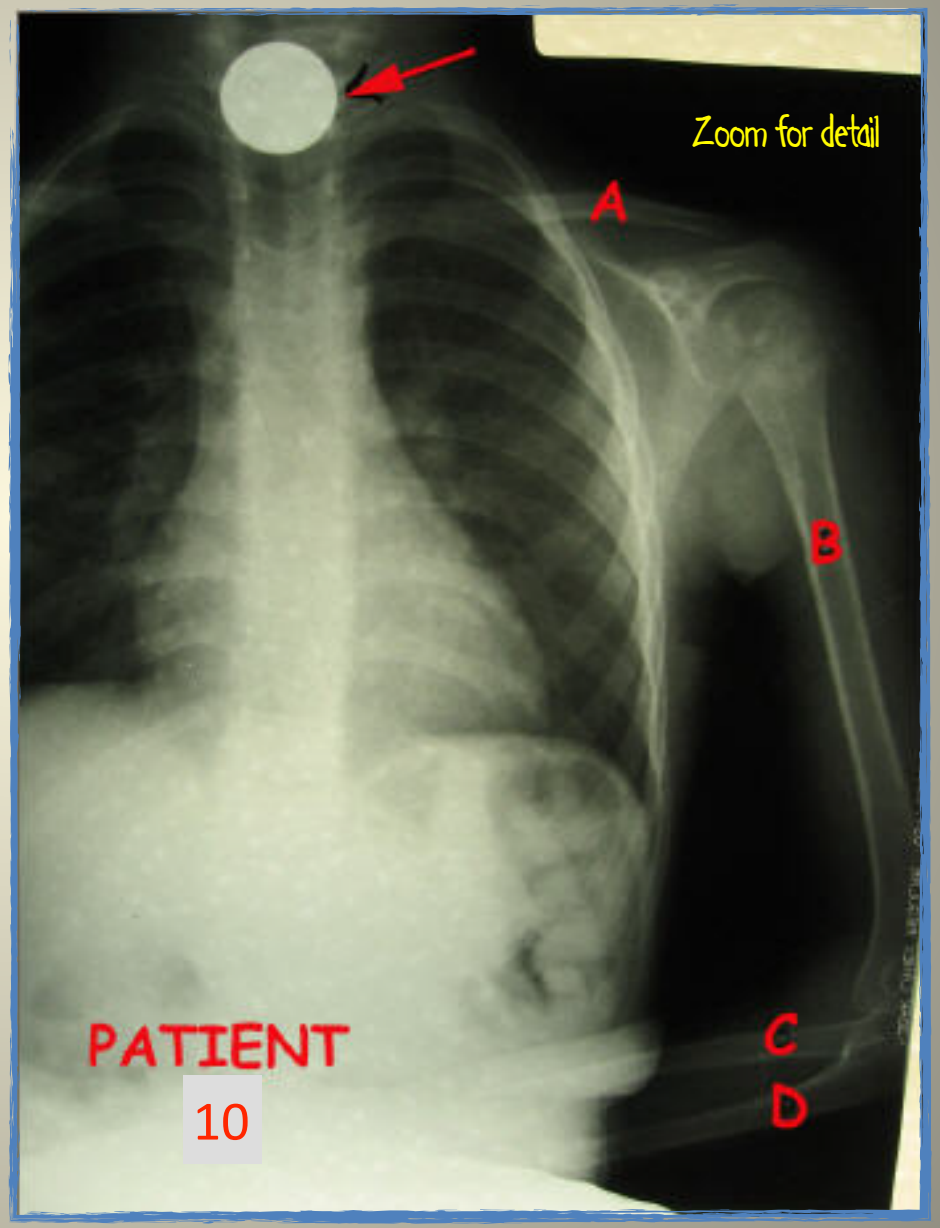
50. Name the bones:

A _____
B _____
C _____
D _____



51. How do you think the nickel should be removed? (notice the size of the nickel compared to the size of the throat) Pick one answer below and briefly explain your reasoning:

-pull it out through the mouth with instruments
-remove from the neck with surgery
-allow it to pass into the digestive system and out of the body



Next Patient

Patient 11

"Yummy, yummy, yummy I've got money in my tummy"...

This small child swallowed a coin and it slid all the way down to his stomach!

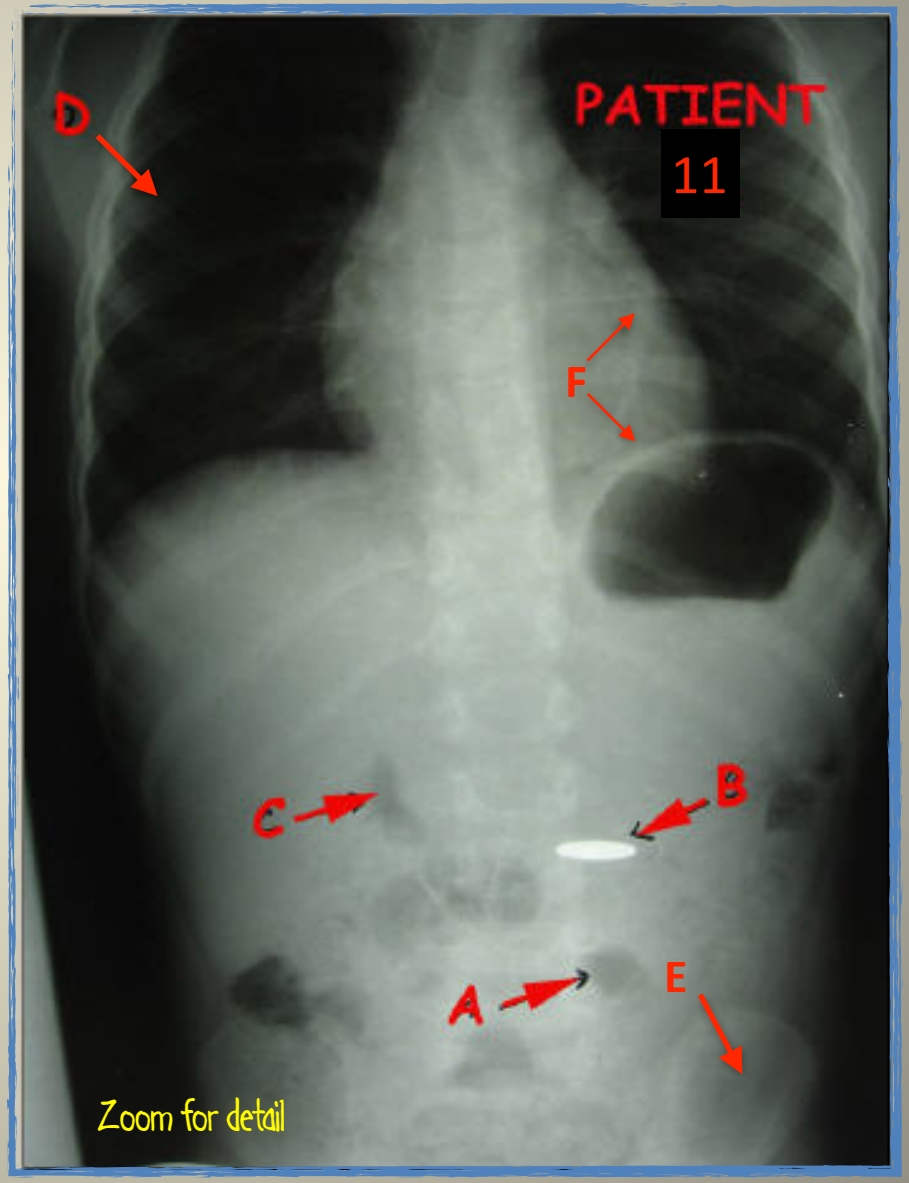
52. Which arrow points to the coin?
    Arrow A Arrow D
    Arrow B Arrow E
    Arrow C

53. What is the name of the organ labeled "F"?
    liver / lung / heart / stomach / intestine

P 6

54. The dark spots labelled "G" are most likely
    fluid bubbles (gastric juice) / kidney stones / partially digested coins/ dollar bills

55. How do you think this coin was removed?
    -pulled out through the mouth with instruments.
    -removed from the stomach with surgery.
    -allowed to pass through the digestive system to be "found" at a later date.



