

DDx Considerations and Imaging Appearances of Cord-Related Lesions

DDx depends on location

- a. Extradural (Epidural)
- b. Intradural/extramedullary
- c. Intramedullary (inside cord)

Extradural

- Imaging
 - Thecal sac deformed/compressed from outside-in
 - Extra "mass" seen in canal
 - CT myelogram or T2 MR --> thecal effacement or minimal CSF visualization
- DDX:
 - ★ ▪ Degenerative disease (herniation, stenosis)- M/C
 - Trauma (fracture fragment up against the dura)
 - Iatrogenic (post- surgical stenosis)
 - Hematoma
 - Abscess
 - Tumor (mets, myeloma)
 - 70% of time comes out the extradural space
- Range of clinical presentation is from axial pain "my neck hurts" out to radiculopathy and myelopathy (cord/root compression)

Intradural Extramedullary - outside cord but underneath dura

- Lesion involved dura or subdural (subarachnoid) space
- DDX:
 - Meningitis
 - Meningioma, Schwannoma
 - Mets (via CSF)

Intradural Intramedullary

- Imaging:
 - Expansion of cord is key finding (in neoplastic lesions)
- DDX:
 - Cells (tumor): ependymoma or astrocytoma; mets
 - Inflammation (transverse myelitis)
 - Lupus for example
 - Blood
 - Syringomyelia
 - Multiple Sclerosis
 - Vast majority begin in the brain
 - 20% begin in the spinal cord
- Most are malignant
- Most are of glial origin
 - Ependymoma or astrocytoma
- Adults: ependymoma is m/c, astrocytoma is 2nd
- Reversed in peds. Astrocytoma m/c, ependymoma 2nd
- Spinal cord tumor clinical symptoms are nonspecific: local pain, sensory and/or motor loss
 - Cant differentiate from other presenting problems until after a trial of care- have to have cautious monitoring
 - If you don't get clinical responses in 3 weeks you need to be asking why not!
- Evaluation of Intramedullary Tumors
 - Cord expansion suggest neoplasm
 - Most cord tumors show contrast enhancement
 - Cysts are commonly associated
 - Non-tumoral (polar) cysts
 - Tumoral cyst

*GBM: Glioblastoma Multiform- most aggressive of malignant neoplasms
Most common brain tumor will turn into this- a grade 4 astrocytoma*

Ependymoma

- Ependymal cells line the ventricles and central canal
- m/c central in location w/ symmetric cord expansion
- Slow growing, compress rather than infiltrates adjacent cord, well circumscribed (*making it much more treatable than astrocytoma for example*)
- Cervical location only (45%), cervical with extension to thoracic spine (23%)
- Radiography:
 - Canal widening, vertebral body scalloping, pedicle erosion

- CT
 - Cord expansion, contrast enhancement
- MRI
 - Low T1/high T2, avg. 2.5 vertebral segments involved, "cap sign," cysts common (usually polar), contrast enhancement, sharp margins

Astrocytoma

- Thoracic location is m/c
- More infiltrating (less well circumscribed)
- Eccentric location with expansion
- Tumoral cyst m/c
- Prognosis worse because it's not easily removable
- Radiography, CT
 - Widened interpedicular distance, bone erosion (l/c than with ependymoma)
- MR
 - Poorly defined, down T1, high T2, avg 7 segments involved, cysts (both types), contrast enhanced...

Normal Skull Radiography

4 views in Skull Series

- Lateral (Right AND Left)
 - *Only part of body where you do both* ★ *These are not the sinuses - there is a sinus series*
- PA - Caldwell
 - *Entire skull*
- AP - Towne
 - *Targets foramen magnum*

Lateral

- 10x12 (crosswise)
- CR 2" above EAM
- Be sure there is no head rotation
- Infraorbitomeatal line parallel to transverse axis of film

PA - Caldwell

- 10x12 (vertical)
- Forehead and nose against bucky
 - (waters view is nose and chin)
- 15 degree downward tube tilt
- CR at back of skull so it exits at the nasion (root of nose)

AP - Towne

- 10x12 (vertical)
- Head flexed so infraorbitomeatal line is perpendicular to film
- Tube tilt 37 degrees downward
- CR at forehead so it exits the foramen magnum

