

**Imaging**  
Medical Education Associates, L.L.C.

**CT Procedures and Anatomy**

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**Cross Sectional Anatomy – Overview  
 &  
 CT imaging Procedures - Introduction**

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**Overview Cross-Sectional Anatomy**

- Head & Neck
  - Brain
  - Vasculature
- Spine
  - Cervical
  - Thoracic
  - Lumbar
- Body
  - Chest
  - Abdomen
  - Pelvis
  - Vasculature
- Musculoskeletal
  - Upper extremities
  - Lower extremities

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**Head**

**CT Images**

**MRI Images**

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**Cranial Bones & Brain Lobes**

**Cranial Bones**

**Brain Lobes**

The 5<sup>th</sup> lobe of the brain is known as the Insula  
 It is located "inside" the Sylvian (Lateral) Fissure

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**Brain Anatomy: Mid-Sagittal**

**Axial CT Image**

**Brain Specimen**

**Midline Sagittal CT Image**

**Midline Sagittal MRI Image**

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**What separates the lobes?**

**Tentorium... separates cerebrum from cerebellum**

**Longitudinal Fissure... Right and Left lobes (inside is the Falx Cerebri)**

**Sylvian Fissure or Lateral Fissure... Separates the Frontal lobe from the parietal lobe**  
 Inside is the 5<sup>th</sup> lobe of the brain, the "Insula" & the MCA

**Sylvian Fissure**

**Longitudinal Fissure**

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### Sagittal Plane

Midline Sagittal | Parasagittal

Midline Sagittal

Parasagittal

Sagittal | Axial | Coronal

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### Brain Anatomy: Gray & White Matter

White Matter | Gray Matter

White Matter | Gray Matter

Brain specimen

Midline Sagittal CT Image

Midline Sagittal MRI Image

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### Brain Anatomy: Corpus Callosum

Corpus Callosum (genu) | Corpus Callosum (body) | Corpus Callosum (splenium)

Corpus Callosum (genu) | Corpus Callosum (body) | Corpus Callosum (splenium)

Midline Sagittal CT Image

Midline Sagittal MRI Image

Hint- the Corpus callosum is the only white matter structure to cross midline  
Hint- white matter is made up of myelin

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### Fractional Anisotropy

FA=0.0-1

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### Brain Anatomy: Brain Stem

Cerebral peduncles | Pons | Medulla | Spinal Cord

Cerebral peduncles | Pons | Medulla | Spinal Cord

Midline Sagittal CT Image

Midline Sagittal MRI Image

Hint- we know that we are in the midline when we see the spinal cord

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### Brain Anatomy: Midline Structures

Anterior horn | Lateral ventricle | Thalamus | Third ventricle | Optic chiasm | Pituitary stalk | Pituitary gland | Clivus

Anterior horn | Lateral ventricle | Thalamus | Third ventricle | Optic chiasm | Pituitary stalk | Pituitary gland | Clivus

Midline Sagittal CT Image

Midline Sagittal MRI Image

Hint- we know that we are in the midline when we see the pituitary and sella Turcica

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### Brain Anatomy: Para-Sagittal

**Labels:** Parietal, Frontal, Temporal, Occipital, Cerebellum, Maxillary Sinus, Teeth, Sulci gyri, para Sagittal MRI Image, Parietal lobe, Occipital lobe, Sylvian (lateral) fissure, MCA flow through The insula is inside, Cerebellum, Temporal Lobe, Frontal lobe, para Sagittal CT Image.

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### Coronal Plane

**Labels:** Sagittal, Axial, Coronal, coronal slice more anterior, coronal slice more posterior, coronal slice very posterior.

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### Coronal Facial Bone Anatomy

**Labels:** Christi galli, Cribriform plate, Orbital roof, Nasal conchae, Maxilla, Mandible, Fracture, Frontal bone, Nasal bone, Maxilla, Temporal bone, Zygoma.

Coronal CT reformatted image of Trauma

Coronal Oblique CT

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### High Resolution Brain Protocol

- Lateral & AP Scout  
120 kv, 80 ma, 50 fov
- Axial  
120 kv, 220 ma, 28cm fov  
512 x 512 matrix  
1-3 mm to frontal sinus  
-straight- floor of maxillary sinus perpendicular to table- gantry  
Straight  
9 mm to top of head  
or  
5mm / 5mm through fossa  
8 -9mm entire head  
125 W 55 L Head
- Coronal  
120 kv, 220 ma, 16-20cm fov  
512 x 512 matrix  
3 mm to frontal sinus  
angled perpendicular to mandible  
250 W 30 L (soft tissue)  
2000 W 350 L (bone)

Soft tissue windows

Bone windows

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### Coronal Through Pituitary Gland

**Labels:** Optic chiasm, Pituitary stalk, Do you see the seagull?, Parietal lobe, Longitudinal fissure, Pituitary gland (w/tumor), Pit stalk (infundibulum), Optic chiasm, Lateral ventricles, Septum pellucidum, Temporal lobes.

Coronal CT

Coronal MR

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### Brain Anatomy Coronal Posterior

**Labels:** Cisterna Ambler w/Pineal gland, Cerebral aqueduct, Tentorium, 4th ventricle, Cerebellum.

Coronal CT image

Coronal MR image

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### Imaging Planes

Axial Slice locations  
5 4 3 2 1  
Angled with base of skull

Axial - SLICE # 1

Axial - SLICE # 2

Axial - SLICE # 3

Axial - SLICE # 4

Axial - SLICE # 5

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### Axial Slice Locations

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### Brain Anatomy: Axial Superior

This red line indicates the location of the axial slice

Gray matter ribbons

Anterior

Superior sagittal sinus

White matter

falx cerebri - enhanced on CT image

Parietal lobe

Sulci & Gyr

Posterior

Frontal lobe

Longitudinal fissure

Sulci gyri

Cortical bone

Subcutaneous fat

Axial CT image Superior location

Axial MR image Superior location

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### Brain Anatomy: Axial @ Ventricles

Gray matter

White matter

Anterior Horns of the Lateral Ventricles

Septum pellucidum

Choroid Plexus

Posterior Horns of the Lateral Ventricles

Axial CT image

Axial T1 weighted MR image

Just because the structure is gray, does not automatically make it gray matter!

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### Brain Anatomy: Axial Basal Ganglia

Caudate Nucleus

External Capsule

Lentiform Nucleus

Internal Capsule

Thalamus

Caudate nucleus

Lentiform nucleus

Putamen & globus pallidus

Internal capsule

Thalamus

External capsule

Clastrum

Extreme capsule

Axial CT image

Axial PD weighted MR image

Just because the structure is white, does not automatically make it white matter!

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### White Matter Tracts

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### Brain Anatomy: Axial Orbits

This red line indicates the location of the axial slice

Cerebellum  
At the level of the vermis

This red line indicates the location of the axial slice

Frontal sinus  
Orbit  
Nasal conchae  
Sphenoid sinus  
Temporal Lobe  
Basilar Artery  
Pons  
4<sup>th</sup> ventricle  
Mastoid air cells  
Cerebellum

Axial CT image

Axial MR image

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### Brain Anatomy: Axial Orbits

This red line indicates the location of the axial slice

This red line indicates the location of the axial slice

Lens  
Globe of the eye  
Optic nerve  
Lateral rectus muscle  
R. Medial rectus muscle  
L. Medial rectus muscle  
Temporal lobe

Axial CT image

Axial MR image

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### Brain Anatomy: IAC's

This red line indicates the location of the axial slice

This red line indicates the location of the axial slice

Temporal Lobe  
Temporal bone  
IAC  
Mastoid Air Cells  
7th & 8th cranial nerves

Axial CT image

Axial MR image

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### Brain Anatomy: IAC's

This red line indicates the location of the axial slice

This red line indicates the location of the axial slice

Temporal Lobe  
Temporal bone  
IAC  
Mastoid Air Cells  
Cochlea  
Semicircular canals

Axial CT image

Axial MR image

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### Axial Brain Anatomy: Midbrain

This red line indicates the approximate location of the axial slice

This red line indicates the approximate location of the axial slice

Cerebellum  
At the level of the vermis

Frontal Lobe  
Falx Cerebri  
Sylvian Fissure  
Temporal lobe  
Cerebral peduncles  
Red nucleus  
Cerebral Aqueduct  
Vermis  
Cerebellum  
Occipital Lobe