Next Patient

Patient 12

This is an x-ray of a fractured ankle that has been repaired with surgery.

56. Name the bones:

A _____
B _____
C _____
D _____

57. What has been used to hold the bones together?
wires/steel plate/pins/screws/rods

58. After the bone has healed, this hardware will most likely
- be removed in the doctor's office
- be removed with followup surgery
- remain in place for the rest of the patient's life
- dissolve

Next Patient

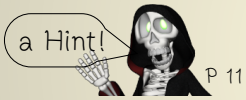
Patient 13

This is an x-ray of a hip joint after surgery.

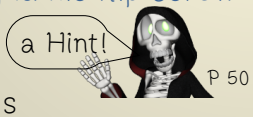
59.. What is the name of the bone labeled "A"?

60. The pelvis is divided into several bones. The bone labeled "B" is the

-ilium -coccyx
-ischium -pubic symphysis
-sacrum



61. The "hardware" used to repair the bone is a
compression plate / spinal fusion rod / dynamic hip screw



62. The hip joint is a synovial joint that allows
- side to side and angular motion but not rotational
- side to side, back and forth, and rotational motion
- only rotational (rotary) motion
- only back and forth motion

63. What portion of this ball and socket joint was repaired?
- the ball
- the socket

Next Patient

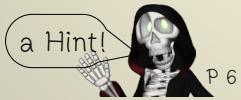
Patient 14

The ELECTRONIC MAN?

This patient has a problem with an irregular heart beat. A battery operated pacemaker has been implanted under his skin to help regulate his heart.

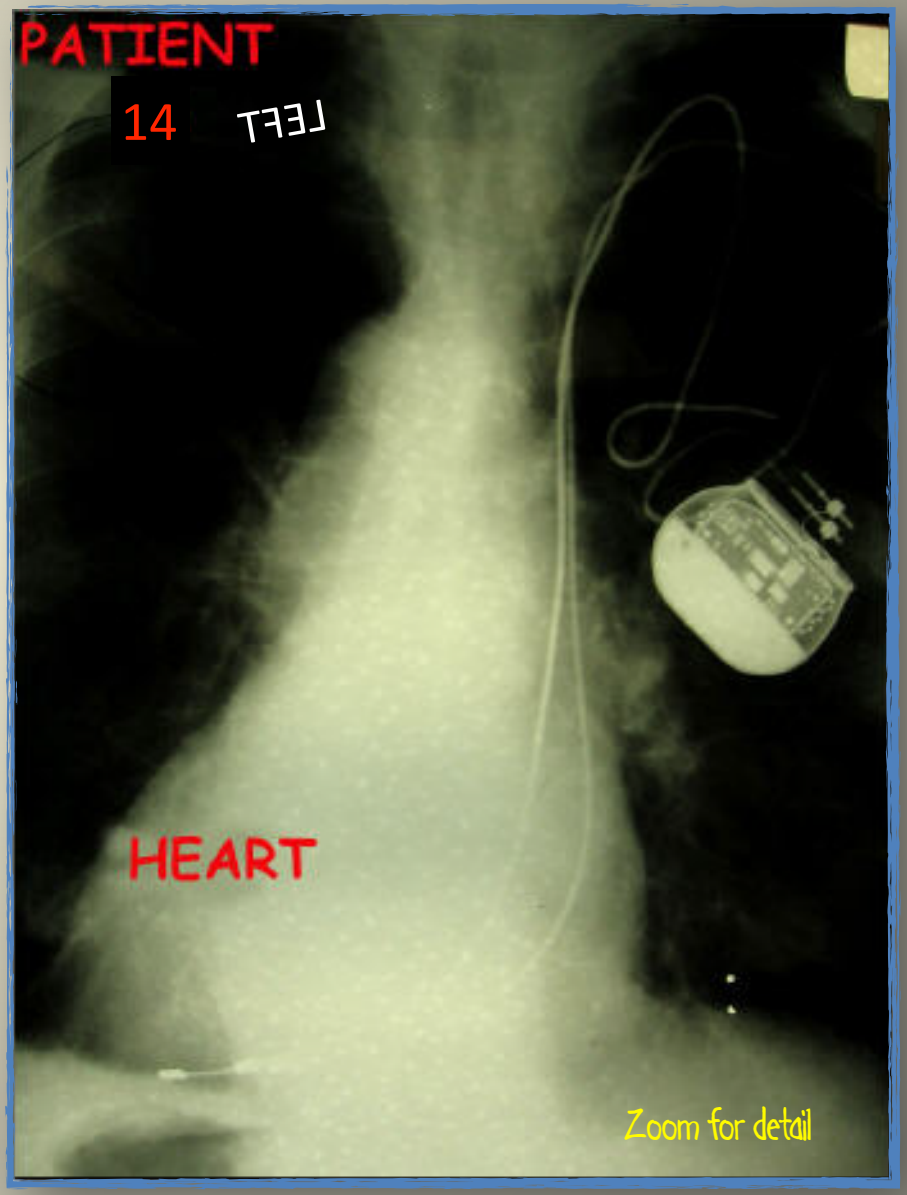
64. The pacemaker has wires that lead to the patient's heart / lungs / rib cage / brain

65. The pacemaker is located under the skin on the patient's right/left _____ side.
(notice the word "LEFT" appears backwards. This film has been flipped on the light board and is being viewed from the wrong side)



66. The pacemaker sends a mild electrical signal to the heart to keep it in rhythm. What do you suppose doctors do before the batteries run down?

67. How could you describe the pacemaker?
(what does it look like)



Next Patient

Patient 15

This patient's car slid off an icy road and crashed into a barn full of Holiday turkeys. When the feathers settled she was taken to the hospital complaining of soreness in her chest. As Chief Radiologist, it is your responsibility to diagnose her condition.

You begin by looking for broken bones:

68. Are the clavicles broken (marked letter A)?
69. Are any ribs broken (marked letter B)?
70. Is either shoulder (marked letter C) dislocated?

The patient came in with a neck brace as a precaution.