★ *DiffDx for skull is same as femur - don't be intimidated*

★ When pressure increases in eye - medial wall fractures (no special name) and floor fractures **Blow Out Fracture**
 Maxillary will be opaque
 Happens when person whacked in the face/eye
 Papreca - means paper thin, and this is how thick these bones are
 Sinus infections carry a high risk potential for infection in the epidural space - epidural abscess comes from this
 Risk to brain

★ Posterior fossa has brainstem
 Lat fossa has temporal
 Ant fossa has frontal

★ **Average cortical thickness is 2mm -**

Aging produces atrophy - thinning

Severe atrophy - dementia

Environmental enrichment - thickens cortex

Learning (like school)

Not 100% but diminishes risk factors for dementia

Shrinking of brain with aging

★ White matter follows the cortex
 Once grey matter changes, white matter changes

Social cognition

Important component of brain function and immune system is social engagement
 In conjunction w/ exercise is very important for the brain

With age: sulci get deeper, ventricles enlarge, brain shrinks - these are called **atrophic changes**

Not necessarily mean cognitive decline

Choroid Plexus is generator of CSF - put blood in and CSF comes out (filter)
 Calcification of these and pineal gland are normal

No negative effects - so physiological calcification
Falx, basal ganglia, etc will undergo physiological calcification

★ *MS hangs out in white matter and around ventricles*

Skull - Marrow between inner and outer space is called **diploic space**
Makes baby platelets, RBCs, WBCs

★ Head gets larger as we age (everything else gets smaller)

Due to diploic space expansion

Paget's Disease heads are the largest

Acromegaly also gives larger head (sella turcica enlarged in this case, ie pituitary tumor)

★ ***Two things that would make hat not fit anymore: Paget's & Acromegaly***

★ Some people are born without a corpus callosum - they can survive but aren't necessarily brilliant and have trouble with creativity

★ Massive expansion of frontal cortex - humans are the only species where this happened

Nothing has the problem solving capacity of human brain

AI is working on it though

Pre-frontal = executive

Failure to retain memory is a failure of temporal lobe?

Selected Neurologic Disorders with Radiologic Correlation

Disorders

- Multiple Sclerosis
 - Demyelinating disease of uncertain etiology (viral, hereditary, environmental)
 - Loss of myelin --> poor nerve function
 - Symptoms are diverse, intermittent, frequently overlooked
 - Produce neurological deficits that vary over time and in space (in the neural axis)
 - Classical presentation is optic neuritis- 50% of optic neuritis patients will go on to have MS
 - Symptoms
 - Young pts (20-40); F > M
 - Tingling, numbness
 - Loss of strength, dexterity
 - Visual disturbance, blindness, diplopia
 - Dizziness, balance difficulty, vertigo
 - Typically intermittent exacerbation/remission
 - Diagnosis
 - Suspicion: young pts with motor or sensory disturbance that is episodic
 - Physical exam: neuro deficit, motor weakness, fundoscopic abnormalities
 - Brain MRI
 - Treatment
 - Oral or IV corticosteroids
 - Short term use only
 - Relieves acute symptoms (decrease inflammation)
 - Don't stop long term progressive disability
 - Side effects: osteoporosis, diabetes, immune suppression, weight gain, fatigue
 - MS Case 1
 - 49 year old males presented with a 10 year history of intermittent optic neuritis, bilateral leg weakness and numbness, hand paresthesia and recent episode of impotence
 - Lesions low on T1 high on T2
 - Typically in periventricular white matter
 - Size from couple mm to several cm
 - Margins sharp is old, poorly defined if acute
 - MS Case 2
 - 40 year old female with 3 week history of vertigo, nausea, vomiting and unsteady gait
 - Lesions that enhance with contrast administration are active
 - Non-enhancing lesions correlate with old areas of scar
 - Both old and new lesions are bright on T2 so contrast offers additional differentiation
 - Contrast enhancement occurs with acute lesion