Axial CT image

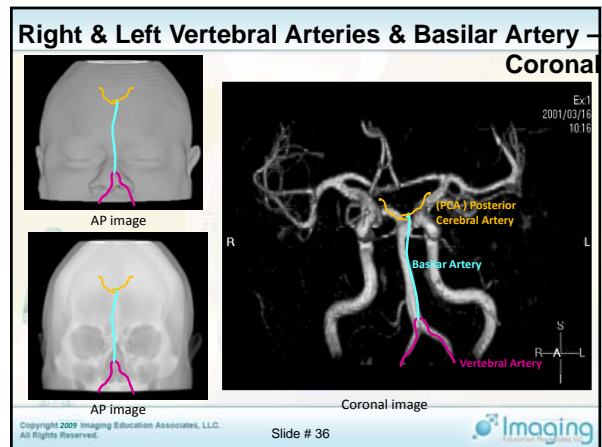
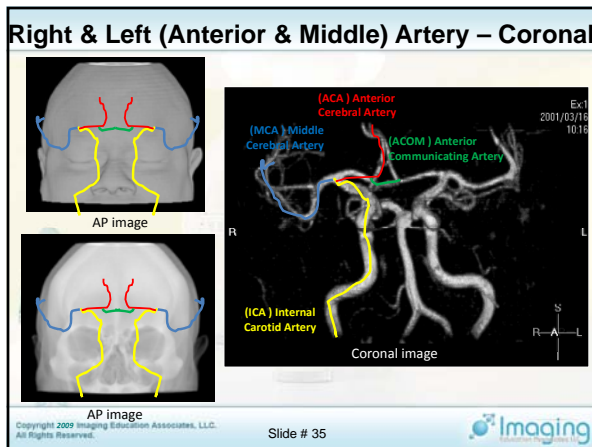
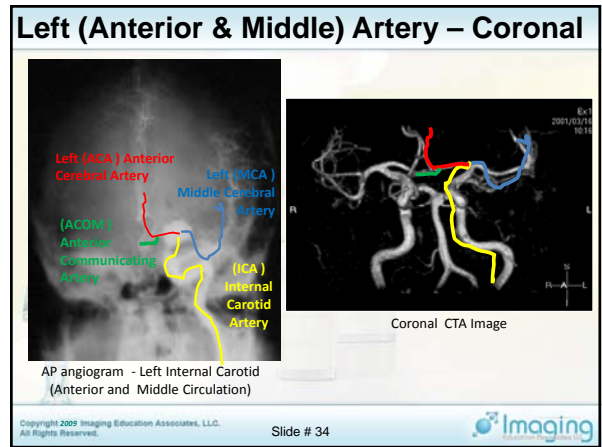
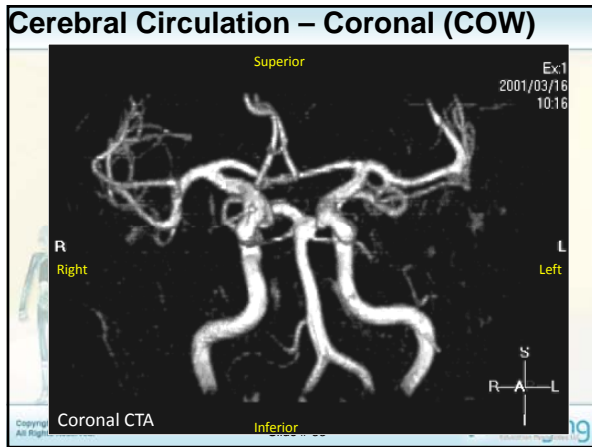
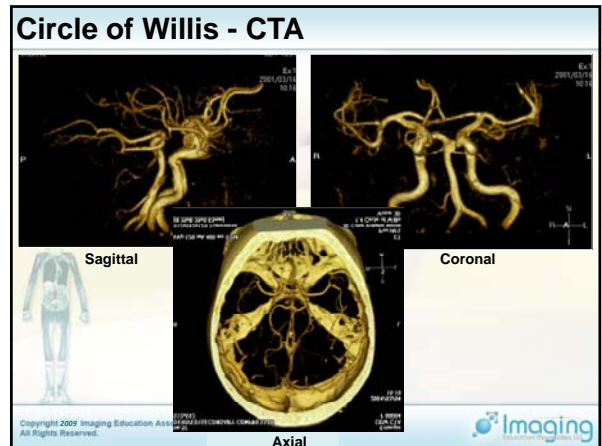
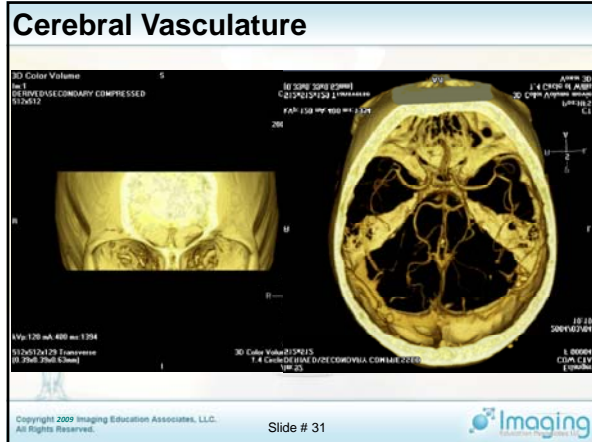
Axial MR image

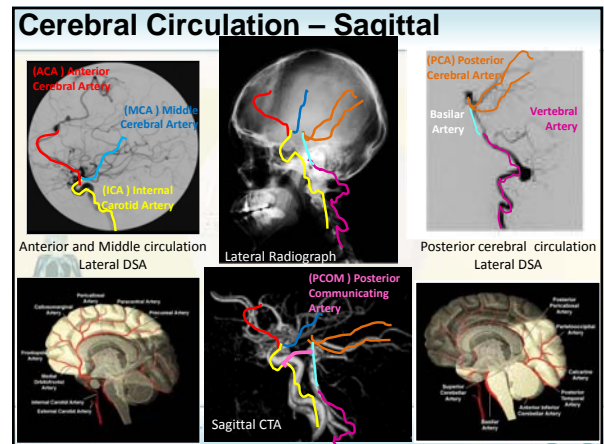
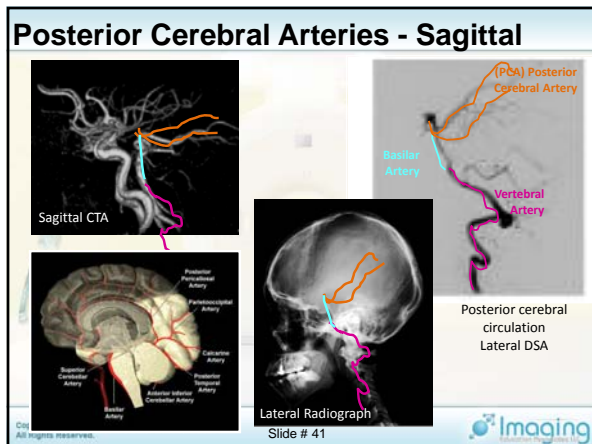
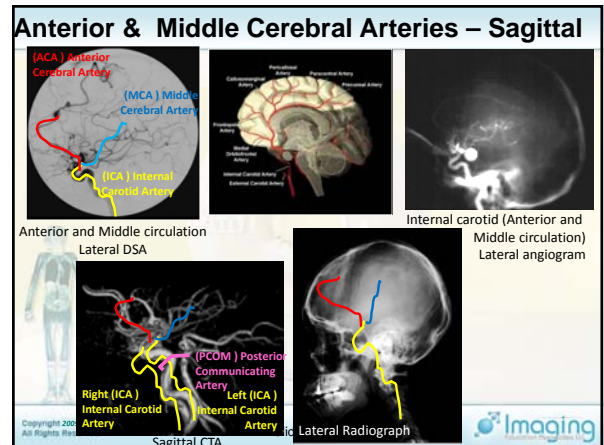
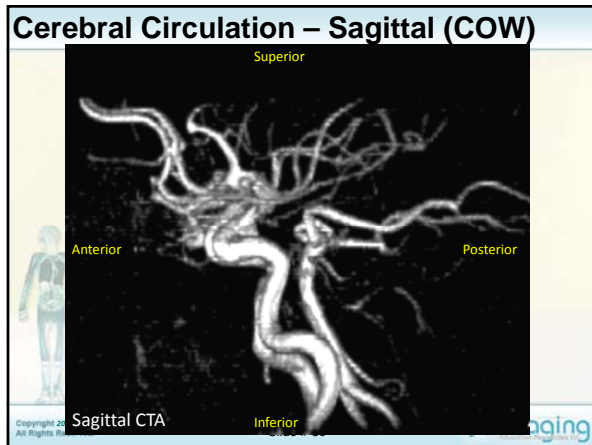
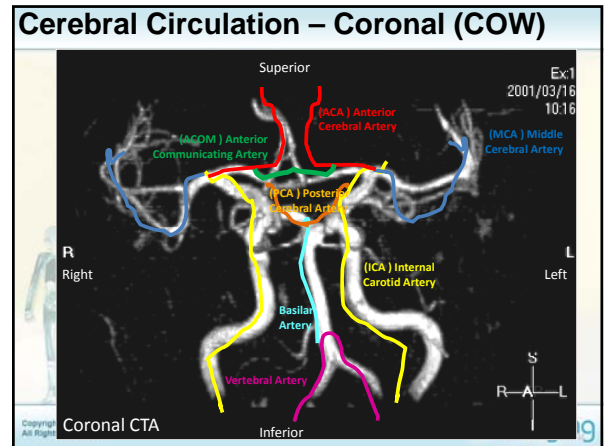
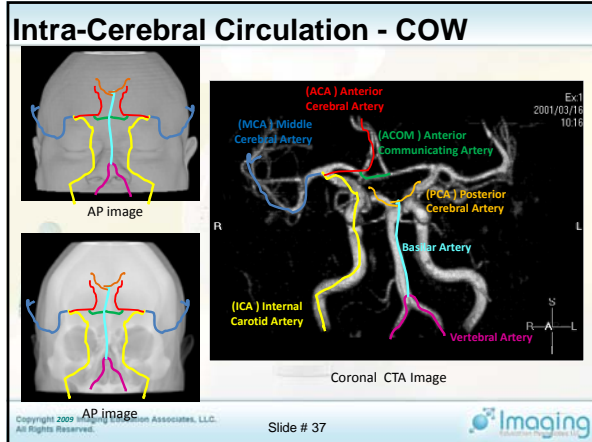
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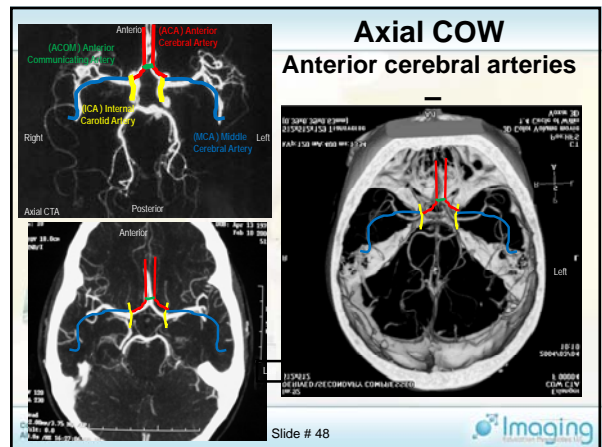
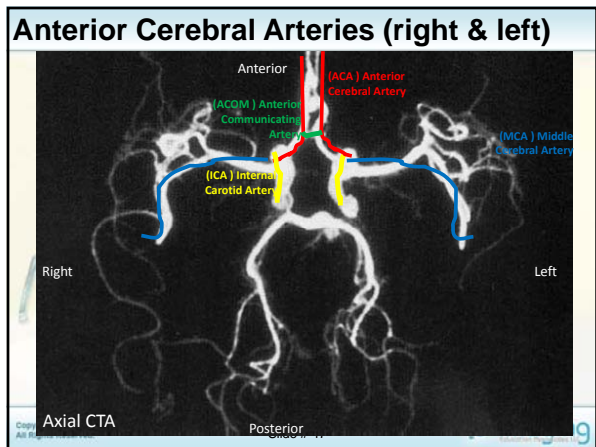
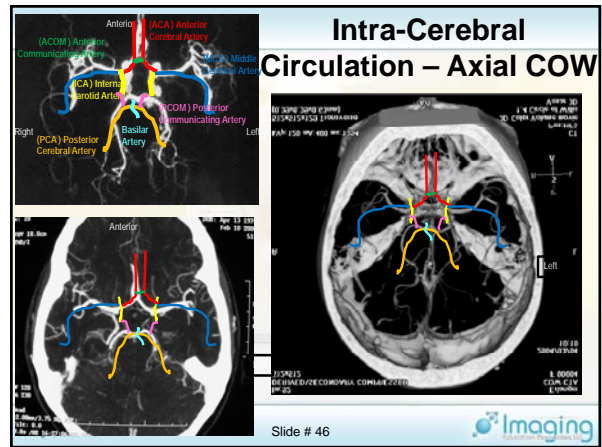
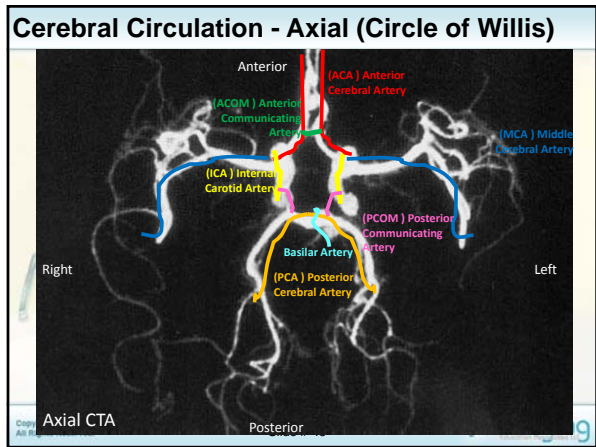
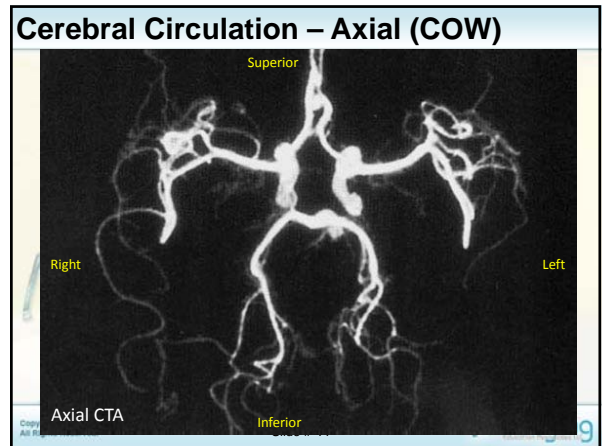
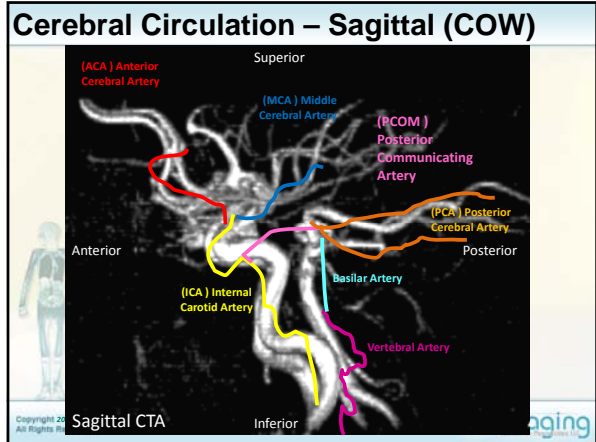
### Overview Cross-Sectional Anatomy