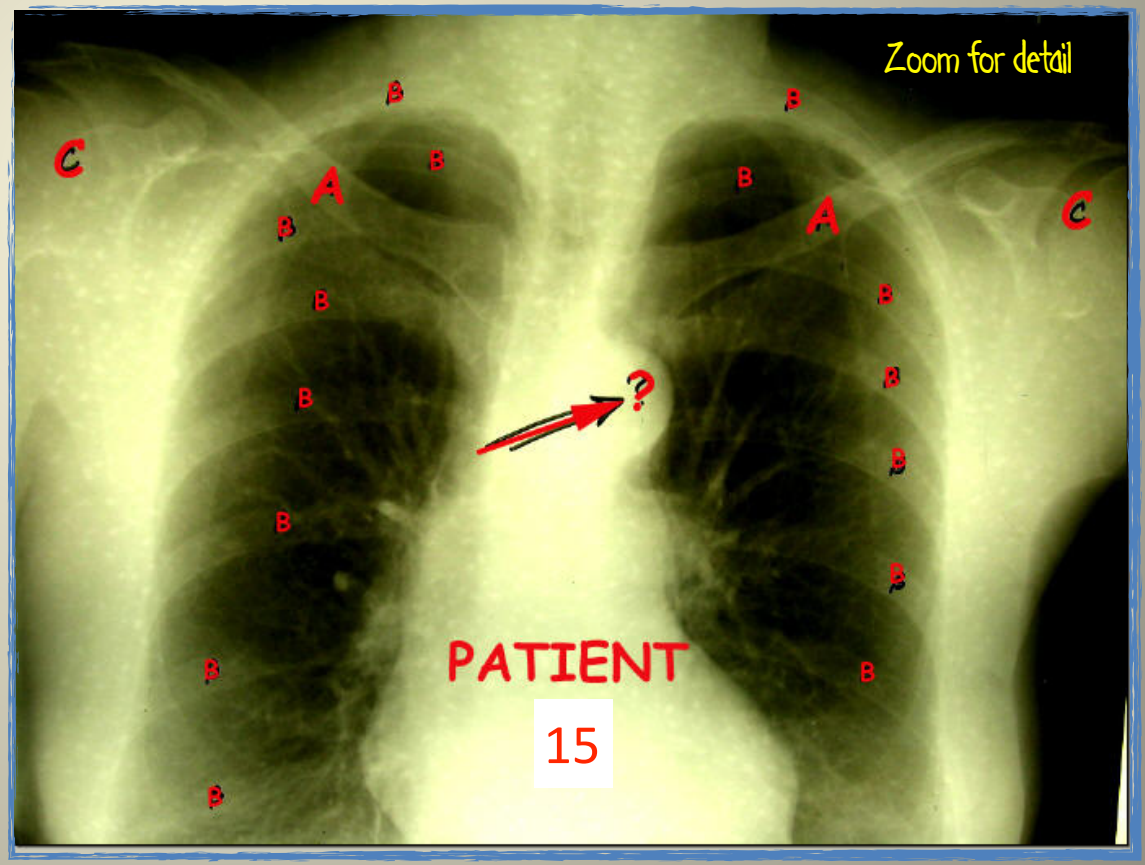
71. Does this x-ray show any evidence of a broken neck?

Now it's time to make a decision. Sending an injured person home will put your malpractice insurance premium through the roof.

72. What is your diagnosis, doctor?
(pick one or write your own)

-multiple broken bones, keep in hospital
-no broken bones but suspicious spots on the lungs (possibly inhaled turkey feathers), keep in hospital
-perfectly normal, send home but no poultry for a week

Hint: Come to think of it, maybe you should write your own ... these choices don't seem very likely.



Next Patient

Patient 16

Several hours before this x-ray was taken, the patient was instructed to drink a Barium solution. Barium absorbs x-rays causing the intestines to appear white. If there is no blockage, the intestine will appear white throughout. If there is a blockage, the intestine will appear light in some areas and dark in others.

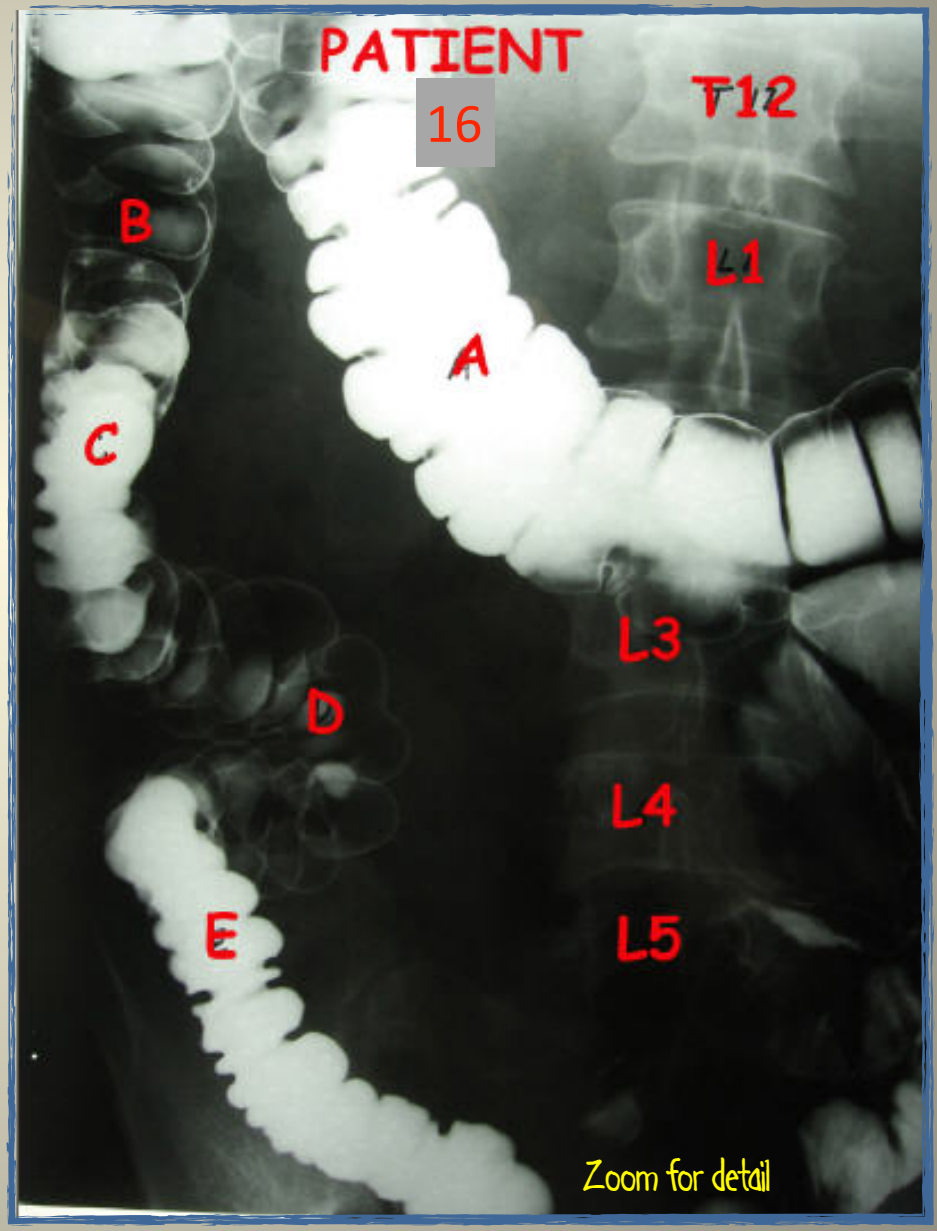
73. Are there any blockages in the intestine? yes / no

Indicate whether each area of the intestine is blocked or not blocked.