- Alzheimer's
 - *Dementia* is a decline in mental ability that usually progresses slowly, in which memory, thinking, judgment and the ability to pay attention and learn are impaired and personality may deteriorate
 - Two m/c causes: Alzheimer's Disease and multi-infarct dementia
 - 4-5% of the population over 65 years old suffer from dementia and approximately 50% of the cases are attributed to AD
 - Pathologically: neurofibrillary tangles and senile plaques
 - Imaging: CT or MR shows generalized atrophy of the cerebral cortex
- Stroke (infarction)
 - A stroke (also called a cerebrovascular accident) is the death of brain tissue (cerebral infarction) resulting from lack of blood flow and insufficient oxygen to the brain
 - Can be ischemic
 - Cerebral blood flow cut off due to atherosclerosis or embolism
 - Can treat with a clot buster (thrombolytic agent) up to 3 hours from the time of incidence
 - Problem is that most of this activity happens during sleep so you don't know how long been experiencing stroke
 - Or can be hemorrhagic (ischemic can lead to this)
 - A vessel bursts, leaks blood into the brain, and prevents normal perfusion to regions downstream
 - ★ **Worse type of stroke- 70% of deaths due to stroke are from hemorrhagic type**
 - Clinically
 - Sudden, rapid development of neurologic deficit or coma
 - Symptoms depend on the area of the brain that is affected
 - Infarction will cause edema/swelling which may further damage other areas of the brain
 - Diagnosis
 - History and physical
 - Confirm with CT or MRI

4/1/09 and 4/2/09

Chest Radiography

Five Stages of Search Pattern

1. *Soft Tissue*
 - a. Paraspinal, axilla, down to costophrenic angle, over to cardiophrenic angle then reverse direction and go up
 - b. Make account for breast density
 - Paraspinal calcification
 - Carotid Atherosclerosis
 - Lymph Nodes
 - Malignant nodes don't usually calcify- fixed, non-mobile and non-painful
 - Mastectomy is going to cause the lung field to be more lucent
 - Expect to see sharp costophrenic angle
 - If see a blunted angle this is **pleural effusion** (a soft tissue search finding)
 - 400-600 ccs fill of posterior costophrenic angle before anterior costophrenic angle appears
 - Look under diaphragm for disorder in the abdomen
 - GI, GU, Vascular systems all need to be evaluated
 - Liver dominates the upper abdomen
 - Gas usually seen on upper left aspect of abdomen- two sources of gas
 - Fundus of stomach
 - Colon (splenic flexure)
 2. *Bones (Musculoskeletal)*
 - a. Three groups
 - i. Vertebral column (pedicles, endplates)
 - ii. Ribs of the thorax
 - 1) Anterior ribs point at the heart, posterior ribs point away from heart
 - iii. Shoulder Complex
 - 1) Scapula, clavicle, humerus and joints of shoulder complex (AC, GH, etc)
 3. *Central Shadow*
 - a. Start at trachea and heart shadow down to the diaphragm
 - b. Trachea should be in mid-sagittal plane and heart has volume
 - i. CT ratio- Cardio Thoracic Ratio
 - 1) Find widest point of heart on both sides draw a line and measure- heart measurement
 - 2) Point on widest margin of ribcage on both sides- thoracic measurement
 - 3) Heart over Thorax should be .55 (55%) or below for adult (kids under 2 = .65 (65%))
 - a) Take the heart out and put it in half of the thorax
 - b) Cardiomegaly is what it's called when CT ratio is greater than 55%: Diff Dx
 - i) Systemic Hypertension i.e. Primary Hypertension (primary = idiopathic)
- ★ **We need to Vagalize more = Dinner, Sex, Sleep (HAHAHA!)**
- One. *Social basis for this disease is imbalance of autonomic tone - need an integration of sympathetic and vagal tone (most diseases have a sympathetic process) - we often catastrophize-we amplify because we don't see the things we should because of fear-we have to be able to see things as they are as well as what you want them to be*

- 4) Can have a normal CT ratio, a normal EKG and still die of a MI tomorrow- first symptom of vascular disease or acute MI is death
- 5) See this on AP film
 - a) AP film shows us contour
 - ★ b) Have to determine if abnormality in the lung or in the mediastinum
 - c) Mediastinal mass can poke out mediastinal wall and cover part of the lung

★ **Radiography is not sensitive to heart disease**

c. Mediastinum defined by three categories

i. Anterior Mediastinal Space/Cavity- Behind sternum and extend up to pericardium

