

Shedding Light on Neonatal X-rays

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Objectives

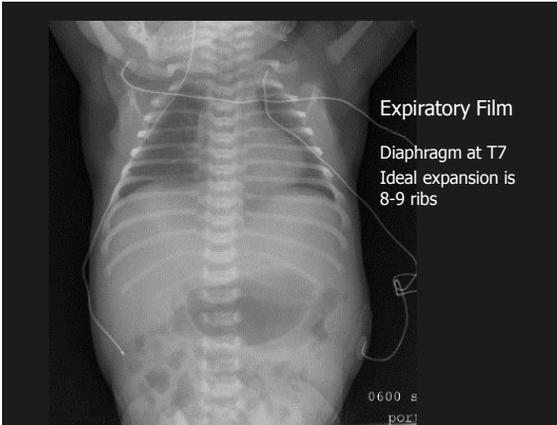
- Utilize a systematic approach to neonatal x-ray interpretation
- Identify correct positioning of the endotracheal tube, umbilical catheters and chest tubes
- Identify common pathologies seen on neonatal x-rays

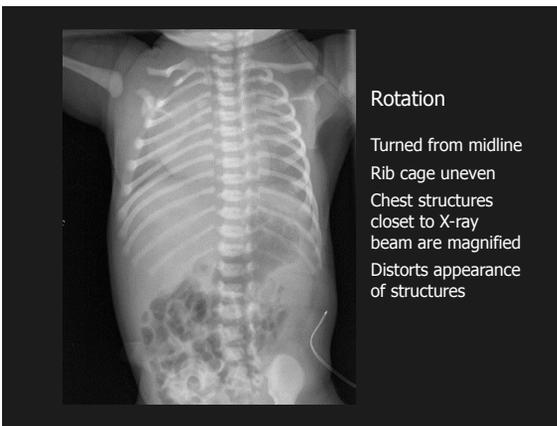
Indications for X-Rays

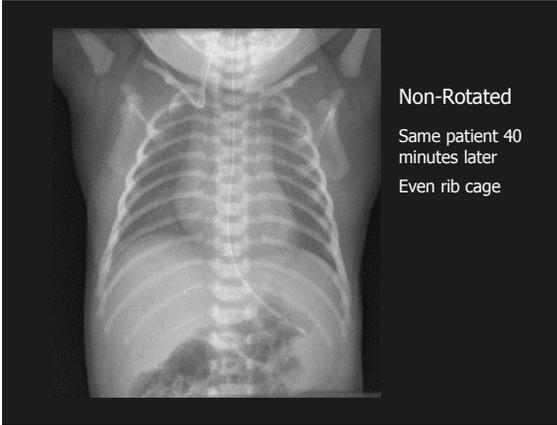
- Assess lungs and abdomen to follow progression or resolution of a disease process
- Assess heart size and position
- Assess tube and catheter positions

Technical Problems

- Expiratory Film
- Rotated Film
- Underpenetrated Film
- Overpenetrated Film
- Artifact