- Head
  - Anterior Circulation
  - Posterior Circulation
  - COW (circle of Willis)
- Neck
  - Carotid Arteries
  - Vertebral Arteries

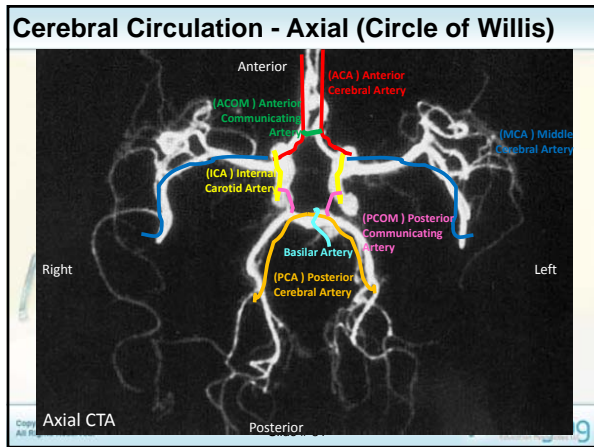
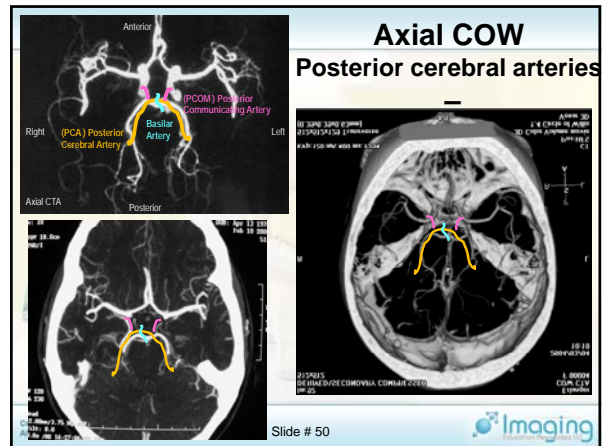
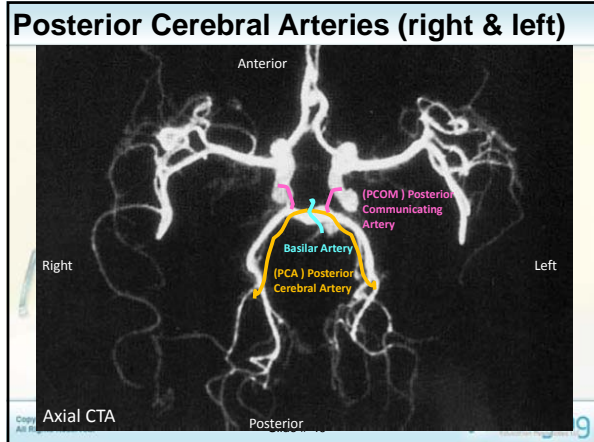
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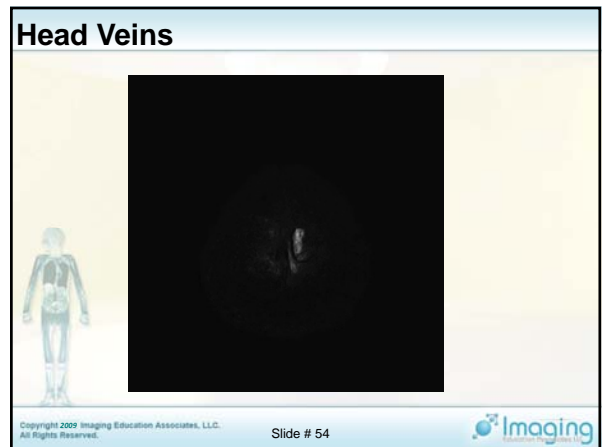
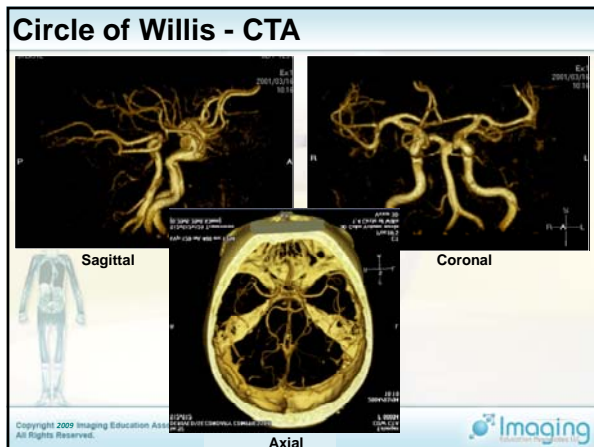




### CTA-Rapid Brain Protocol

- AP & Lateral Scout
  - 120 kv, 80 ma, 50 fov
- Axial
  - 120 kv, 420 ma
  - 512 x 512 matrix, 24cm fov
  - .675 mm through COW
  - then
  - 9mm through entire head
  - straight- floor of maxillary sinus perpendicular to table-gantry straight
  - Contrast if 100 -120cc's
    - non-ionic 350 mg/ml
    - 3 cc/sec for 20g angiocath
    - delay scan 15-20 sec post injection
    - usually reconstructed to a field of 128mm from above the cow to c2

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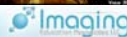
### Overview Cross-Sectional Anatomy

- Head
  - Anterior Circulation
  - Posterior Circulation
  - COW (circle of Willis)
- Neck
  - Carotid Arteries
  - Vertebral Arteries



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### Neck Vasculature

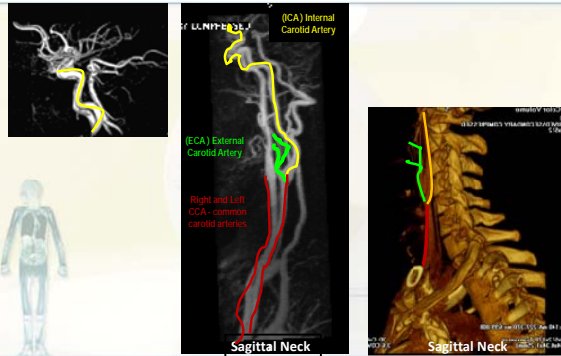


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### Carotid Arteries – Sagittal

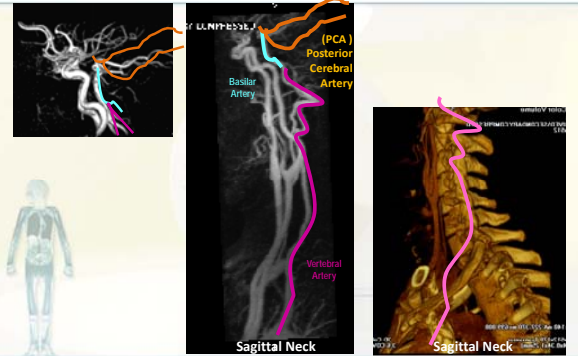


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### Vertebral Arteries – Sagittal

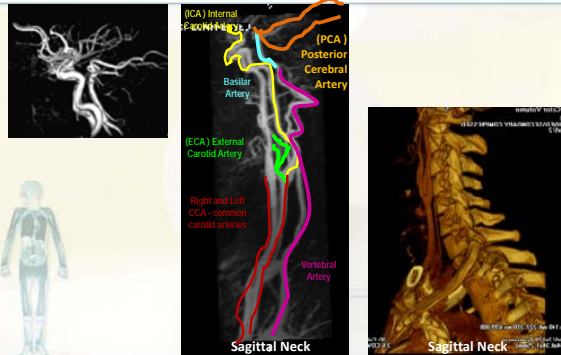


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### Carotid Arteries – Sagittal

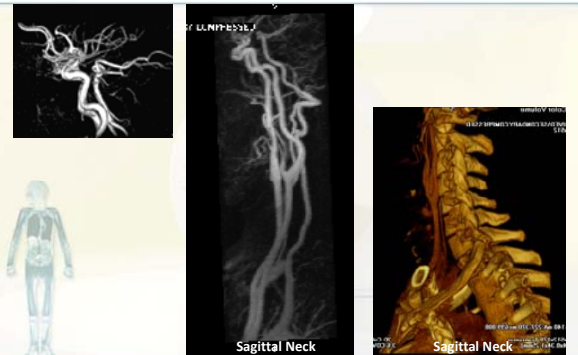


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### Carotid Arteries – Sagittal