1) Diff Dx for Soft Tissue Mass - "5 T's"

- a) Teratoma i.e. Dermoid (Cyst) (congenital tumor)
 - i) Multiple tissues- hair, bone, etc that is pre-malignant
- b) Thymoma
 - i) Involution of thymus may undergo malignant degeneration
 - ii) Many of these patients may have Myasthenia gravis
 - One. Thymoma creates an antigen that attacks ACh receptor
- c) Thyroid
 - i) Goiter
- d) Aortic Aneurysm
- e) Lymphoma

Aneurysm in either anterior, middle or posterior

- *Ascending aorta = soft tissue mass in anterior*
- *Descending aorta = middle and/or posterior*

2) Sternum is most anterior aspect of anterior mediastinal space

ii. Middle Mediastinal Space- pericardium backward to anterior 1/3 of vertebral body

1) Mass in mediastinal is malignant until proven otherwise- either:

- a) Bronchogenic Carcinoma
- b) Lymphoma

iii. Posterior Mediastinal Space- back 2/3 all the way to thorax/rib cage including neural foraminal, pedicles, etc

- 1) Neurogenic Tumor is most common cause of mass - tumor of nerves
 - a) Neurofibroma
 - b) Meningioma
- 2) Paraspinal Masses (infection, myeloma, mets, hematoma, etc)
 - a) Thoracic spine is #1 site for mets to skeleton

d. See mediastinal space on lateral chest film

4. Hilum/Hila

a. Can also see hilum/hila (plural)- a region

- i. See main pulmonary artery
- ii. Can also see lymphadenopathy because there are a lot of lymph nodes in hilum

Want to see pulmonary arteries—not lymph

- 1) Bronchogenic Carcinoma is almost always the cause of lymphadenopathy
 - a) Presents as a hilar mass - assume bronchogenic carcinoma until proven otherwise
- 2) Have to ask Infection vs. Neoplasm (lymphadenopathy may also be due to infection)
 - a) Patient is sicker/more acute with infection

b. Hilar Problem (density)- have to ask is that a node or vessel

- i. Answered by Cat scan with contrast

c. More nodes on right than left so a slight bias of bronchogenic carcinoma on the right

5. Lung/Pleura

a. Upper lung more lucent than lower lung

- i. Vasculature dominates the longer lobe creating a greater density in the lower lung
- ii. Three times cross sectional diameter in the lung base than the lung apex
- iii. Male pec may produce a similar density

b. Should only see pulmonary arteries and their branches should be seen

- i. Anything else is regarded as abnormal

c. Abnormal

i. Opacities

- 1) Pulmonary Nodule = indicates abnormal density, less than 3 cm
- 2) Pulmonary Nodules = abnormal density, greater than 3 cm
- 3) Consolidation (how bacterial pneumonia presents)
- ★ 4) Atelectasis (review pathology of this- Kettner likes to ask about this a lot)
 - a) After age of 40 in adult usually means

★ *Have to make sure scapula is out of the way- radiograph evaluation is limited*

ii. Abnormal Lucencies

- 1) Hyperinflation as in COPD
- 2) Pulmonary cavity
- 3) Pneumothorax

Mammography is ahead of Self Breast Exam detection by 2 years. Digital mammography is the gold standard. We can't use chest films to diagnose breast pathology. Breast Cancer is so prevalent in US because of genetic, environment, less 5% genetic

Carina: bifurcation of right and left mainstem bronchus

After mainstream bronchus there are an average of 26

Pulmonary Embolism:

- Most sensitive sign of pulmonary embolism is Tachypnea - increased rates of respiration- RR > 20
- Females with history of estrogenic drugs (birth control, hormone replacement) are most at risk for pulmonary embolism
- Other risk factors- smoking, alcohol, corticosteroids
- Gold standard test is pulmonary angiogram
- Deep vein thrombus in leg is typically where pulmonary embolism comes from

Three main things Cat Scan looks for (Triple Work Up)

- Pulmonary Embolism
- MI
- Aortic Dissection

Angiogram: Coronary system is being evaluated in an angiogram

- Artery of death = left anterior descending (supplies left ventricle)
 - Male disease (40s-50s) until menopause then female disease (50-60s)
- The vessel must be at least 70% stenotic before symptoms (angina) start to appear
- Collateralization (Revascularization) buys you some function- bypass problem area