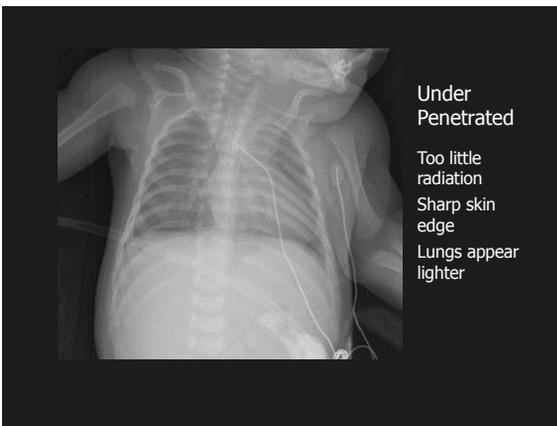


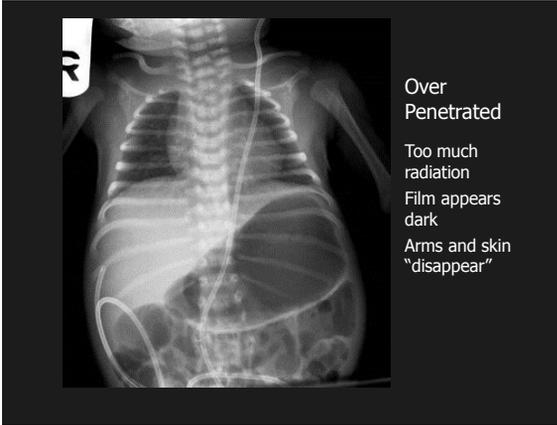


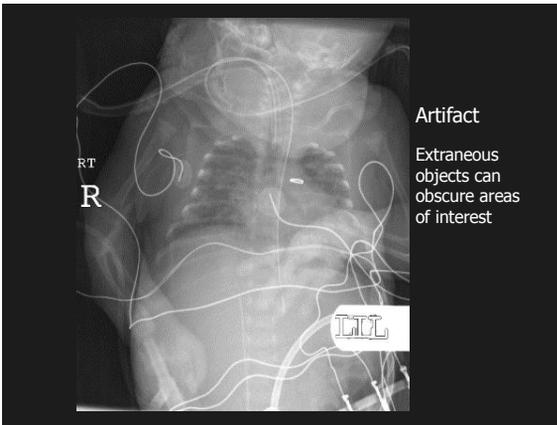


Technical Problems

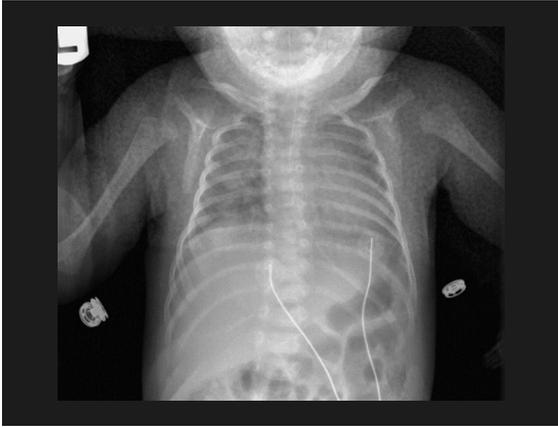
- Penetration
 - Different tissue densities absorb differing amounts of x-rays
 - X-rays pass through gas → dark shadow
 - Bone and fluid absorbs more x-ray → white image











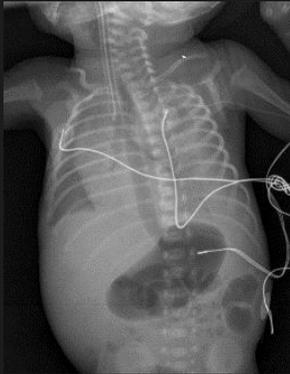
Systematic Evaluation

- Technique
- Heart size and shape
- Lung fields
- Abdominal gas
- Tubes
- Bones



Normal Film

- Good Technique
- Normal Heart size
- Diaphragms domed, 9 rib expansion
- Lungs normal
- Right Liver
- Left Stomach
- Mosaic Bowel Gas
- 12 Ribs
- No Fractures
- No Lines

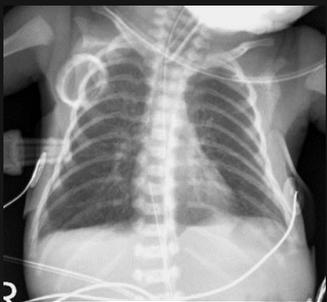


Mediastinum

Contains heart, aorta, vena cava, trachea and esophagus
Trachea to right of esophagus
Carina - bifurcation of trachea T3 - T4
Left mainstem bronchus at sharper angle
ETT should be midway between clavicles and carina



Cardiomegaly



Small heart size due to hyperinflated lungs.
Diaphragms flattened, 11 rib expansion



Umbilical Lines

UAC (T8). Loops down umbilical artery to iliac, then turns up the aorta to LEFT of the spine
Low: L3-4 High: T6-9
UVC (crossing PFO). No loop. Umbilical vein → ductus venosus → IVC.
UVC desired position is just above diaphragm.

