ACUTE PULMNARY INFECTIONS: UNDERSTANDING THE CHEST RADIOGRAPH

Leonard E. Swischuk, M.D.
University of Texas Medical Branch
AUTHOR HAS NOTHING TO DECLARE
LEARNING OBJECTIVES

- Understand the pathophysiology behind images of pulmonary infections.
- Be able to evaluate chest radiographs with more confidence.
- Appreciate common pitfalls in radiographic image assessment.
PULMONARY INFECTIONS TO BE CONSIDERED

- Bacterial
- Viral
- Mycoplasma
PATHOPHYSIOLOGY

– Airspace (alveolar) disease
– Airway (bronchial) disease
CONFUSING CASES
CONFUSING IMAGES
YES
BUT EACH HAS A DIAGNOSIS
SO LET’S SEE HOW WE CAN DO THIS
CLINICAL PICTURES

A. Bacterial pneumonia
   – Toxic, septic
   – Shallow breathing

B. Viral bronchitis
   – Respiratory distress
   – Rapid breathing
   – Bad gases (bronchiolitis)
   – Air trapping
   – Usually not toxic

C. Mycoplasma
   – Mildly sick
FEVER

- High in bacterial pneumonia
  - $39^\circ$, $40^\circ$ C, $103-105^\circ$ F

- Low or high in viral infection
  - but usually low

- Usually low with mycoplasma
THE CHEST RADIOGRAPH

FEATURES AND CONCEPTS

BUILDING A TEMPLATE
DESCRIPTIVE ADJECTIVES

- CLEAN VS DIRTY
- VOLUME LOSS VS NO LOSS
- PERIPHERAL VS CENTRAL
- SYMMETRIC VS ASYMMETRIC
CLEAN VS DIRTY
CLEAN
BACTERIAL PNEUMONIA

DIRTY
VIRAL BRONCHITIS
VOLUME LOSS
VS
NO VOLUME LOSS
NO VOLUME LOSS
VOLUME LOSS
ATELECTASIS (VIRAL)

NO VOLUME LOSS
PNEUMONIA (BACTERIAL)
CAN BE A BIT OF A PROBLEM WITH SMALL LOBES RML AND LINGULA
CENTRAL SYMMETRIC

VS

PERIPHERAL ASYMMETRIC
PERIPHERAL ASYMMETRIC
CENTRAL SYMMETRIC
VIRAL BRONCHITIS

PERIPHERAL ASYMMETRIC
PNEUMONIA CONSOLIDATION
BACTERIAL INFECTIONS
(Pathophysiology)

- Inhale organism
- Organism deep in alveoli
- Organism trapped
- Organism multiplies
- Body reacts (polys)
- Purulent exudate
- Replaces air (no volume loss)
- Consolidation
CONSOLIDATION

- Smooth homogenous infiltrate
- Starts from the periphery (pleural based)
- Occasionally fluffy, nodular
- Occasionally round or mass-like
- No volume loss
NO VOLUME LOSS

WHY?
BECAUSE

Exudate simply replaces air
CONSOLIDATION

Occasionally fluffy, nodular
CONSOLIDATION

Occasionally round or mass like
CONSOLIDATION

Occasionally Multilobar “Double Pneumonia”
DOUBLE PNEUMONIA
BUT USUALY

NOT SYMMETRIC
AND NOT
BOTH LOWER LOBES
UNLESS
SICKLE CELL
ACUTE CHEST SYNDROME
CONSOLIDATIONS

( PLEURAL BASED )

– Effusions common
– Empyemas common
CONSOLIDATING PNEUMONIA Hiding LLL MOST COMMON LOOK FOR DIFFERENT DENSITY OF THE HEART
ACUTE ABDOMEN AND PNEUMONIA

THE ACUTE ABD SERIES
VIRAL INFECTIONS
(Pathophysiology)

- Intracellular infections
- Begin in nasal passages and hypopharynx
- Descend into trachea and bronchi
- Tracheo-bronchitis
VIRAL TRACHEO-BRONCHITIS

— Peribronchial thickening
— Bilateral parahilar (central) infiltrates
— Radiate outward
— Symmetric
— The end result is PHPB infiltrates
— Parahilar peribronchial
— Hilar adenopathy
— Overaeration (bronchospasm)
VIRAL TRACHEO-BRONCHITIS

PARAHILAR PERIBRONCHIAL INFILTRATES

PHPB

BILATERAL, CENTRAL, SYMMETRIC AND DIRTY
SPECTRUM OF PHPB

STILL
Bilateral, Central, Symmetric
VARIATIONS

Hilar Adenopathy (bilateral)
BILATERAL HILAR ADENOPATHY
CLEAR
BUT OVERAERATED LUNGS
BRONCHIOLITIS
NOW

ATELECTASIS

THE BIG PROBLEM

- LOBAR
- SEGMENTAL
- MUCOUS PLUGS
LOBAR ATELECTASIS

—Volume loss
—Often multiple
ATELECTASIS  LOBAR
(VOLUME LOSS)
LOBAR ATELECTASIS
VOLUME LOSS AND SHIFT
ATELECTASIS OR PNEUMONIA?
SEGMENTAL ATELECTASIS

—Streaky, linear
—Wedge-like
—Multiple
WEDGELIKE
STREAKS, WEDGES, MULTIPLE, DIRTY
SEGMENTAL ATELECTASIS

WHISKERS
MORE WHISKERS
VIRAL INTERSTITIAL INFECTION (Pneumonitis)

- Reticulo-nodular infiltrates (bilateral)
- Hazy / opaque lungs (bilateral)
  - Both lungs totally involved
  - Both lower lobes involved
RETICULO – NODULAR INFILTRATES
HAZY / OPAQUE INFILTRATES

interstitial inflammatory edema
BILATERAL LOWER LOBES
BUT CAN LEAD TO PSEUDO CONSOLIDATION

(Viral Interstitial Inflammatory Edema)
CASE 6
ALSO CAN BE
TOTAL LUNG INVOLVEMENT
BUT AGAIN
BILATERAL
CASE 7
ENTIRE SPECTRUM

Clear lungs to pseudoconsolidation
Single patient
VIRAL INFECTION WITH SUPERIMPOSED BACTERIAL CONSOLIDATION TAKES ABOUT A WEEK
CLINICAL PICTURE CHANGES FROM VIRAL TO BACTERIAL
ANOTHER CASE PNEUMONIA LLL ?
SORT OF WEDGELIKE
LOW FEVER AND VIRAL PICTURE
AND SO ATELECTASIS WITH PHPB
MYCOPLASMA INFECTION

(Pathophysiology)

Basically the same as viral
MYCOPLASMA INFECTION

(PHPB)

BUT USUALLY NOT BILATERAL
BILATERAL NOT VERY COMMON
MOST OFTEN

—Lobar (often one lobe)
  —Pseudoconsolidation (uncommon)
  —Retriculonodular (very common)
  —Hazy (very common)
MYCOPLASMA INFECTIONS
UPPER LOBES

- Mimic TBC
- Ipsilateral hilar adenopathy
MYCOPLASMA INFECTIONS CAN MIMICK TBC
CONCLUSION

– PATHOPHYSIOLOGY
– IMAGING
– CLINICAL CORRELATION
THIS PRESENTATION WILL BE AVAILABLE ON OUR WEB SITE FOR THIRTY DAYS

radiology.utmb.edu

(go to main page, go to pediatric radiology)