4/8/09

Atelectasis: "incomplete inflation" -pulls structures out of normal position

- Scar atelectasis: lung is contracted and pulls tissue together
- Obstructive atelectasis: this is how bronchogenic carcinoma presents

Direct sign of atelectasis

- Displaced Fissure
 - i.e. horizontal fissure is elevated

Indirect signs of atelectasis

- Bronchial obstruction usually by neoplasm
- Displaced mediastinum
- Tracheal deviation- toward
- Hilar deviation- goes up if atelectasis above
- Diaphragmatic elevation on ipsilateral side
- Intercostal narrowing
- Sometimes consolidation
- Two default categories of VICTANE for chest- 95% of time
 - Neoplasm
 - Infection
 - Most prevalent chest infection is TB

★ Scar atelectasis and bronchogenic carcinoma are two causes of pulling structures out of normal position

★ Solitary pulmonary nodule (~3 cm) think two categories

- Neoplasm
 - Bronchogenic carcinoma
 - Metastatic carcinoma
- Infection
 - Granuloma
 - 70 yoa is cut off age
 - Below 70 granuloma is probably
 - Over 70 either bronchogenic carcinoma or METS
 - Once calcification in nodule no longer refer to it as a solitary pulmonary nodule-refer to it as granuloma
 - ◆ Calcification not important unless eccentric (pushed to one side)

Azygos lobe

- Congenital Anomaly of lung
- No clinical significance
- .05%

Elevation of Diaphragm

Is this being pushed up or pulled up (atelectasis possibly)?

Anymore than a couple of rib interspaces if potential problem

Acute rib fracture can give you an elevated diaphragm

Look for Phrenic Nerve Palsy

★ Pulmonary mass (6 cm or more)

- a. Neoplasm
 - i. Bronchogenic carcinoma
 - ii. Metastatic carcinoma
- b. Infection
 - i. Abscess

Prognosis for Bronchogenic Carcinoma

- 13% at 5 years if tumor in the hilum
- Peripheral nodule doubles to 30%

4/9/09

18 bronchial segments in which a bronchogenic carcinoma can occur (10 on the right, 8 on the left because heart is on that side)

Tends to occur on the right side for reasons that are still unclear

Cardiomegaly can occur based on

- Patient position (AP looks bigger)- OFD
- Not taking a breath in

Chest X-ray: Right Hilum has something other than vessels - less than 3 cm- solitary pulmonary nodule, no calcification within it - Hilar mass or nodule is a dx of bronchogenic carcinoma until proven otherwise - if not it will be TB - lymph node also increasing- tumor inside lymph node

Elevation: area of congenital weakness in the diaphragm- elevation/bump that has no clinical significance - limited to a chunk of the diaphragm

Three bumps on left side

1. Aortic arch
2. Left hilum/pulmonary artery
3. Left ventricle

Old healed fractures = Remote fractures
(a temporal not spatial definition)

Right side bump

1. Right atrium

Shouldn't see the edge of mediastinum at top

Most ribs heal in mal-union

Ectasia: larger than normal but not to the point of aneurysm
Pulmonary apex- TB likes to grow here (See in apical lordotic view)

Always be sure to get a pulmonary apex on shoulder x-rays

★ **LOOK UP THE FOLLOWING**

- Silhouette Sign
- Air Bronchogram- means no atelectasis

Reactivation TB likes to go high- oxygen concentrates

Apical lung is known as the **sulcus** of the lung

Have to have obliques of the ribs because of the geometry (cylindrical)
Chest film in expiration is taken as part of rib series to enhance detection of a pneumothorax
Herpes Zoster can cause pain from back all the way around to front of ribs

Sometimes due to patient positioning (patient rotated) a questionable bump on the right side (manubrium) may be confused for something it's not

★ Dilated small bowel with air fluid levels is the hallmark of intestinal obstruction
Colon gas and fundus of stomach is all you should see normally re: air fluid levels

Splenomegaly is an important diff dx to consider when there is upper abdomen air fluid displaced to midline

Spleen and Liver are most common ruptured organs in the abdomen

Summation artifact = is what occurs when two densities overlap one another (?)