74. Area marked "A"? blocked / not blocked
75. Area marked "B"? blocked / not blocked
76. Area marked "C"? blocked / not blocked
77. Area marked "D"? blocked / not blocked
78. Area marked "E"? blocked / not blocked

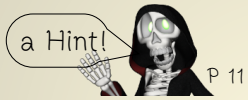
79. Most of the vertebrae shown in this X-ray are
    - cervical (neck)
    - thoracic (chest)
    - lumbar (lower back)

Next Patient



Patient 17

This x-ray of the cervical spine clearly shows some interesting parts of anatomy. See if you can identify them...



80. Atlas — a. arrow A

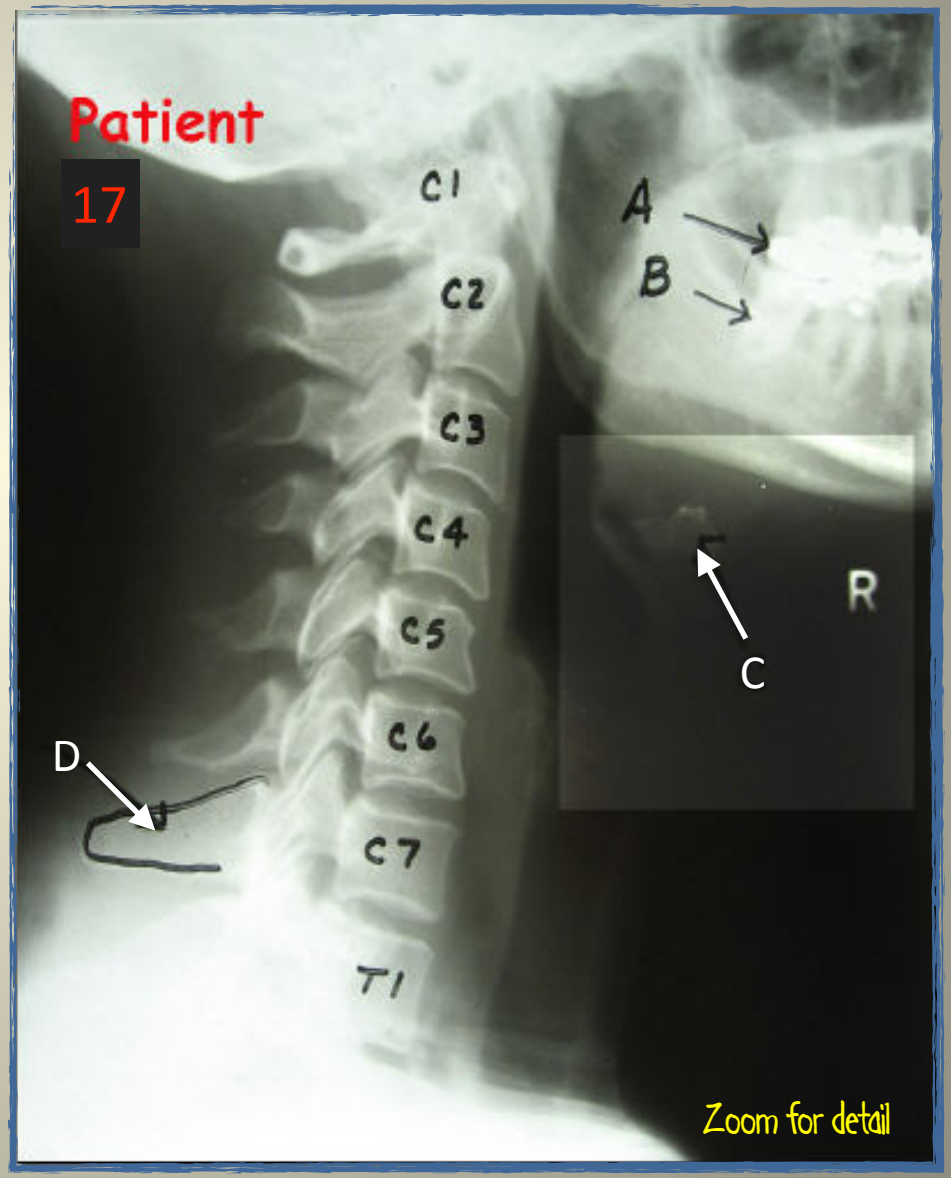
81. Axis — b. arrow B

82 Hyoid bone — c. arrow C

83. Spinous process — d. arrow D

84. Tooth root — e. vertebra C1

85. Fillings in teeth — f. vertebra C2



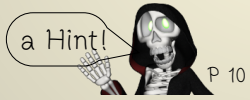
Next Patient

Patient 18A (Before Surgery)

While up on a ladder painting his house, Bruce Miller decided to reach out an inch too far resulting in a nasty fall. Bruce landed on his left outstretched arm. The next page (Patient 18B) shows Bruce after surgery.

86. From the X-ray you can determine that Bruce suffered

a fractured radius and a dislocated ulna
a fractured ulna and a dislocated radius
a fractured radius and ulna
a dislocated radius and ulna



87. The best description of this fracture is

a complete, segmental fracture
a displaced, oblique fracture
a non-displaced, oblique fracture
an incomplete, greenstick fracture

Next Patient

Patient 18B (After Surgery)

Bruce Miller (see patient 18A for his before surgery images) had his left arm repaired with surgery. Based on this X-ray, select Yes for each technique that was used in Bruce's surgery and No for those that are were not used.

88. Open reduction and internal fixation. Yes / No
89. Dynamic Compression Plate to repair the dislocated radius. Yes / No
90. Pins (K-wires) to repair the dislocated ulna. Yes / No
91. Pins (K-wires) to repair the fractured ulna. Yes / No
92. Dynamic Compression Plate to repair the fractured radius. Yes / No
93. Intermedullary Rods to repair the fractured radius. Yes / No
94. External Fixation hardware to stabilize the bone. Yes / No