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### Overview Cross-Sectional Anatomy

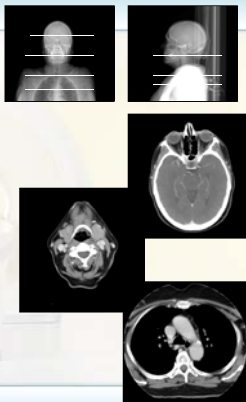
- Head
  - Anterior Circulation
  - Posterior Circulation
  - COW (circle of Willis)
- Neck
  - Carotid Arteries
  - Vertebral Arteries



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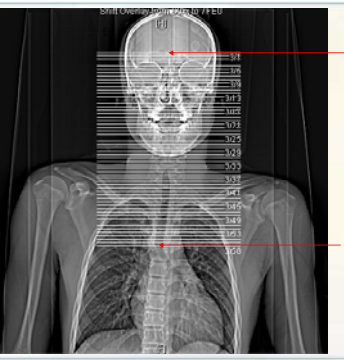
### Protocol for Neck

- AP & Lat scout
  - 120 kv, 80 ma, 50cm FOV
- Axial
  - 120 kv 280 ma
  - 5/5 mm, 23 cm FOV
  - 512 x 512 matrix
- Scan frontal sinus to carina-include mandible
- Contrast
  - 100 cc's non-ionic 240-300 mg/ml
  - 2 cc/sec for 20g cath
  - delay scan 70 second post injection
  - 250 W 30 L (soft tissue)
  - 2000 W 350 L (bone)



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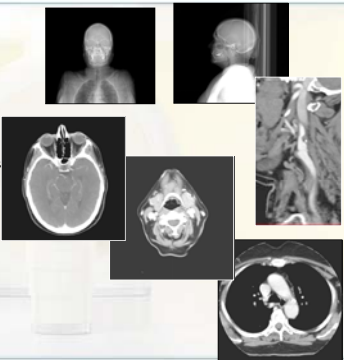
### Scan Planning



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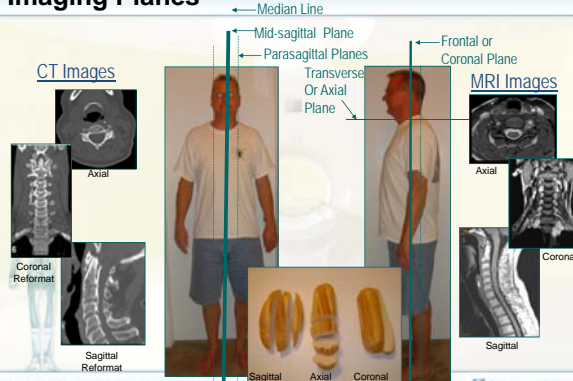
### CTA-Rapid Neck Protocol

- AP & Lateral Scout
  - 120 kv, 80 ma, 50 cm FOV
- Axial
  - 120 kv, 420 ma
  - 512 x 512 matrix, 24cm FOV
  - 1 mm from the arch to above the frontal sinuses
  - straight- floor of maxillary sinus perpendicular to table- gantry straight
- Contrast if 100 -120cc's non-ionic 300-350 mg/ml
- 3 cc/sec for 20g angiocath
- delay scan 15-20 sec post injection
- usually reconstructed to a field of 128mm



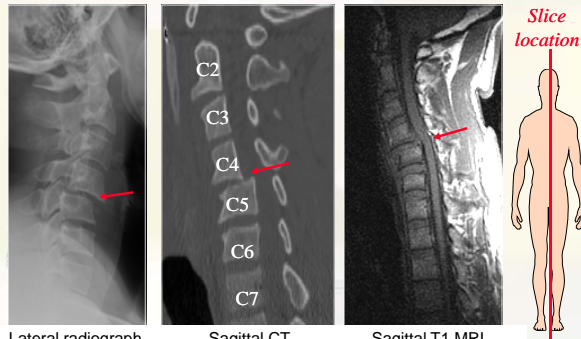
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### Imaging Planes



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### Image Comparison in the C-spine



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### Spinal Anatomy Brachial Plexus & Lumbar Plexus

Fracture

Brachial plexus  
Cervical vertebrae

Lumbar vertebrae  
Lumbar plexus  
Sacral plexus

Sacrum

CORONAL CT

CORONAL MRI

SAGITTAL MRI

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### Spinal Anatomy Vertebral bodies & Intervertebral disks

C1  
C2  
C3

Spinal cord  
Intervertebral Disk  
Anulus (dark)  
Nucleus pulposus (bright)  
Conus medularis

L4  
L5  
S1

SAGITTAL CT

SAGITTAL MRI

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### Imaging Planes – C Spine & Neck

Anterior arch c1  
The dens

Laryngeal Cartilages  
Larynx  
Cervical vertebra  
Pedicle  
Dorsal and ventral nerve roots  
Spinal cord  
Lamina  
Spinous process  
Spinal muscles

Axial CT image

Axial MR image

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### Neck CT - Laryngocele

Internal Laryngocele  
Causes stridor

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### Imaging Planes – C Spine & Neck (continued)

Vertebral body  
Pedicle  
Lamina  
foramina

C1  
Dens (C2)  
C-7

Lordosis  
Vert bodies  
Disk  
Cord  
esophagus  
trachea  
Spinal muscles

Epidural fat (bright)  
CSF (cerebrospinal fluid)

CT AXIAL

MRI AXIAL

SAGITTAL CT

SAGITTAL MRI

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### “Arnold Chiari Malformation”

Cerebellar Tonsils  
Syrinx

SAGITTAL MRI

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### Apical Herniation: Ehlers-Danlos syndrome

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### Sagittal T-spine Anatomy

Approximate location for sagittal reformat

Approximate location for sagittal

CT AXIAL

MRI AXIAL

T1 (1<sup>st</sup> thoracic vertebrae)  
 T12 (12<sup>th</sup> thoracic vertebrae)  
 Spinal Cord  
 Vertebral bodies (curvature = kyphosis)  
 Intervertebral Disk  
 Spinous process  
 Conus  
 Cauda equina  
 CSF around the nerves  
 Posterior longitudinal ligament (along the posterior vertebral bodies from C1 - sacrum)  
 Anterior longitudinal ligament (along the anterior vertebral bodies from C1 - sacrum)

Ligamentum flavum

Sagittal Reformatted CT Slide # 74 SAGITTAL MRI

### Thoracic Spine

Approximate location for axial

Approximate location for axial

SAGITTAL CT

SAGITTAL MRI

CT AXIAL

MRI AXIAL

Aorta  
 Vertebral body  
 Lung  
 Costo-vertebral joint  
 Pedicle  
 Rib  
 Spinal canal  
 Spinal cord  
 CSF (cerebrospinal fluid)  
 Transverse process  
 Lamina  
 Spinous process  
 Ligamentum flavum  
 Erector spinae muscles

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### Spine

CT AXIAL

MRI AXIAL

SAGITTAL CT

SAGITTAL MRI

Vertebral body  
 Pedicle  
 Lamina  
 Facet joints

L1  
 L5  
 Vert bodies  
 lordosis

Disk  
 Ligamentum flavum  
 Posterior longitudinal ligament

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### Anatomy Musculoskeletal System

TMJ

TMJ

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### Imaging Planes - TMJ

Median Line

Mid-sagittal Plane

Parasagittal Planes

Transverse Plane

Mid Frontal Coronal Plane

CT Images

MRI Images

Axial

Coronal

Sagittal

Sagittal Axial Coronal

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### Overview musculoskeletal Anatomy - TMJ

Localizer for sagittal oblique sections

Localizer for coronal oblique sections

Temporal bone  
Fossa (meniscus within)  
Mandibular condyle  
Mandible

Sagittal Oblique TMJ

Coronal Oblique TMJ

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### Corocoid vs coronoid...

"There's a sea (C) between two Nations"

TMJ 3D CT reformatting image

Shoulder radiograph

Sagittal MR Elbow

Sagittal reformatting CT

Shoulder CT

Lateral radiography (Elbow)

CoroNoid

CoroCoid

CoroNoid

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### Anatomy Musculoskeletal System

Shoulder

Shoulder

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### The lumps and bumps of the shoulder

- Shoulder
  - Scapula
    - Spine of the scapula
    - Coracoid process
    - Acromion process
  - Clavicle
  - Humerus
    - Head of the humerus
    - Greater tubercle
    - Lesser tubercle

Reformatted CT Image shoulder

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### Surgical Fixation

AC Joint

Clavicle

Ribs

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### Overview musculoskeletal Anatomy - Shoulder

Median Line

Midline Sagittal Plane

Parasagittal Planes

Transverse Or Axial Plane

Frontal or Coronal Plane

Axial

Sagittal

Coronal oblique

The sagittal oblique plane is acquired along this dotted red line, parallel to the glenoid fossa

The coronal oblique plane is acquired along this dotted red line on the axial shoulder image. Parallel to the supraspinatus muscle & tendon or perpendicular to the glenoid fossa

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### Structures of the rotator cuff...(SITS)

**Structures of the rotator cuff...(SITS)**

- Axial MR Image
- Reformatted CT Image
- Coronal oblique MR Image
- Trapezius
- Deltoid
- RC (S.I.T.S.)
- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

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### Shoulder Structures

**Shoulder Structures**

- Sagittal Oblique Shoulder
- Axial MR Image
- Coronal oblique MR Image
- Deltoid
- Supraspinatus tendon
- Infraspinatus tendon
- Teres minor tendon
- Subscapularis tendon
- Biceps muscle
- Trapezius
- Rotator cuff
- Glenoid fossa
- Glenoid labrum

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### Bony Structures of the shoulder

**Bony Structures of the shoulder**

- Sagittal Oblique Shoulder
- Axial MR Image
- Coronal oblique MR Image
- Acromion
- A/C joint (acromio-clavicular joint)
- Clavicle
- Humeral Head
- Corocoid process
- Rotator cuff
- Scapula

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### Anatomy Musculoskeletal System

**Anatomy Musculoskeletal System**

Elbow

Elbow

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### Bones of the Elbow Joint

**Bones of the Elbow Joint**

- Sagittal Oblique Elbow
- Axial MR Image
- Coronal oblique MR Image
- Humerus
- Olecranon process
- Joint space
- Trochlea
- Capetellum
- Coronoid process
- Ulna
- Trochlea-humero-ulnar joint

"Cap on Head" (Capetellum on the head of the radius)

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### Muscles, Tendons & Ligaments of the Elbow Joint

**Muscles, Tendons & Ligaments of the Elbow Joint**

- Sagittal Oblique Elbow
- Axial MR Image
- Coronal oblique MR Image
- Triceps muscles
- Biceps Muscles
- Extensor tendons
- Brachioadialis muscle
- Radial collateral ligament
- Ulnar collateral ligament