Tortuosity: high pressure in the system and vessels undergo serpentine like geometry
Can be ascending or descending aortic tortuosity

Hiatal Hernia causes GI reflux, chest pain and can cause ulcers in the esophagus and eventually Barrett's esophagus which is pre-neoplastic

4/15/09

Gas underneath right hemi-diaphragm is **pneumoperitoneum** implication is rupture in GI tract- ulcer, malignancy, bullet, anything that penetrates abdominal wall and causes release of bowel gas

★ **Dilated small bowel with air fluid level is the hallmark of intestinal obstruction**

Most common microbe in community based (walking) pneumonia is *Streptococcal pneumoniae*
Nosocomial pneumonia is acquired from instrumentation in the hospital

Absence of a border between two soft tissues is the *Silhouette sign*
Ex. Can't see where mediastinum starts and stops

High lesions in the pulmonary apex - pulmonary sulcus tumor- with invasion of rib, brachial plexus often in C8 distribution- clinical presentation on head and neck exam can be Horner's syndrome

Pancoast syndrome- pulmonary sulcus tumor with metastasis to bone and brachial plexus

Effect of Scoliosis on the Chest Film

- May see diaphragmatic elevation
- Relationship with scoliosis >60 pulmonary arterial hypertension

- Most common cause of PAH is COPD
- Emphysema is most common cause of COPD
 - Also cystic fibrosis, chronic asthma, chronic bronchitis, bronchiectasis
- Spirometry is more reliable at predicting cardiovascular disease than EKG
- Cor Pulmonale- chronic lung disease that then causes heart disease

4/16/09

Pursue Assessment of Heart Summary

- Shape is abnormal (contour)
- Size is too big
 - Use CT ratio to access (in adults should be less than 55%)
 - Larger than 55% need to look for cardiomegaly
- Following up imaging for the heart is
 - Stress EKG and Echocardiogram (heart US)
- Plain film chest is not sensitive to early heart disease

Other vascular structures

- Aortic notch
- Ascending component of aortic arch
- Common carotids and brachiocephalic arch, subclavian

COPD- Hyperinflation

- Bowing/Curving of Sternum
- Large retrosternal air space
- Anterior mediastinal space is large
- Diaphragm dome is flat on lateral film
- Eventually there will be an enlarged heart on the right side

Cardiac disease presents to us clinically as Exertional fatigue and dyspnea

Patients shrink to fit the disorder and make it invisible- for example, use elevator instead of stairs because walking upstairs makes them short of breath

Straight Back Syndrome: pectus excavatum and no T/S curve- looking for heart murmurs

Cardiovascular Structures and Pathophysiology - (Chest Film Still)

- Heart evaluation is a major component when you are looking at chest film
 - Bump for aorta, artery, ventricle on left - one bump on right
- We don't care about little hearts, we only care about enlarged hearts
 - Small hearts are of no clinical significance
- Mensuration to establish heart size
 - Cardio-thoracic ratio (C/T ratio)
 - Numerator
 - Right atrium (widest part on right) to a midline point (SP)
 - Widest part on left (ventricle) (lower than right side measure) to center
 - Denominator
 - Then widest part of thorax from side to side
 - Should be under 55% (ie heart should not take up more than half of thorax)
 - Over is cardiomegaly
 - ◆ Perform more testing
 - ◇ Echocardiogram
 - ▶ Is really US of heart - see chamber thickness, valve function, stenosis, insufficiency, problem in mm of heart itself (tumor, etc), measure cardiac output
 - ▶ Great way to study the heart
 - ▶ Inexpensive
 - ◇ Stenography
 - ◇ Stress EKG
 - ▶ On treadmill
- Or look at contour of heart
- Plain film is not sensitive to heart disease
 - Most heart problems can't be seen on plain film
 - Once you see enlarged heart the person has had heart disease for quite some time
- Once aorta penetrates diaphragm its abdominal aorta. Look up the branches
- Aortic arch
 - Brachiocephalic artery
 - Subclavian

Subclavian Steal Syndrome: occlusion in subclavian artery causing low pressure in the vertebral arteries- steals from cortical blood supply to give blood to the arm -get lightheaded from using arms up over head