Next Patient

Patient 19

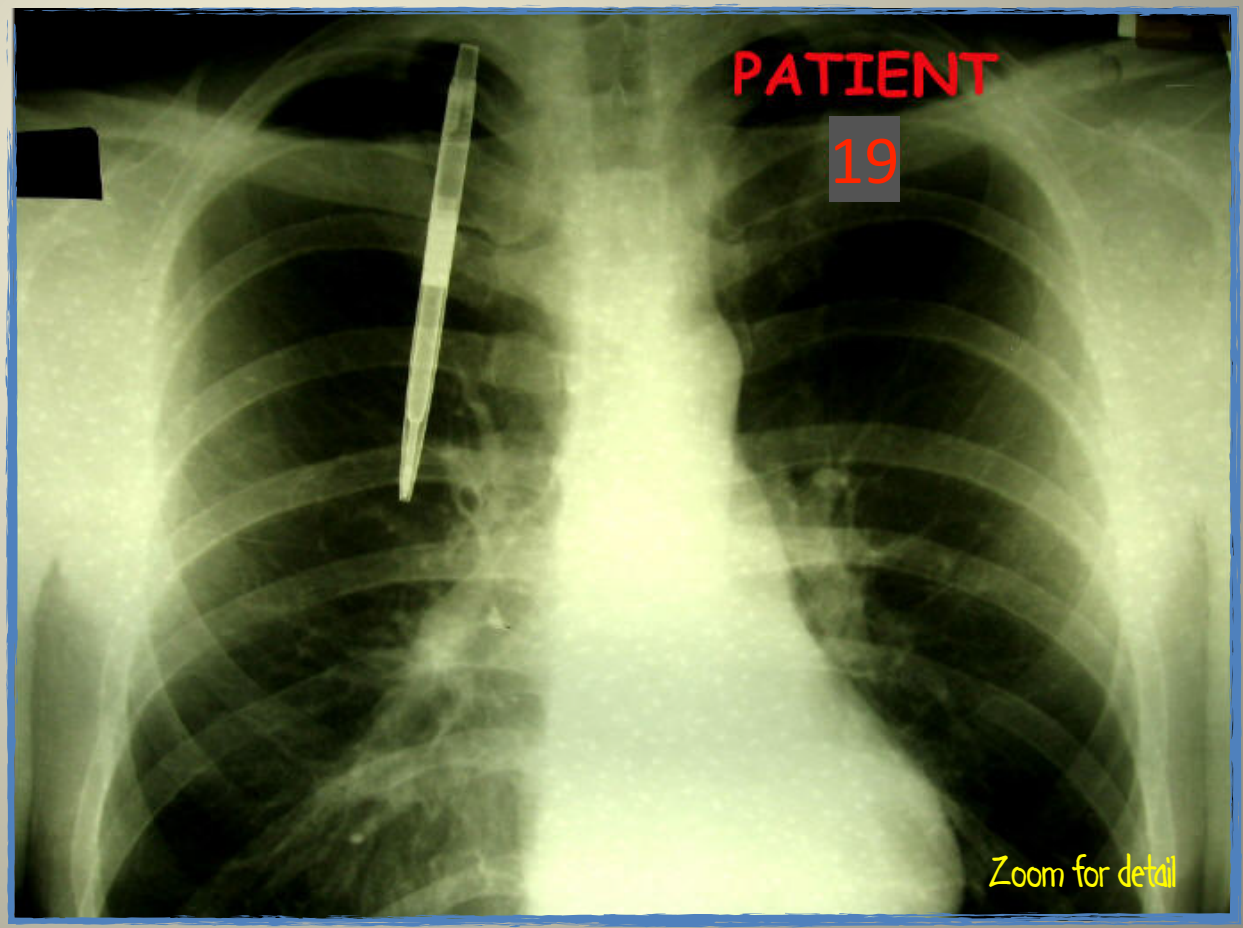
Abnormal Chest X-ray?

Perhaps the world's most astonishing medical mishap occurred during the 10th Annual Glass Blowing Competition held in Klagenfurt, Austria. Defending champion Arnold Schwartzensniffler drew in such a deep breath he accidentally inhaled the judge's pen through his nose!! The pen became lodged in Arnold's right lung leaving doctors clueless as to how to get it out!

95. This accident occurred during the _____ annual glass blowing competition.

96. The pen belonged to the _____.

97. In the event that the explanation given above is incorrect, how else could you explain this X-ray?



Next Patient

Patient 20

Catch of the Day!

While fishing off the coast of Goteborg, Sweden, fisherman Yoloff Svenson reeled in this 42 pound whopper. His prize catch, however, was disqualified by the Guinness Book of World Records when it was discovered that the "fish" was actually Yoloff's grandson. The lad was snagged while playing underwater. The boy has a sore toe but is otherwise doing well. Yoloff was awarded the consolation prize, a new pair of glasses!

98. According to the X-ray, what seems to be the boy's problem?

99. Did the fish hook puncture any bone?

100. Notice spaces between the bones of the foot as shown by the arrows. Which statement best explains this.

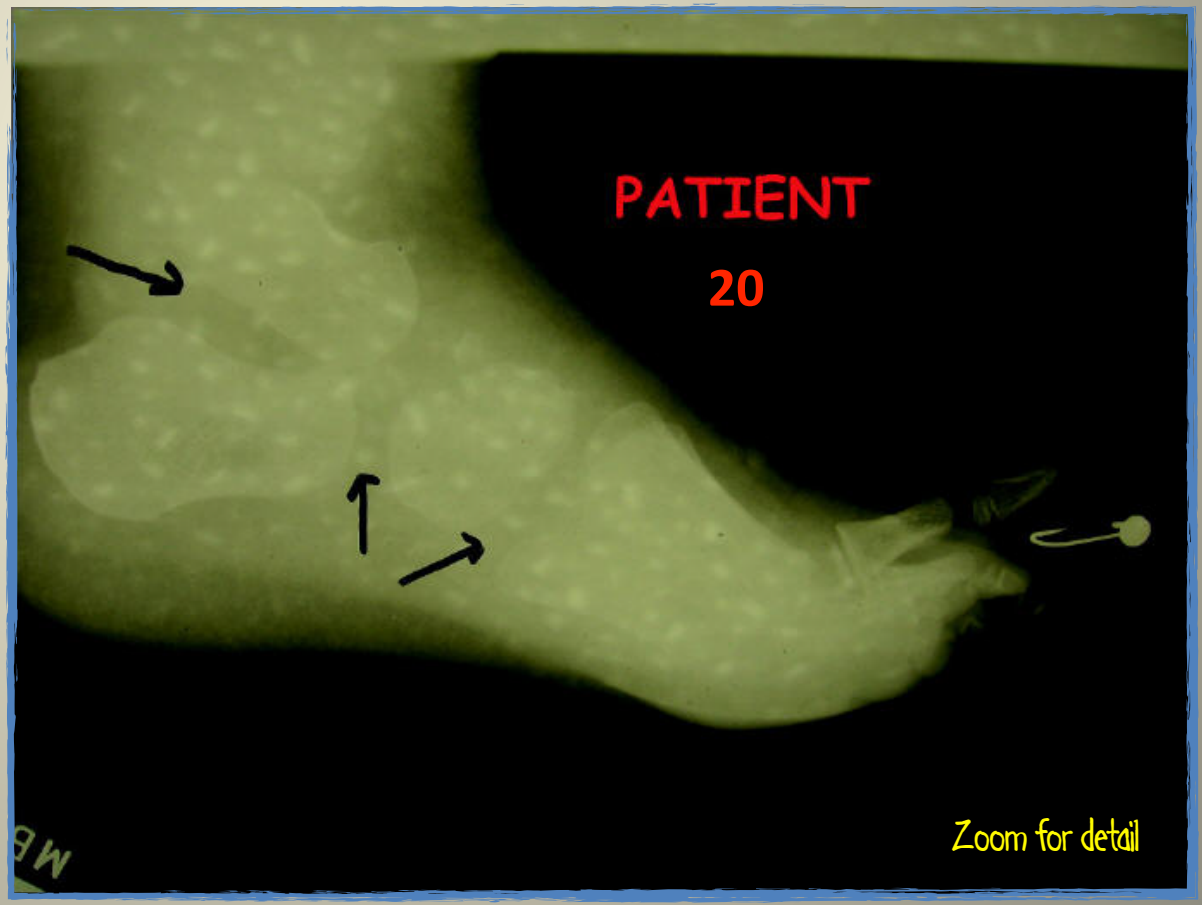
a) subluxations as a result of being pulled out of the water.

b) the bones are fractured

c) the spaces are filled with cartilage which is normal for a small child

P 9

Next Patient



Patient 21

The nurse dropped off this X-ray without any explanation. Let's see what we can determine from examining it closely.

101. We are looking at

- a right hand
- a left foot
- a left hand
- a rib cage

102. What is the name of bone A?

103. What is the name of bone B?

104. What type of joint is at C?

105. Is the patient a man or a woman?

106. How could you tell?

Next Patient

Patient 22

A "Humerus" Story

Nothing funny here! When falling out of a tree, little Lenny Crawford stuck out his arm to break his fall. Unfortunately, the fall is not all that was broken.