ETT down R mainstem



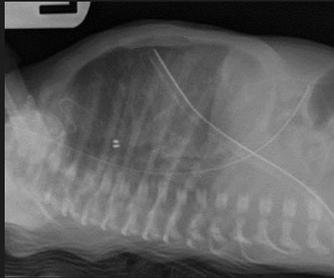
Lines Lateral View
(same patient)

UAC down umbilical artery to aortic bifurcation, then up the aorta along spine.
UVC straight from umbilicus thru liver and ductus venosus into heart

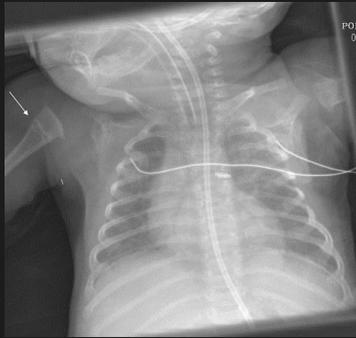


Chest Tube

For evacuating pneumothorax or pleural effusion



Chest Tube
(cross table lateral)
Anterior position
for evacuating air
Posterior position
for evacuating
fluid



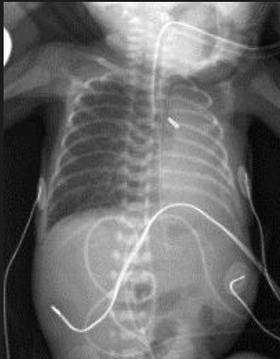
Bones
Fractured
right
humerus



Bones
Hemi-vertebra

Respiratory Diseases

- Atelectasis
- RDS
- Pneumonia
- Meconium Aspiration Syndrome (MAS)
- Congenital Diaphragmatic Hernia (CDH)
- Air Leaks
 - PIE
 - Pneumothorax
 - Pneumomediastinum
 - Pneumopericardium



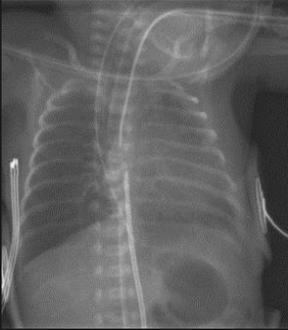
Left Atelectasis
(ETT right mainstem)

Volume loss as air is absorbed from left lung
Heart pulled toward left
Due to: malpositioned ETT, obstruction of bronchus (mucus plug, blood, meconium, foreign body)



RDS

Surfactant deficiency
Homogenous pattern
Low lung volumes
Diffuse reticulogranular "ground glass" pattern (White-out)
Air bronchograms (aerated bronchioles)
UVC: T6 UAC: T6



RDS after surfactant
(same patient)

Improved but unequal
aeration

ETT right mainstem

UVC: T8 (improved)



Pneumonia

Coarse, streaky,
interstitial
markings

Appearance can
vary widely



RLL Pneumonia

RLL patchy,
granular opacities

ETT good position
midway between
clavicles and carina

OG tube artifact



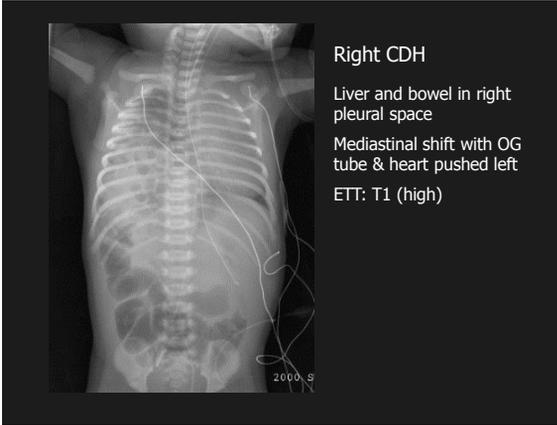
MAS
(meconium aspiration)
Irregular, diffuse pattern of patchy or nodular infiltrates, "chunky"
Lungs hyperinflated
Air trapping can lead to air leaks