- Vertebral artery off subclavian so if block (occlude) subclavian the pressure in vertebral is low, so eventually blood comes down through circle of willis in order to supply the arm
 - Arm still gets heavy and doesn't want to function, but it isn't completely obliterated

Cephalization: blood's backing up because it's not going forward-it's going back into veins - normally only see pulmonary arteries

Expiratory Chest Shot can appear to have heart disease compared to an inspiratory film because on an expiratory film the Lungs opacify/are denser because vessels pushed together, heart looks bigger by 20%, higher diaphragm

AP projection also makes big heart

★ **Look at 2 things with heart:**

- **C/T ratio**
- **Contour**

★ **Internist (internal medicine)- specialty focused on diagnosis**

Mainly internal dx
Diff dx specialist
Sub-specialities
Cardiology
Nephrology
etc

★ **Echocardiogram is follow-up for cardiac problem**

- Right common carotid
 - Left common carotid
- Anomalies
 - Aortic can be on right
 - Two aortas - **aortic sling**
 - Causes esophageal and tracheal compression
 - Usual dx in infancy
- Veins
 - Can't see veins unless person has heart disease
 - Called **cephalization**
 - Left ventricle doesn't have enough forward flow and it begins to flow backwards --> pulmonary veins --> pulmonary venous hypertension --> cephalization (looks like moustache of Salvadoré Dali (vertical handlebar))
- Inspiration will show smaller heart
 - Depressed diaphragm
 - 10 ribs should be visible above diaphragm
- Expiration will show larger heart
 - Diaphragm will go up to make heart look fat
 - Vessels get crowded together and they become more visible (density increases)
 - Anything less than 10 ribs visible is expiration film
- **Cor Pulmonale** - HTN of pulmonary arteries
 - Atrophy around alveoli is cause
- m/c tumor of the heart - **myxoma**
 - In atrium
 - Mucinous
 - Tumor flops back and forth between ventricle and atrium
- MRI is best imaging of heart - used in hospitals
- Echocardiogram is m/c in offices
- **Hyperinflation** (sign of COPD)
 - Enlarged, dense pulmonary arteries
 - Curved sternum outward
 - Enlarged anterior mediastinal space
 - Diaphragm not domed on lateral (flat)
 - COPD causes right sided heart disease - even if heart doesn't appear enlarged yet - not very sensitive early on
 - If patient lives long enough you will see enlarged heart
 - Cystic Fibrosis patients aren't expected to live long
 - Over time they can't breathe because too much fibrosis in lungs
 - Chronic hypoxia makes pt feel like breathing in concrete
- When curve on left ventricle extends below the diaphragm it means that the left ventricle is undergoing hypertrophy
 - Caused because resistance in vascular system by closing the small vessels down = HTN
 - Can only do until next phase of heart disease which is dilation
 - Muscular wall gets stretched thin
 - Also see pronounciation of aortic arch (enlarged arch)
- Congestive Heart failure - all roads lead here
 - Biventricular enlargement - heart is huge
- Pectus Excavatum
 - On PA will push heart to the left
 - Not usually a problem unless pt has no thoracic curve - **Straight Back Syndrome**
 - **Tamponade** - compression of heart
 - Usually dx in peds
 - Can't keep up with peers
 - Could compress to decrease cardiac output
 - Child doesn't run as fast or as long, can't keep up, etc
 - Unusual
 - Look for murmurs and if have then send for echocardiogram
- **Ventricular Aneurysm**
 - Calcification of left ventricle - might bang into thorax (enlarged by aneurysm)
 - Some can be repaired some would die of surgery (cardiothoracic surgeon would do)
 - This is a very bad thing to have
- **Aortic Arch Aneurysm**
 - Enlarged mediastinum
 - Looks like very enlarged arch (really whole left border of heart is large and looks like one big bump to me) on plain film
 - Blows out in car accident (or other thoracic trauma) - rupture and fills mediastinum with blood and they are dead before they get to hospital

★ 12-14% magnification of heart on AP film

★ 2 things that make hearts look larger

- AP film
- Expiration

★ COPD in 18 year old with chronic inflammatory infiltrates (fibrosis) - Cystic Fibrosis

Dx by:

*Starts in infancy with pneumonia
Repeat pneumonia again and again
Pneumonia is caused by cystic fibrosis
Keep scarring lung*

★ Pts shrink their lifestyle to compensate for their diseases - they might not realize they are doing this (for instance they have back pain so they garden less, but tell themselves it was because they didn't really like it anyway.)