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### Anatomy Musculoskeletal System

Wrist

Wrist

Slide # 91

Imaging

### Overview musculoskeletal Anatomy – Wrist

Never Lower Tillie's Pants...Grandmother Might Come Home

- Navicular
- Lunate
- Triquetrum
- Pisiform
- Greater Multangular
- Lesser Multangular
- Capitate
- Hammate

Coronal reformatted CT

Coronal MRI

Slide # 92

Imaging

### Overview musculoskeletal Anatomy – Wrist

Some Lovers Try Positions....That They Can't Handle

- Scaphoid
- Lunate
- Triquetrum
- Pisiform
- Trapezium
- Trapezoid
- Trapezoid
- Capitate
- Hammate
- Aneurysm
- Raidal artery
- Ulnar artery
- Trapezium
- Trapezoid
- Capitate
- Hammate

Coronal reformatted CT

Coronal MRI

Slide # 93

Imaging

### Overview musculoskeletal Anatomy – Wrist

- Trapezium
- Trapezoid
- Capitate
- Hammate
- Hook of the Hammate
- TFCC (triangulo-fibrocartilage complex)
- Carpal Tunnel
- Flexor tendons
- Median Nerve
- Distal Radius
- Distal Ulna
- Radio-ulnar joint

Coronal MRI

Axial MRI

Slide # 94

Imaging

### Wrist Pathology

Aneurysm

Fracture

Slide # 95

Imaging

### Handshake

Slide # 96

Imaging



### Anatomy Musculoskeletal System

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### Bony anatomy of the HIP

Acetabulum  
Ilium  
Ischium  
Pubis  
Obturator foramen

Femoral Head  
Femoral Neck  
Greater Trochanter  
Lesser trochanter  
Femoral Shaft

Reformatted CT Image Hip

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### BONE METS

Compressed vertebral body  
Met to the pelvic bone

Reformatted Coronal CT Image pelvis

Reformatted Sagittal CT Image Spine

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### Hips & Pelvis

Ilium  
Iliac arteries  
Psoas Muscles  
Obturator foramen  
Gluteal Muscles  
Mass  
Obturator Internus muscles  
Obturator Externus

Coronal reformed CT

Coronal CT

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### Structures of the HIP

(ASIS) Ilium  
Acetabulum  
Obturator foramen  
Ischium  
Pubis

Femoral Head  
Femoral Neck  
Greater Trochanter  
Lesser trochanter  
Femoral Shaft

Reformatted CT Image Hip

Ilium  
Acetabulum  
Glenoid Labrum  
Femoral Neck  
Femur  
Obturator Internus muscles  
Obturator Externus

Coronal MRI of the Hips

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### NAVEL

Nerve, Artery, Vein, Empty space, Lymph node

Psoas Muscle  
Iliacus Muscle  
Gluteus Maximus  
Gluteus minimus  
Quadriceps Muscle  
Hamstrings

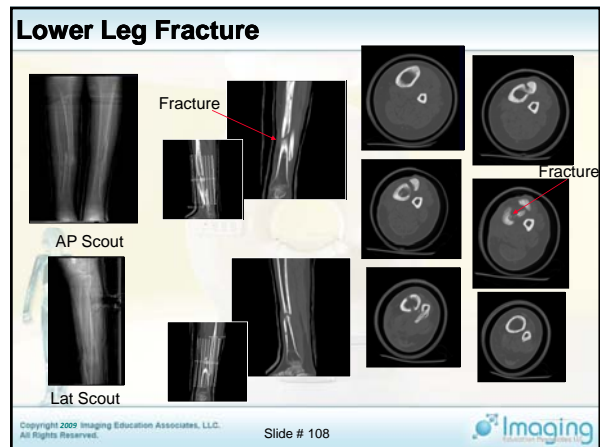
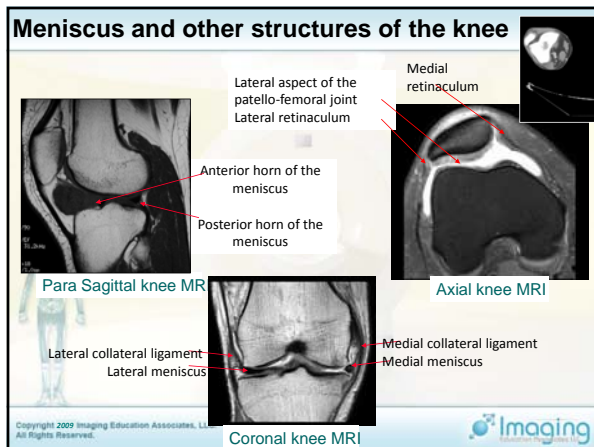
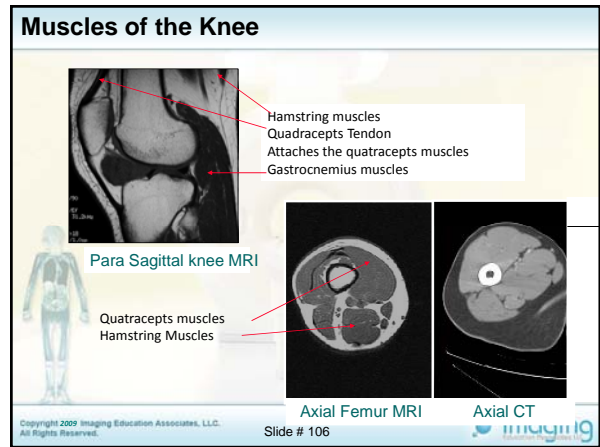
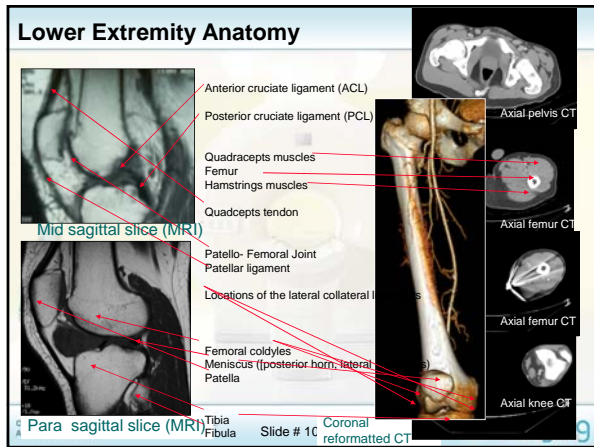
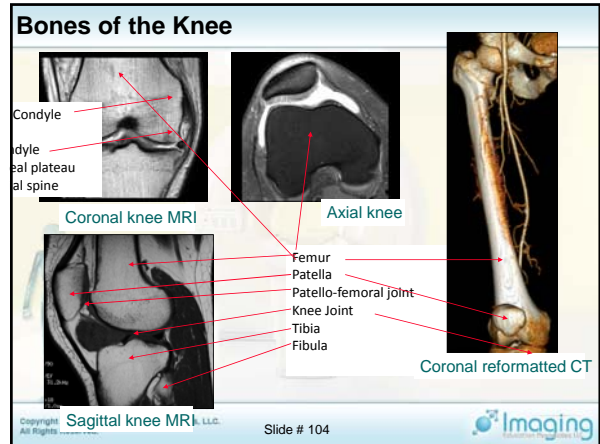
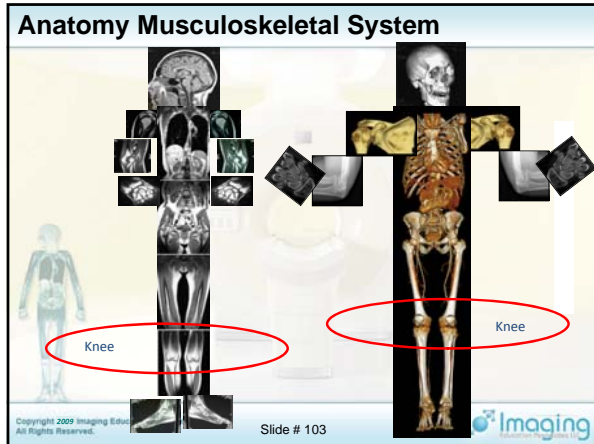
Coronal MRI of the Hips

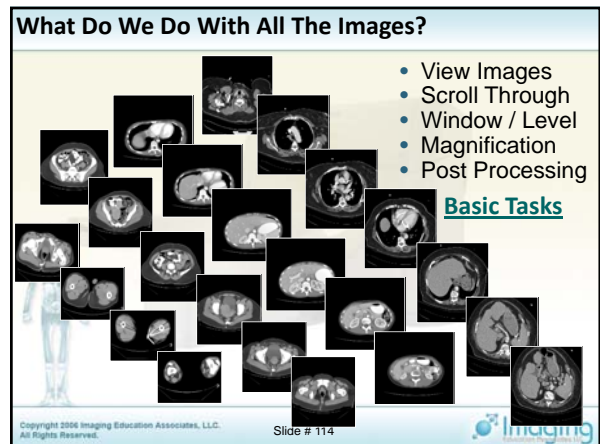
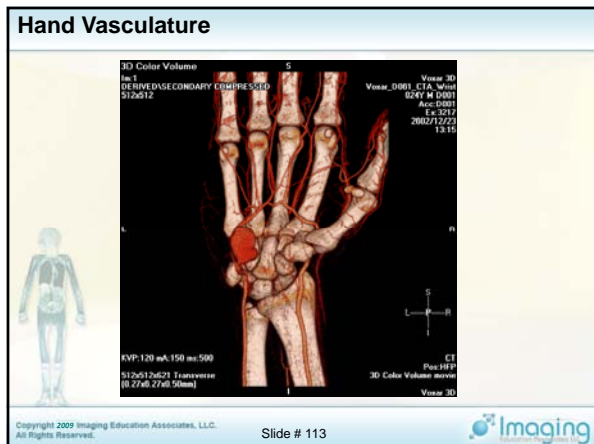
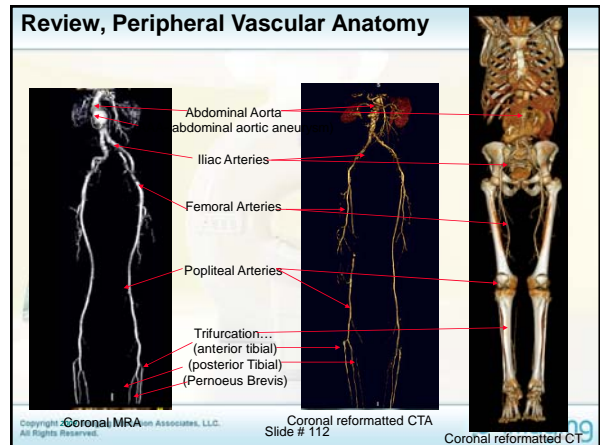
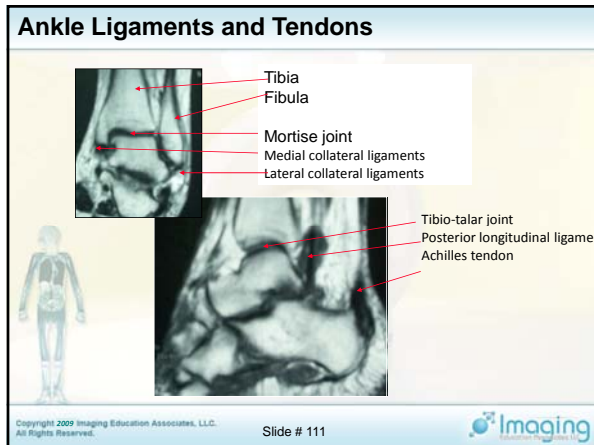
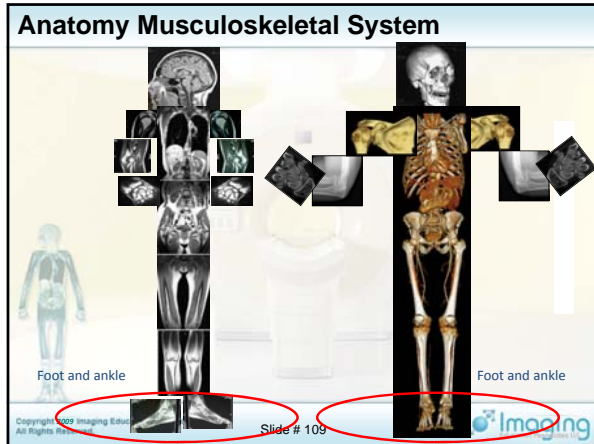
bladder