107. What is the name of the bone that has broken?

108. This fracture can best be described as
- a displaced Torus (Buckle) fracture
- a compression fracture
- an Avulsion fracture
- a Comminuted fracture

109. The most likely course of action to repair Lenny would be
- open reduction and internal fixation with a dynamic hip screw
- open reduction and internal fixation with plates, screws, and pins
- open reduction to set the bone and apply a cast (no hardware)
- closed reduction (set bone without surgery) and apply a cast

Next Patient

Patient 23

YOU'RE THE DOCTOR!

Your patient limps into the emergency room and faints before he can tell you where it hurts. This film is of his right ankle.

What do you see in this X-ray?

110. A fractured Fibula. Yes / No
111. A fractured Tibia. Yes / No
112. A dislocated ankle joint. Yes / No
113. An avulsion fracture of the Calcaneus. Yes / No

114. Which arrow points to the fracture? A / B / C / D

115. What is the best description for this fracture?
    a transverse fracture
    an oblique fracture
    a linear fracture
    a segmental fracture

116. Now put it all together ... write your diagnosis as completely as you can.

Next Patient

Patient 24

Followup visit:

One of your patients returns for a followup visit 12 days after you repaired the injury. You just took this X-ray a few minutes ago.

117. First of all, what are we looking at?
a foot / an ankle / a wrist / a knee

118. Which if these best describes the injury?
an oblique fracture of the tibia
a spiral fracture of the fibula
a complete fracture of the radius
a fracture of the ulna

119. Which best describes your treatment?
external fixation
internal fixation with rods and nails
open reduction and internal fixation with K-wires
closed reduction (set bone without surgery) and applied a cast

120. How is our patient doing?
the bone is not properly lined up, surgery is needed
everything looks good, he should be good as new in about 6 weeks.

121. What is this patient wearing (see arrow A)?
alligator skin boots / pants legs with zippers / a cast

Next Patient

Patient 25

"JUST A COOL DUDE IN A LOOSE MOOD!"

This is not exactly Chester Cheetah but it is a member of the same family. This domestic feline posed for the x-ray camera long enough to get this picture.

Compare the spine of the cat with that of a human. Fill in the number of each type of vertebrae.

	Human	Cat
122. Cervical	7	_____
123. Thoracic	12	_____
124. Lumbar	5	_____

125. How is the cat spine different from a human?

Name these bones of the cat skeleton (the names are similar to those of a human).

126. Bone A?
127. Bone B?
128. Bone C?
129. Bone D?
130. Bone E?
131. Bone F?
132. Bone G?

Next Patient

Patient 26

THE MIRACLE OF LIFE!

This is a fascinating picture of a baby just minutes before being born. It is such a neat x-ray I will not ruin it with any silly stories. The more carefully you study it the more you will see and appreciate!

First let's identify some things so we know what we're looking at:

133. Part labelled A?
mother's pelvis / baby's pelvis / baby's shoulders

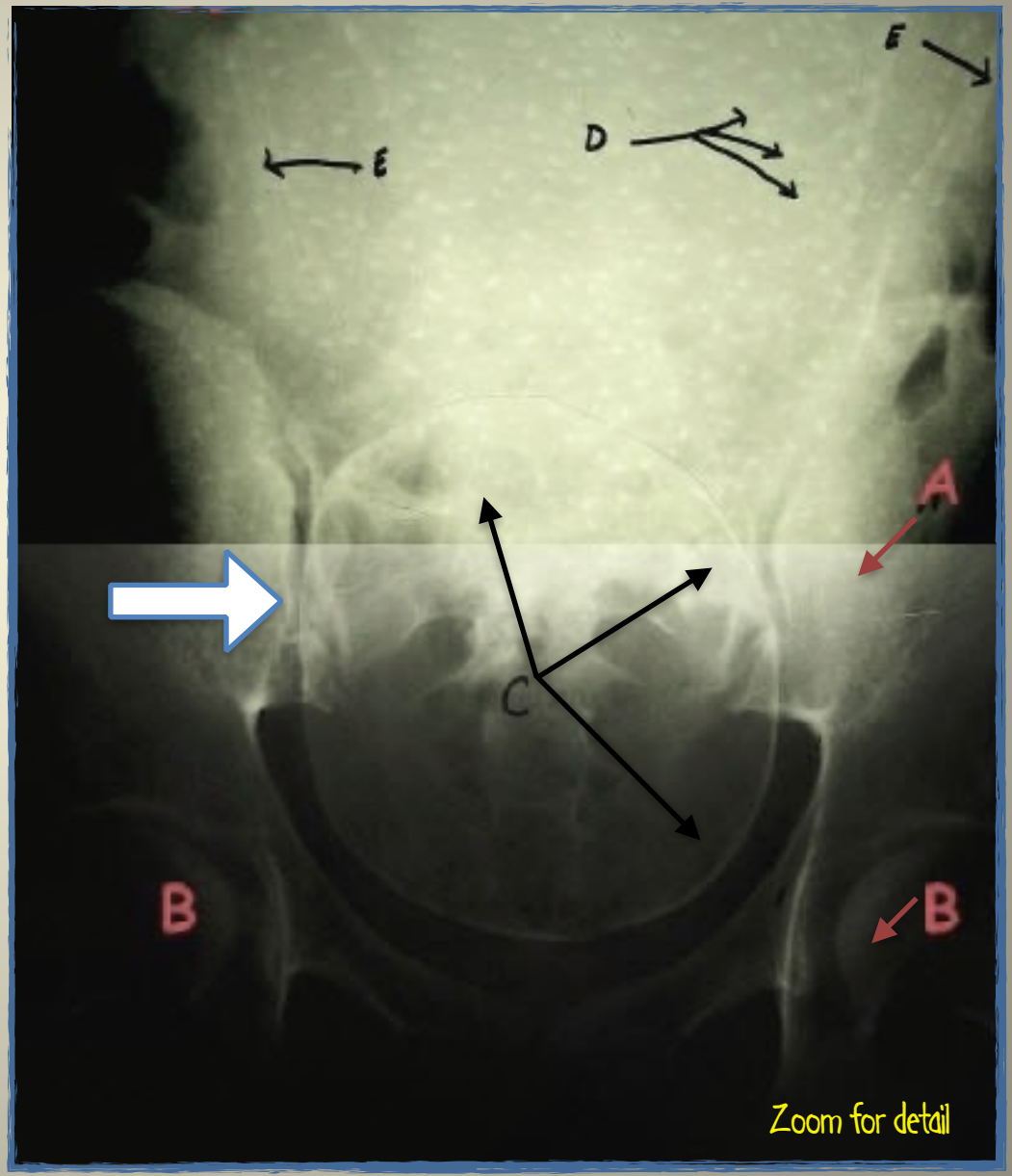
134. Part labelled B?
baby's head / baby's pelvis / mother's hip (femur)

135. Part labelled C?
mother's pelvis / baby's pelvis / baby's head

136. Part labelled D?

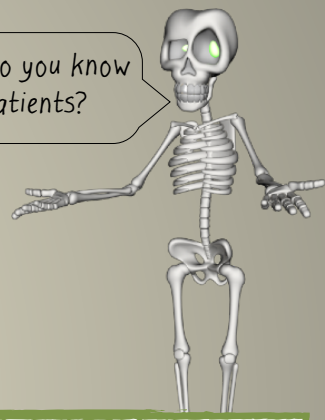
137. Part labelled E?