Final Review

50 Questions on Final with lots of case studies
Multiple multiples, no pictures

Diff Dx process

- What system
- What category

Chest and Trauma are a good chunk of the questions

- Is there a disorder that is threatening?
- Is there a disorder that is common?
- Relevant by threat or frequency?

Musculoskeletal System

- Degenerative Arthritides (first thing we looked at)
 - OA
 - Primary
 - Secondary
 - Synovial chondrometaplasia
 - Charcot's joints
 - No afferent innervation
 - ◆ Can thus find an incidental finding of a nail or needle, etc in their foot because patient doesn't feel it
 - Diabetic neuropathy and alcoholics (especially in foot)
 - Joints affected
 - ◆ Foot- intertarsal and tarsal joints
 - ◆ Knee
 - ◆ Hip
 - ◆ Spine
 - ◆ Glenohumeral joint- from syring
 - Charcot was the Neurologist in Paris to observe this
 - If you damage a ligament you have a neural disorder
 - ◆ Musculoligamentous reflex affected - don't have normal reflex going to the muscle
 - Radiographic evidence of 6 D's
 - ◆ Destruction
 - ◆ Debris
 - ◆ Dislocation
 - ◆ Density
 - ◆ Distention (get a lot of effusion)
 - ◆ Disorganization
- ★ Most threatening arthritide is infectious arthritis - crosses joints- goes from one bone to the next eating up the cartilage (neoplasms don't do this)

★ *Herniation of disc is usually a degenerative arthritide due to degenerated disc*

★ *Looks like dynamite went off in the joint*

Trauma

- Musculoskeletal system
- Two types
 - Axial
 - Instability (soft tissue injury)
 - Retropulsion - extradural abnormality- fragment that breaks off of spine and impinges on the canal
 - May see myelopathy with radiculopathy
 - Differentiate between UMN and LMN lesion
 - ◆ He'll ask clinical questions using radiology
 - Herniation is typically a DDD which means its an arthritide
 - Protrusion usually asymptomatic
 - Extrusion usually symptomatic
 - Size and location of herniation has NOTHING to do with the clinical presentation
 - Appendicular
- Three types of injury
 - Soft tissue injury
 - Osseous injury
 - Joint injury
- Fracture Healing process- look up in book- he'll ask questions on this
 - Union
 - Non-union
 - Mal-union
 - Complications of fracture

★ **Read summaries at end of each section**

Classification of Spondylolisthesis

- One in C/S is congenital - usually a missing pedicle
- Spondylolisthesis from spondylolysis is acquired

Two Types of Stress Fractures

- Fatigue - bone got loaded more than it should've relative to soft tissue- osteoclasts overworked and then osteoblasts come behind it
 - Completed fracture is the risk of non-compliance from patient- risk of non-union
- Insufficiency Fracture- osteoporosis
 - Produces rounding of vertebral body- *codfish vertebra*

Pathologic Fracture

- Neoplasm, infection or both
- In spine suspected when front and back of vertebral body collapse- *vertebral plana*
- L3 pathologic fracture differential fracture- METS, Multiple Myeloma or Infection (across joint)

Review the epinymys

Jefferson's, Hangman's, etc

Short overview of imaging of brain and cord

- Multiple sclerosis
- Epidural vs. subdural hematoma
- Sinus disorder
- Fractures of orbital floor
 - Blow-out fracture- fracture orbital floor and fat herniates into the sinus creating an opacity
 - Infection or inflammation opacifies sinus
 - Malignancy also opacifies
- Skulls are like femur- they get lytic and blastic disease
 - What's different is what's inside skull
 - Pathological calcifications are really the only thing we can see in brain from plain film
- Extradural and Intradural disorders

Chest

- Review differential and search pattern
- Determine Infection vs. neoplasm
 - Sicker the patient looks the more likely it's infection
- Signs of the
 - Silhouette sign
 - Extrapleural sign
 - Air bronchogram sign