Nerve  
Artery  
Vein  
Empty space  
Lymph nodes  
Quadriceps Muscle  
Gluteus Maximus  
Rectum

Axial MRI of the Hips

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### Imaging Planes

Median Line  
 Frontal or Coronal Plane  
 Mid-sagittal Plane  
 Parasagittal Planes  
 Transverse Or Axial Plane

**CT Images**  
 Axial  
 Coronal Reformat  
 Sagittal Reformat

**MRI Images**  
 Axial  
 Coronal  
 Sagittal

Sagittal Axial Coronal

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### Chest Coronal, Heart & Lungs

CTA  
 MRA  
 Heart  
 Lungs  
 Enhanced Coronal CT  
 Coronal MRI

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### Chest Coronal, Vasculature

CTA  
 MRA  
 Pulmonary Arteries  
 Pulmonary Veins  
 Enhanced Coronal CT  
 Coronal MRI

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### Chest Coronal, Lungs & Airway

Upper Lobe of the right lung  
 Upper Lobe of the left lung  
 Bronchi - carina  
 Middle lobe of the right lung  
*\*remember there is no middle left because of the heart!*  
 Lower lobe of the right lung  
 Lower lobe of the left lung  
 Diaphragm  
 Coronal CT  
 Coronal MRI

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### Chest Coronal Muscles of the Chest

Pectoralis muscles  
 Heart Muscle  
 Trapezius  
 Latissimus  
 Intercostal Muscles  
 Diaphragm  
 Axial CT  
 Axial MRI  
 Coronal CT  
 Coronal MRI

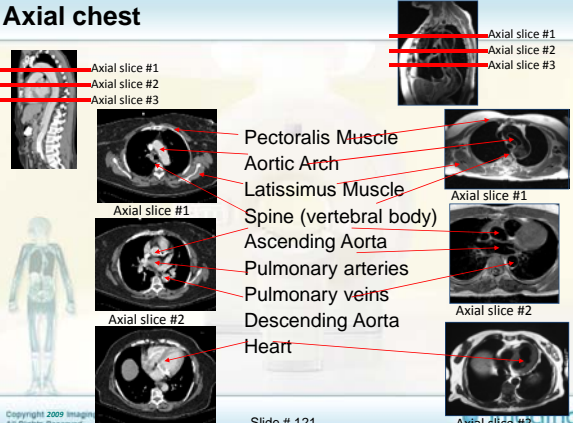
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### Sagittal Chest – “Candy Cane Shot”

Aortic Arch  
 Ascending Aorta  
 Descending Aorta  
 Heart  
 Sagittal CT  
 Sagittal MRI

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### Axial chest



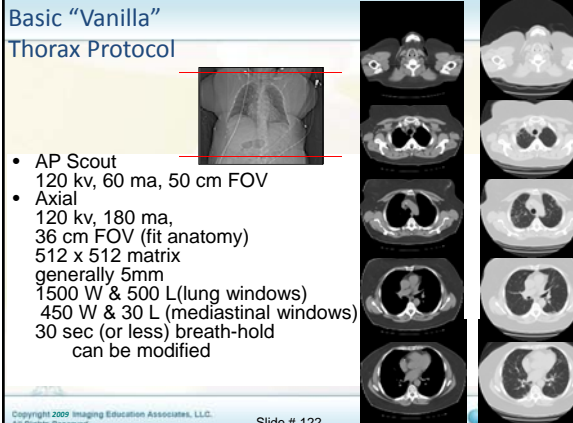
Axial slice #1  
 Axial slice #2  
 Axial slice #3

Pectoralis Muscle  
 Aortic Arch  
 Latissimus Muscle  
 Spine (vertebral body)  
 Ascending Aorta  
 Pulmonary arteries  
 Pulmonary veins  
 Descending Aorta  
 Heart

Axial slice #1  
 Axial slice #2  
 Axial slice #3

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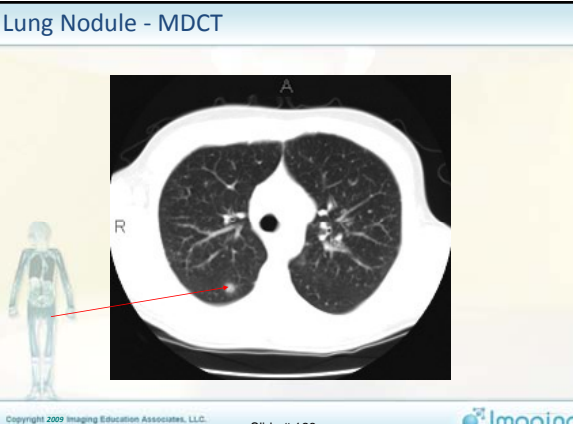
### Basic "Vanilla" Thorax Protocol



- AP Scout  
120 kv, 60 ma, 50 cm FOV
- Axial  
120 kv, 180 ma, 36 cm FOV (fit anatomy)  
512 x 512 matrix  
generally 5mm  
1500 W & 500 L (lung windows)  
450 W & 30 L (mediastinal windows)  
30 sec (or less) breath-hold  
can be modified

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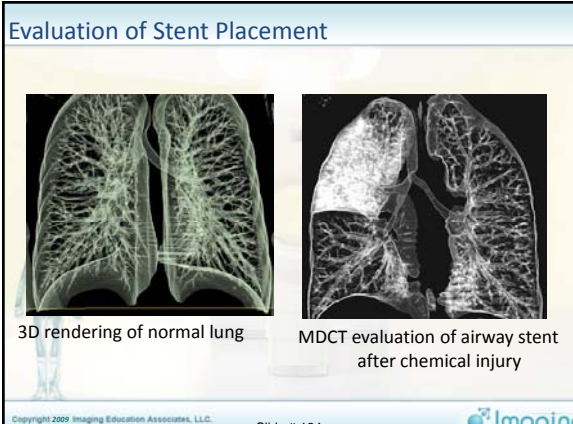
### Lung Nodule - MDCT



R  
 A

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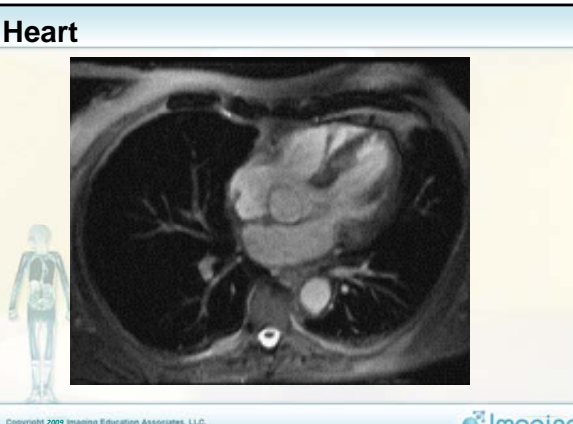
### Evaluation of Stent Placement



3D rendering of normal lung  
 MDCT evaluation of airway stent after chemical injury

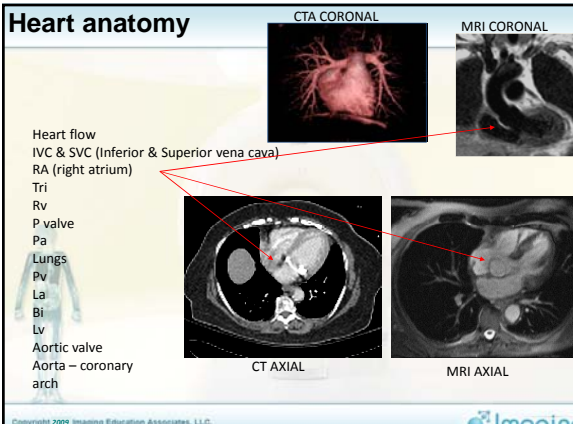
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### Heart



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### Heart anatomy



CTA CORONAL  
 MRI CORONAL  
 CT AXIAL  
 MRI AXIAL

Heart flow  
 IVC & SVC (Inferior & Superior vena cava)  
 RA (right atrium)  
 Tri  
 Rv  
 P valve  
 Pa  
 Lungs  
 Pv  
 La  
 Bi  
 Lv  
 Aortic valve  
 Aorta – coronary arch

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### Heart Anatomy

Heart flow  
 SVC (superior vena cava)  
 RA (right atrium)  
 Tri cuspid valve  
 Rv  
 P valve  
 Pa  
 Lungs  
 Pv  
 La  
 Bi  
 Lv  
 Aortic valve  
 Aorta – coronary arch

CTA CORONAL MRI CORONAL  
 CT AXIAL MRI AXIAL

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### Heart Anatomy

Heart flow  
 IVC & SVC (Inferior & Superior vena cava)  
 RA (right atrium)  
 Tri cuspid valve  
 RV (right ventricle)  
 P valve  
 Pa  
 Lungs  
 P-S v  
 La  
 Bi  
 Lv  
 Aortic valve  
 Aorta – coronary arch

CTA CORONAL MRI CORONAL  
 CT AXIAL MRI AXIAL

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### Heart Anatomy

Heart flow  
 IVC & SVC (Inferior & Superior vena cava)  
 RA (right atrium)  
 Tri cuspid valve  
 RV (right ventricle)  
 Pulmonary valve  
 PA (Pulmonary artery)  
 Lungs  
 Pv  
 La  
 Bi  
 Lv  
 Aortic valve  
 Aorta – coronary arch