138. Normally X-rays are not taken during child birth so there must be a problem. Look at the area shown by the big white arrow and give your diagnosis (what is the problem)?



Next Page: Patient Information Survey (just for fun)

Patient Information Survey (just for fun)



Match the following: (some answers are used more than once)

_____ Horse was attacked by a killer skunk.

_____ Elephant sat on her leg.

_____ Inhaled judge's pen.

_____ Tumbled off uneven parallel bars.

_____ Stuck arm into elevator door.

_____ Caught by the big toe with a fishing hook.

_____ Fell from tree and stuck out arm to break fall.

_____ Won consolation prize ... a new pair of glasses.

_____ Broke his collar bone.

_____ Suffered a spiral fracture.

_____ World's most astonishing medical mishap.

_____ Suffered a badly broken femur.

_____ Broke his humerus but is not laughing.

a) Leonard Karpofolitz

b) Arnold Schwartzensniffler

c) Miles Giles

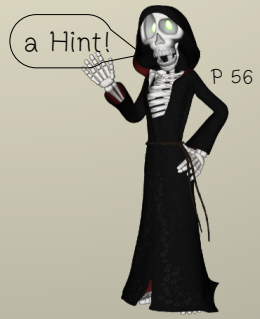
d) Yoloff Svenson

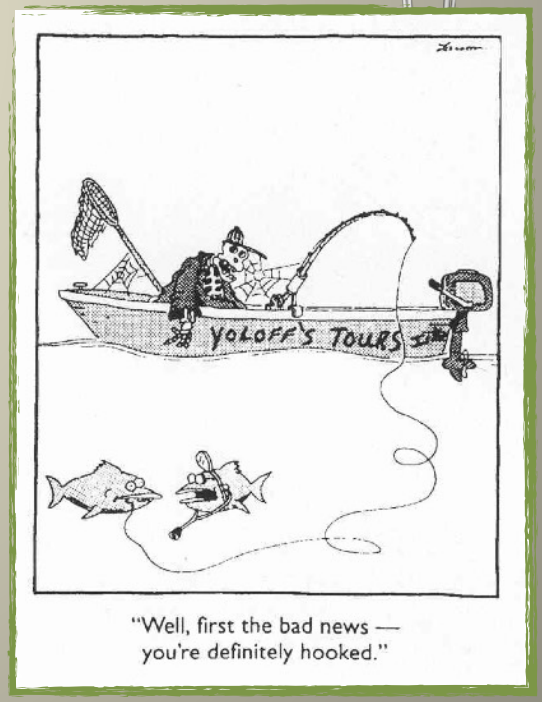
e) Polly Perkowitz

f) Lenny Crawford

g) Yolanda Flugelhoffer

h) Yoloff's grandson





"Well, first the bad news — you're definitely hooked."

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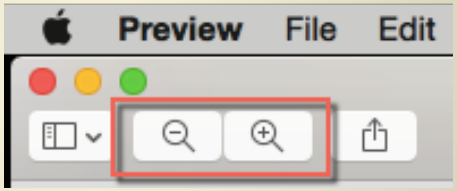

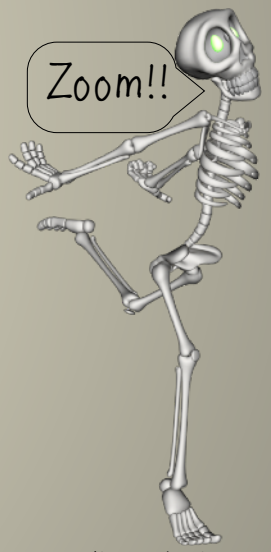

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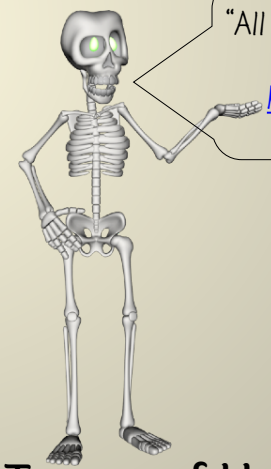

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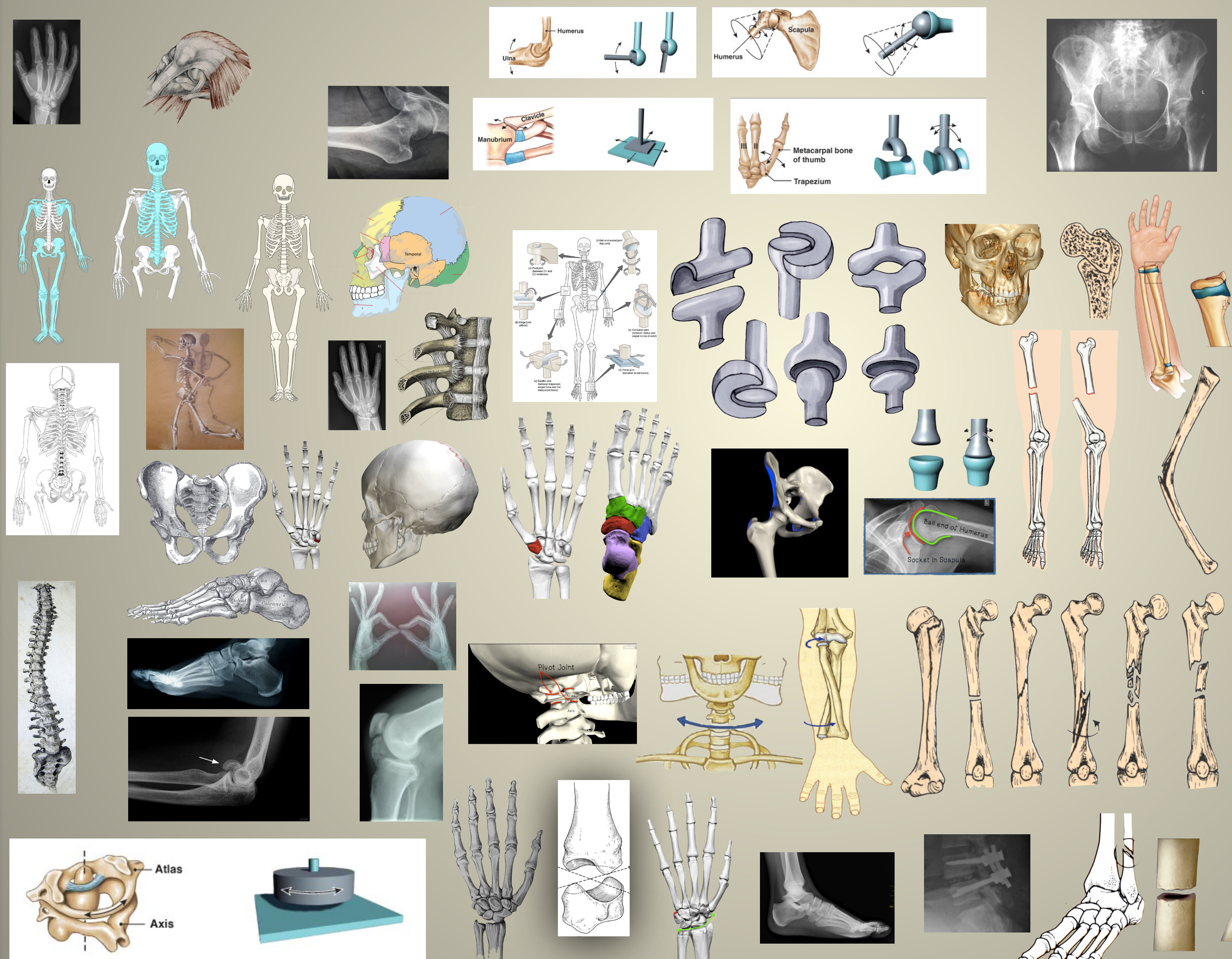