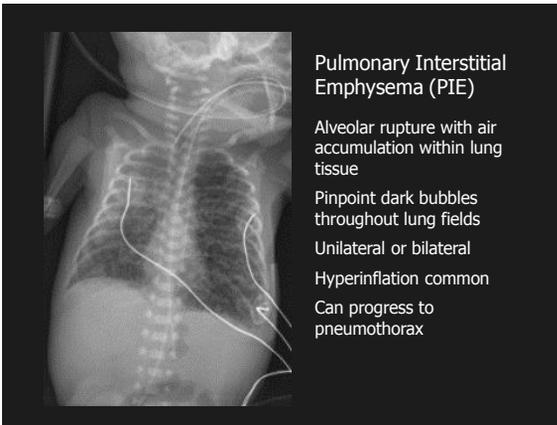


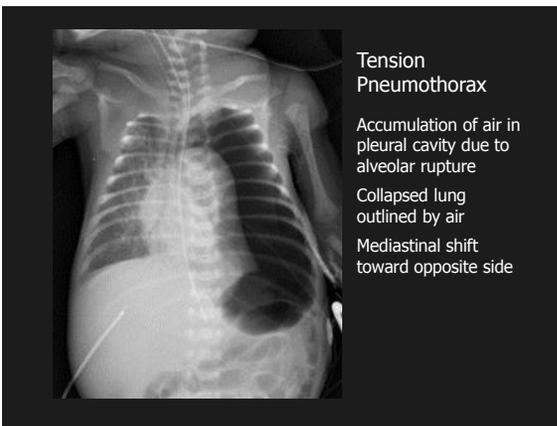
MAS
(same patient)
Lungs hyperinflated with bowing of diaphragms



Left CDH
Lucent bowel gas in pleural space
Herniation of abdominal organs into chest cavity
May contain stomach, bowel, liver, or spleen
85-90% occur on left
Mediastinal shift to right due to mass effect of the bowel
ETT just above carina
Soft tissue edema









**Anterior
Pneumothorax**

Free air is anterior with lucency along cardiac border or diaphragm

Usually no mediastinal shift

Lateral film helpful to see anterior air

Can progress to tension pneumo

Overpenetrated film



Pneumomediastinum

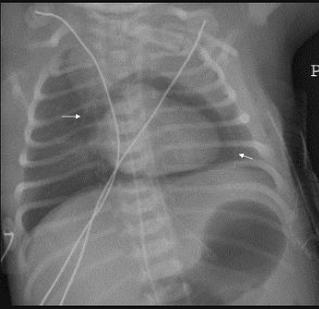
Lucency over upper chest

Free air accumulates within mediastinum

Air lifts thymus off heart outlining the undersurface of the thymus, creating the "sail sign"

Can progress to a pneumothorax or pneumopericardium

Pneumopericardium



Free air accumulates within pericardial sac

P. Radiolucent halo completely surrounds the heart

Classic dome-shaped upper margin

Pericardial rim may be visible (arrows)

Decreased heart size with cardiac tamponade

Pneumopericardium



Serial CXRs from 12:45 to 16:20
Progressive resolution of pneumopericardium
Mild cardiac tamponade
Heart size increases with resolution

Case Study

- 30 week gestation infant was just born at a nearby hospital ED
- Was intubated with difficulty by the ED physician secondary to respiratory distress
- You are part of the transport team and arrive 1 hour later.





Case Study

- Term infant with respiratory distress after a difficult vaginal birth
- Was placed on nasal CPAP initially and transport was requested
- You are part of the transport team and arrive to find he was just intubated for a sudden bradycardic/desaturation event