CTA CORONAL MRI CORONAL  
 CT AXIAL MRI AXIAL

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### Heart Anatomy

Heart flow  
 IVC & SVC (Inferior & Superior vena cava)  
 RA (right atrium)  
 Tri cuspid valve  
 RV (right ventricle)  
 Pulmonary valve  
 PA (Pulmonary artery)  
 Lungs  
 PV (pulmonary veins)  
 LA  
 LV  
 Aortic valve  
 Aorta – coronary Arch

CTA CORONAL MRI CORONAL  
 CT AXIAL MRI AXIAL

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### Heart anatomy

Heart flow  
 IVC & SVC (Inferior & Superior vena cava)  
 RA (right atrium)  
 Tri cuspid valve  
 RV (right ventricle)  
 Pulmonary valve  
 PA (Pulmonary artery)  
 Lungs  
 PV (pulmonary veins)  
 LA (Left Atrium)  
 Bi  
 LV  
 Aortic valve  
 Aorta – coronary Arch

CTA CORONAL MRI CORONAL  
 CT AXIAL MRI AXIAL

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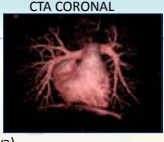
### Heart anatomy

Heart flow  
 IVC & SVC (Inferior & Superior vena cava)  
 RA (right atrium)  
 Tri cuspid valve  
 RV (right ventricle)  
 Pulmonary valve  
 PA (Pulmonary artery)  
 Lungs  
 PV (pulmonary veins)  
 LA (Left Atrium)  
 Bi cuspid valve  
 LV  
 Aortic valve  
 Aorta – coronary Arch

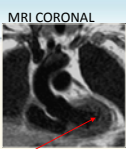
CTA CORONAL MRI CORONAL  
 CT AXIAL MRI AXIAL

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### Heart anatomy

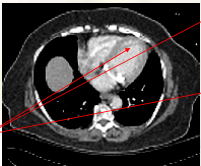


CTA CORONAL

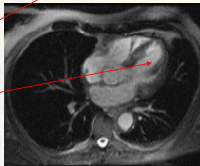


MRI CORONAL


- Heart flow
- IVC & SVC (Inferior & Superior vena cava)
- RA (right atrium)
- Tri cuspid valve
- RV (right ventricle)
- Pulmonary valve
- PA (Pulmonary artery)
- Lungs
- PV (pulmonary veins)
- LA (Left Atrium)
- Bi cuspid valve
- LV (Left Ventricle)
- Aortic valve
- Aorta – coronary Arch



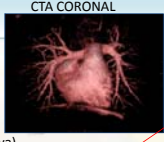
CT AXIAL



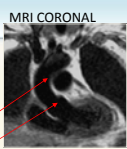
MRI AXIAL

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### Heart anatomy




CTA CORONAL

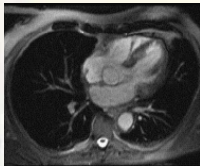


MRI CORONAL


- Heart flow
- IVC & SVC (Inferior & Superior vena cava)
- RA (right atrium)
- Tri cuspid valve
- RV (right ventricle)
- Pulmonary valve
- PA (Pulmonary artery)
- Lungs
- PV (pulmonary veins)
- LA (Left Atrium)
- Bi cuspid valve
- LV (Left Ventricle)
- Aortic valve
- Aorta – coronary Arch



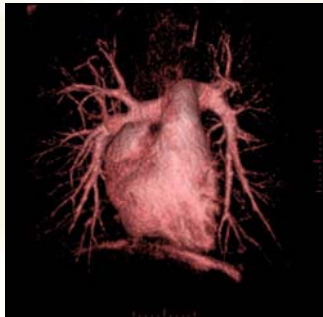
CT AXIAL




MRI AXIAL

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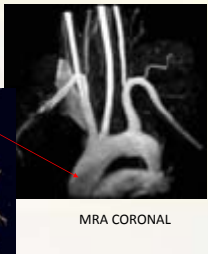
### Heart and Pulmonary Arteries



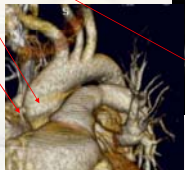
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### Aortic Arch – the “A, B, C’s”


- Ascending aorta
- Coronaries
- Brachiocephalic (aka Innominate)
  - right common carotid
  - right subclavian
- right vertebral
- Left common carotid
- Left Subclavian
- Left vertebral



MRA CORONAL

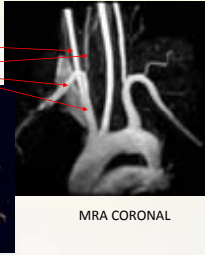


CTA CORONAL


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### Aortic Arch – the “A, B, C’s”


- Ascending aorta
- Coronaries
- Brachiocephalic (aka Innominate)
  - right common carotid
  - right subclavian
- right vertebral
- Left common carotid
- Left Subclavian
- Left vertebral



MRA CORONAL

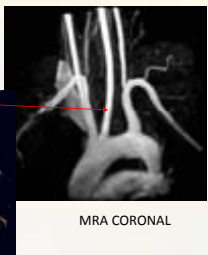


CTA CORONAL


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### Aortic Arch – the “A, B, C’s”


- Ascending aorta
- Coronaries
- Brachiocephalic (aka Innominate)
  - right common carotid
  - right subclavian
- right vertebral
- Left common carotid
- Left Subclavian
- Left vertebral



MRA CORONAL



CTA CORONAL

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### Aortic Arch – the “A, B, C’s”

Ascending aorta  
 Coronaries  
 Brachiocephalic (aka Innominate)  
     right common carotid  
     right subclavian  
     right vertebral  
 Left common carotid  
 Left Subclavian  
     Left vertebral

CTA CORONAL  
 MRA CORONAL

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### Coronary Calcifications

- Calcium is an indicator for a disease artery (CAD)
- Calcification in the coronary artery reveals the condition of coronary arteriosclerosis
- Leads to heart attacks

Grossly calcified left coronary artery

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### Situs Inversus

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### Cross Sectional Abdomen

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### Abdomen Images

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### Imaging Planes

Sagittal Axial Coronal

CT Images

Axial Coronal reformat Sagittal reformat

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### Imaging Planes

Frontal or Coronal Plane  
Median Line  
Mid-sagittal Plane  
Parasagittal Planes  
Transverse Or Axial Plane

Sagittal Axial Coronal

CT Images

Axial Coronal Sagittal

Slide # 145

### Coronal Abdomen

Approximate Slice location

Kidneys  
Adrenals  
Spleen  
Liver  
Psoas Muscles  
Gluteus Muscles

Coronal CT image

Coronal MR image

Slide # 146

### Coronal Abdomen

Approximate Slice location

Liver  
Liver Mass  
Spleen  
Stomach  
Bowel  
Small Bowel  
Structures of the Small bow  
Duodenum  
Jejunem  
Ileum

Coronal CT image

Coronal MR image

Slide # 147

### Coronal Abdomen

Approximate Slice location

Liver  
Spleen  
Stomach  
Structures of the stomach:  
Lesser curvature  
Fundus  
Pylorus  
Greater curvature  
Small Bowel  
Structures of the Small bow  
Duodenum  
Jejunem  
Ileum  
Large bowel (colon)  
Ascending colon  
Transverse colon  
Descending colon  
Sigmoid colon  
Lesser curvature

Coronal CT image

Coronal MR image

Slide # 148

### Axial Abdomen

Diaphragm

Diaphragm

Approximate Slice location

Approximate Slice location

Liver  
Spleen  
Stomach  
Aorta  
Vertebral body

Axial CT image

Axial MR image

Slide # 149

### Axial Abdomen

Approximate Slice location

Approximate Slice location

Liver  
Spleen  
Stomach  
Aorta  
Vena cava  
Vertebral body

Axial CT image

Axial MR image

Slide # 150

### Axial Abdomen

Approximate Slice location

Liver  
Spleen  
Pancreas  
Kidneys

Axial CT image      Axial MR image

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### Axial Abdomen

Approximate Slice location

Rectus abdominus muscles  
Liver  
Gall bladder  
Pancreas  
Kidneys

Axial CT image      Axial MR image

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### Sagittal Abdomen

Approximate Slice location

Thoracic Spine  
Liver  
Pancreas  
Lumbar Spine  
Aorta  
Bowel  
Sacrum  
Coccyx  
Bladder  
Symphysis Pubis

Sagittal CT image      Sagittal MR image

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### Sagittal Abdomen

In: 28 (1/319)  
In: 1 DEGREE DISE CONDARY COMPUTE SEED 512x512  
w 577 L 295  
51.24 (Time)  
Original 512x512 (0.64x0.64mm)  
Contr: Sagittal MIP Sub (30 of 30)

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### Basic "Vanilla" Abdomen & Pelvis Protocol

- AP Scout
- 80 kv 120 ma
- 50 cm FOV
- Axial
- 120 kv, 220 ma,
- 36 fov (fit anatomy)
- 512 x 512
- 5mm – 8 mm
- 500 W & 50 L
- 30 sec breath-hold
- can be modified

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### Renal Calculus (Stones)

- No oral contrast
- No IV contrast
- Run to the bladder
- For ureters

Slice #1  
Slice #2  
Slice #3  
Slice #4

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**Non-Contrast Pathology**

**Trauma**



3D Reconstruction of Kidney Fracture

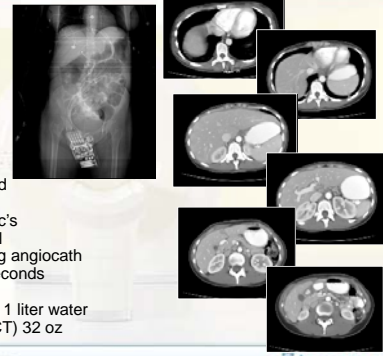
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Slide # 157



**Basic "Vanilla" Abdomen & Pelvis Protocol with sprinkles**

- AP Scout
- Axial
  - 120 kv, 220 ma, 36 fov (fit anatomy) 512 x 512
  - generally 5mm
  - 500 W & 50 L
  - 30 sec breath-hold can be modified
- Post contrast
  - IV- Contrast if 100 cc's non-ionic 300 mg/ml 2 cc/sec for 20g angiocath delay scan 60-70 seconds
  - Oral – gastrografin 30 per 1 liter water Barium (dilute for CT) 32 oz



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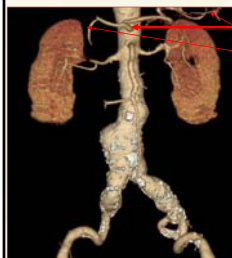
Slide # 158