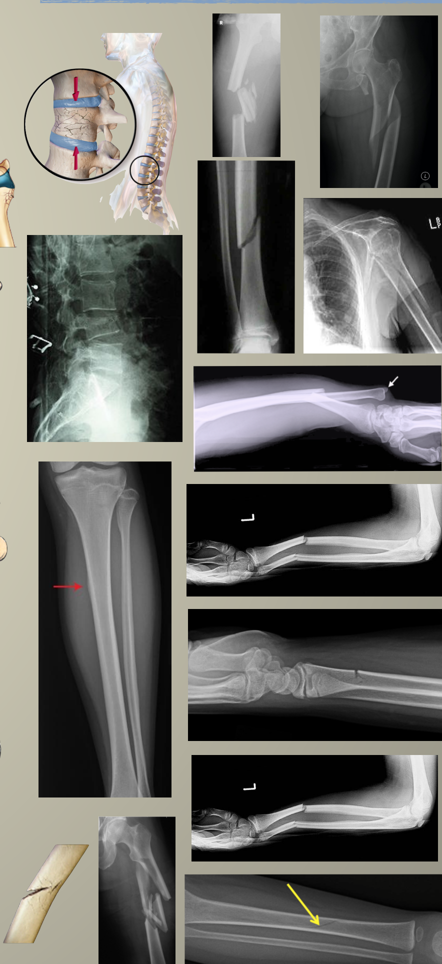

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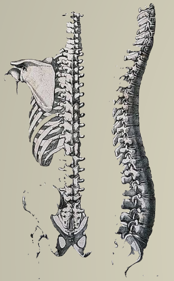
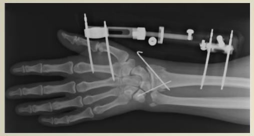


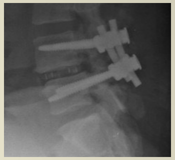





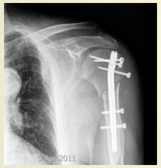


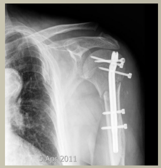


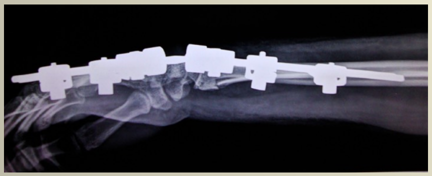
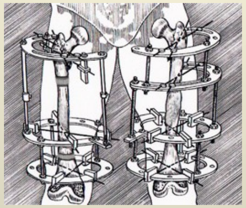


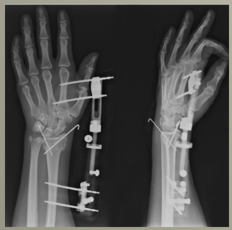






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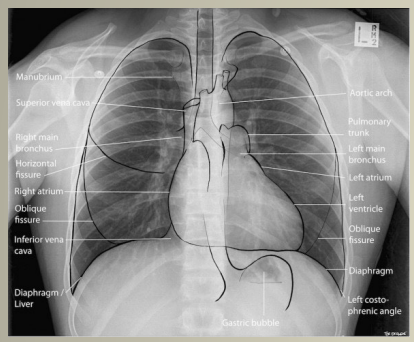

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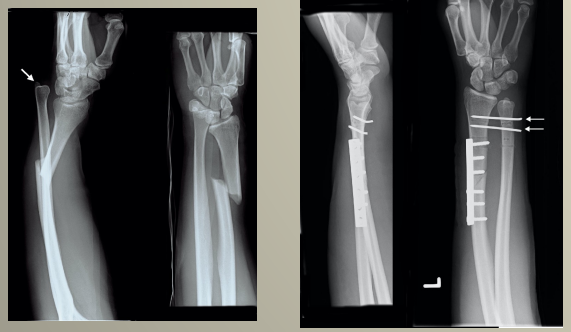

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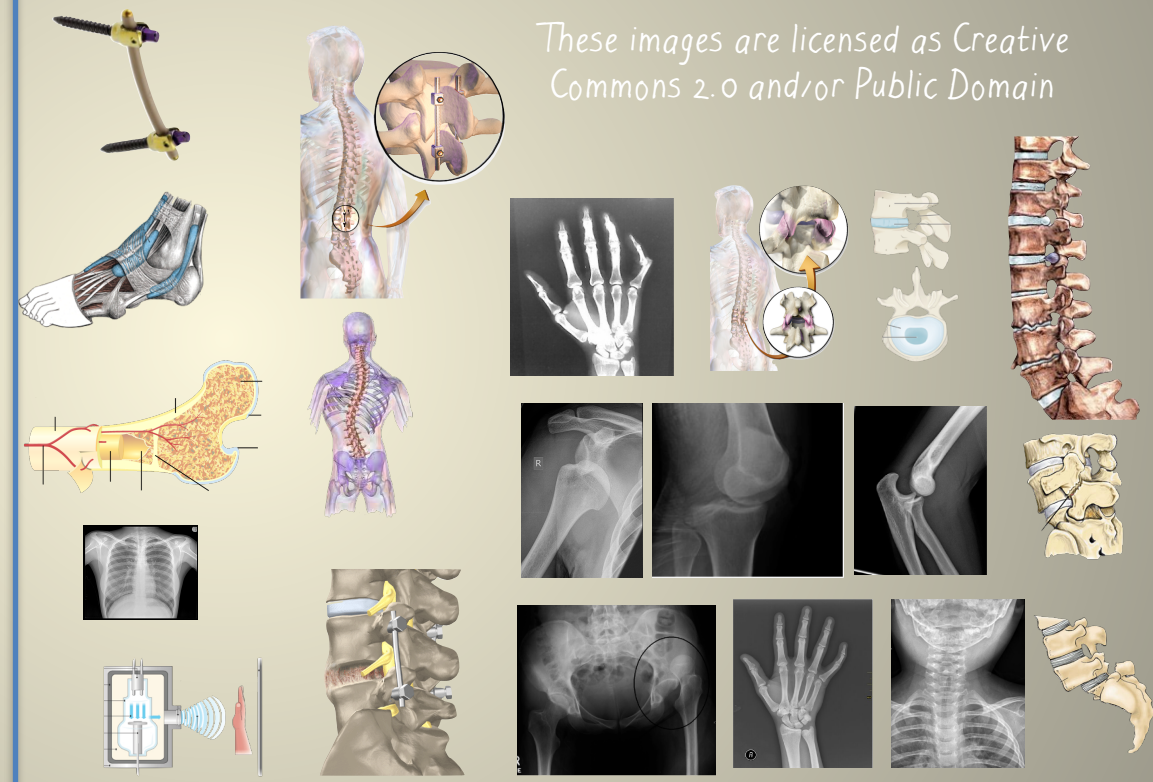

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