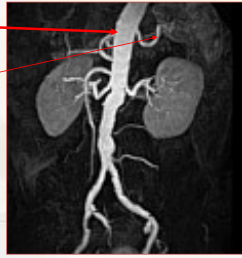
**Abdominal Vasculature**

**"See Spot Run In.."**

**"C" not see) Celiac, SMA, Renals (right & Left), IMA**



Coronal CTA Image



Coronal MRA image

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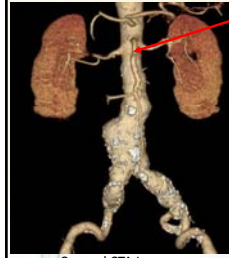
Slide # 159



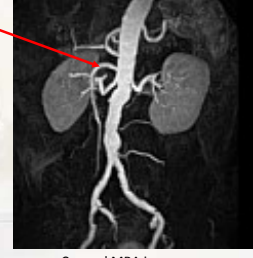
**Abdominal Vasculature**

**"See Spot Run In.."**

**"C" not see) Celiac, SMA, Renals (right & Left), IMA**



Coronal CTA Image



Coronal MRA image

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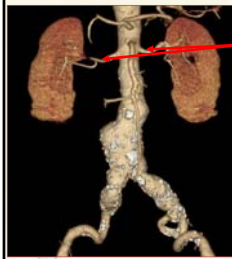
Slide # 160



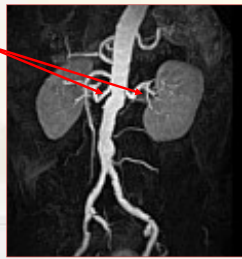
**Abdominal Vasculature**

**"See Spot Run In.."**

**"C" not see) Celiac, SMA, Renals (right & Left), IMA**



Coronal CTA Image



Coronal MRA image

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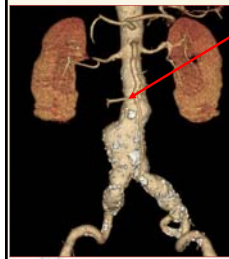
Slide # 161



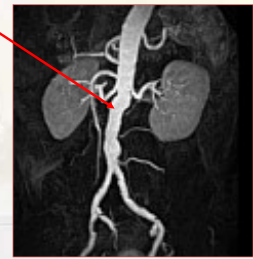
**Abdominal Vasculature**

**"See Spot Run In.."**

**"C" not see) Celiac, SMA, Renals (right & Left), IMA**



Coronal CTA Image



Coronal MRA image

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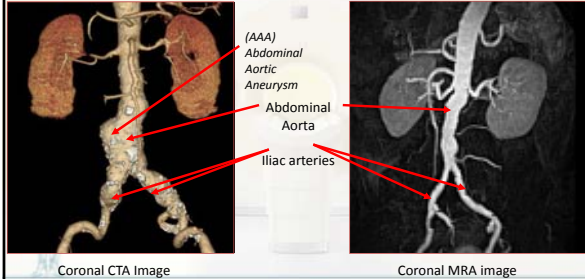
Slide # 162



### Abdominal Vasculature

“See Spot Run In..”

“C” not see) Celiac, SMA, Renals (right & Left), IMA



Coronal CTA Image

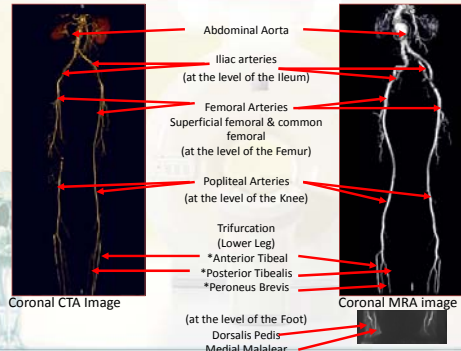
Coronal MRA image

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Slide # 163



### Peripheral Vasculature “Run-off’s



Coronal CTA Image

Coronal MRA image

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Slide # 164



### Abdominal Vasculature



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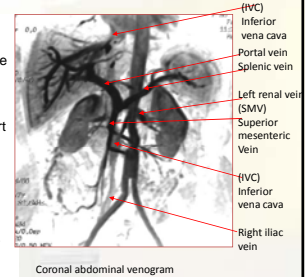
Slide # 165



### Abdominal Veins

#### Review Vasculature...

- Almost ALL Arteries:**
- Carry oxygenated blood away from the heart
  - Carry oxyhemoglobin blood to organs
- Almost ALL Veins:**
- Carry deoxygenated blood to the heart
  - Carry deoxyhemoglobin away from organs
- Exceptions:**
- Portal vein-
    - Carries deoxyhemoglobin to the liver
  - Pulmonary veins-
    - Carries deoxyhemoglobin to the lungs
  - Pulmonary arteries-
    - Carries oxyhemoglobin to the heart



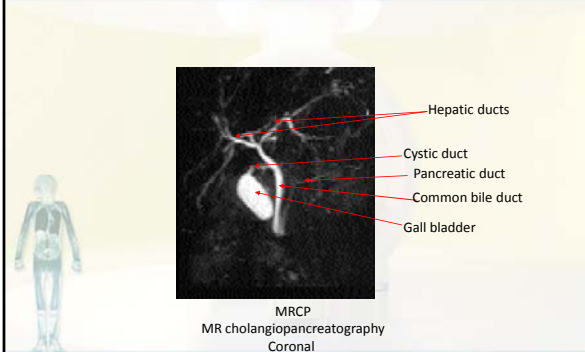
Coronal abdominal venogram

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Slide # 166



### Biliary ducts



MRCP  
MR cholangiopancreatography  
Coronal

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Slide # 167



### Biliary System




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Slide # 168



### APPENDICITIS


- INFLAMMATION OF THE APPENDIX
- TYPICALLY APPEARS PUS/AIR FILLED



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### CROHNS DISEASE

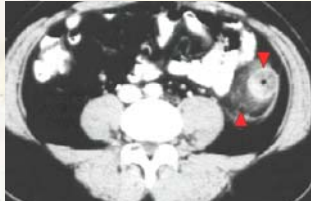
- REGIONAL ILEITIS
- ETIOLOGY



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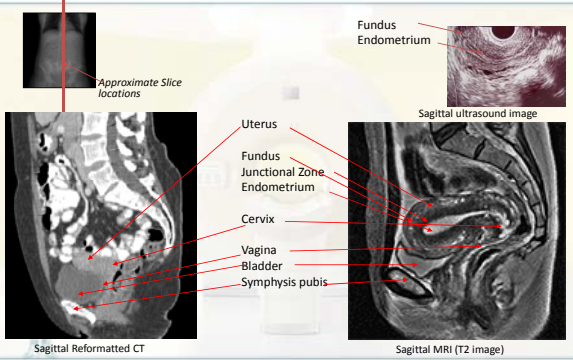
### DIVERTICULITIS

- INFLAMED DIVERTICULUM
- CT PRESENTATION



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### Female Pelvis Anatomy



Approximate Slice locations

Fundus Endometrium

Sagittal ultrasound image

Uterus

Fundus Junctional Zone Endometrium

Cervix

Vagina

Bladder

Symphysis pubis

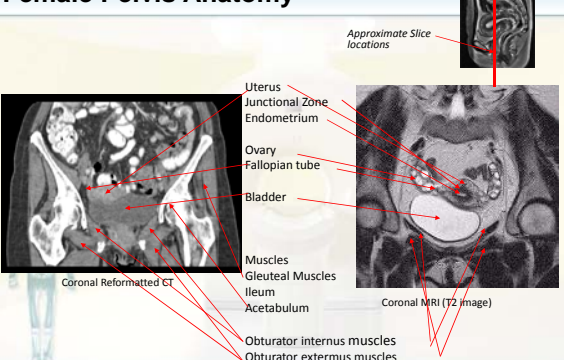
Sagittal Reformatted CT

Sagittal MRI (T2 image)

body anatomy Slide 8a

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### Female Pelvis Anatomy



Approximate Slice locations

Uterus

Junctional Zone

Endometrium

Ovary

Fallopian tube

Bladder

Muscles

Gluteal Muscles

Ileum

Acetabulum

Obturator internus muscles

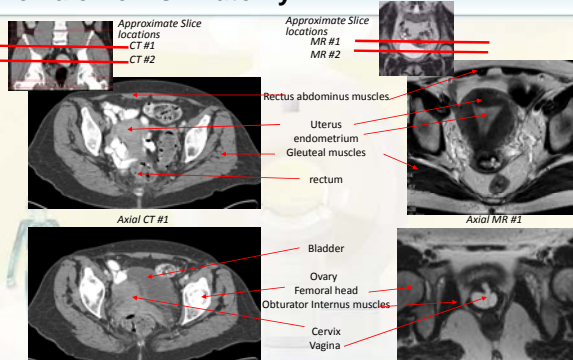
Obturator externus muscles

Coronal Reformatted CT

Coronal MRI (T2 image)

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### Female Pelvis Anatomy



Approximate Slice locations

CT #1

CT #2

MR #1

MR #2

Rectus abdominus muscles

Uterus

endometrium

Gluteal muscles

rectum

Bladder

Ovary

Femoral head

Obturator internus muscles

Cervix

Vagina

Axial CT #1

Axial MR #1

Axial CT #2

Axial MR #2

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### Male Pelvis Anatomy

Approximate Slice locations

Psoas Muscles  
Bladder  
Prostate (base)  
Seminal vesicles  
Vas deferens  
Urethra  
Apex of the Prostate  
Pubic bone

Coronal Reformatted CT

Coronal Oblique MRI (T2 image)  
High resolution (small FOV)

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### Male Pelvis Anatomy

Approximate Slice locations

NAVEL

Symphysis Pubis  
Prostate - Central gland  
Peripheral zone (normal)  
Peripheral zone (cancer)  
Neurovascular bundle  
Rectum  
Gleutal Muscles  
Obturator Internus Muscles

Axial CT

Axial MR  
High resolution (small FOV)

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### Male Pelvis Anatomy

Approximate Slice locations

Seminal vesicles  
Urinary Bladder  
Prostate Base  
Peripheral zone  
Prostate Apex  
Rectum  
Rectus abdominus Muscles  
Symphysis Pubis

Sagittal Reformatted CT

Sagittal MRI (T2 image)  
High resolution (small FOV)

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### Basic Pelvis Protocol

- AP Scout  
80 kv 120 ma
- Axial  
-120 kv, 220 ma,  
-36 fov (fit anatomy)  
-512 x 512  
-generally 5mm  
-500 W & 50 L  
-30 sec breath-hold  
can be modified

If contrast

- Post contrast  
-Contrast if 100 cc's non-ionic 300 mg/ml  
3 cc/sec for 20g angiocath  
delay scan 25-30 seconds min post injection to peak enhancement

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### Male Pelvis

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### Male and Female Pelvis

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