Outreach Education

The Art of Infant X-Ray

Lori Markham, ARNP, MSN, MBA, NNP

March 5, 2009

Program Handouts

This information is provided as a courtesy by Children's Health Care System and its related organizations (CHCS). Persons accessing this information assume full responsibility for the use of the information and understand and agree that CHCS is not responsible or liable for any claim, loss or damage arising from the use of the information. The views and opinions of the document authors do not necessarily state or reflect those of CHCS. Neither the authors nor CHCS nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.
Welcome

The Art of Infant X-Ray
Lori A. Markham ARNP, MSN, MBA, NNP-BC
Manager, Neonatal Nurse Practitioner Program
Seattle Children’s Hospital

Objectives
- Identify reasons an infant would need an x-ray
- List critical components of a quality film
- Identify strategies for ensuring a quality film
- Discuss how technique and interpretation might influence nursing interventions

What is an X-ray?
- Short electromagnetic radiations produced by energy conversion when fast-moving electrons from the filament of the x-ray tube interact with the tungsten anode (target)
- An X-ray picture is really a picture of the shadows cast by the denser materials (like bones) in your body
- These shadows are projected onto a film that has been coated with a sensitive material. The film is developed in a manner very similar to a photograph

Why should we do an x-ray?
- Used to assess heart, lungs, abdomen, bones
- X-rays are ordered:
  - as part of a physical examination
  - to assess symptoms of conditions related to the heart or lungs
  - to check the position of internal devices such as central venous catheters or ETT
  - to correlate with physical findings

Assess symptoms
Check position of devices

Correlate with physical findings

How do X-rays work?

• X-rays are absorbed by tissue in varying amounts
• Denser tissues absorb more and look white
• Less dense tissue absorb less and look black on film
  • Bones look white
  • Soft tissue look gray
  • Air filled structures look black

X-ray positions – AP film

• The AP chest x-ray (anterior posterior view)
• Most common view
• Best view for identification of heart/lung disease, diagnosing abdominal disorders or verification of ETT, UAC, UVC

X-ray positions – cross table lateral

• Cross-table lateral view
• Optimal view for relative position of the lung, intrapleural air, and chest tube position

X-ray positions – lateral decubitus

• Left lateral decubitus film
• Best view to diagnose perforation or small pneumothorax
A systematic approach

- Compare to previous film
- Examine soft tissues
- Review bony framework
- Tracheal air and/or deviation
- Examine the hilum
- Evaluate the mediastinal structures
- Evaluate the diaphragm
- Check the pleura
- Identify the gastric bubble and liver
- Evaluate the lung fields
- Note indwelling devices

Another systematic approach

- Evaluate quality of film
- Survey infant position
- Evaluate for extraneous objects
- Evaluate the film systematically
  - Heart size, position and shape
  - Mediastinum
  - Lung fields (volume)
  - Aeration of lungs
  - Assess pulmonary vascularity

Systematic assessment

Quality of an x-ray

- Quality is essential for accurate evaluation
  - position
  - rotation
  - artifact
  - penetration/exposure

Position and rotation

- Ribs should appear equal in length
- Clavicles symmetric
- Rotation causes skewed lung fields and possible misdiagnosis
- Difficult to evaluate ETT and/or line position

Lordotic Position

- Neonate – conical shape
  - Front of chest tipped up naturally
  - Posterior lung fields disappear behind the diaphragm (posterior lung pathology may go undetected)
  - Exaggerated by: tipping chest upward (infant lifting back off of a cold plate)
  - Improved by: ↑ HOB 5-10%
Artifact

• Identify artifact versus pathology

Penetration/Exposure

• Overexposed
  • Burned out
  • No lung markings
  • Less contrast with background of film
• Underexposed
  • Light gray all over
  • Lacks contrast

Inspiratory Film Clues

• Less than 1/3rd of heart is below the dome of the diaphragm on frontal film
• Diaphragm domes are flat or rounded
• 5th or 6th anterior rib crosses the diaphragm on the frontal film
• Triangle of air behind heart on lateral film
• Lungs are black

Expiratory Film Clues

• More than 1/3rd heart projects below the dome of the diaphragm
• Diaphragms are very domed
• 3rd or 4th anterior rib crosses the diaphragm
• No triangle of air behind the heart
• Lungs are white

Role of the Nurse

• Often initiates the request for a film
• Being aware of and ensuring proper technique
• Ensure proper positioning of the infant
• May be the first to see the x-ray
• Ability to interpret the findings can mean prompt intervention and treatment

Pearls

• Anatomic structures are recognized by differences in density
• Different disease processes may produce similar x-ray findings
• Focusing on one aspect of the film or pathology can lead to overlooking other abnormalities or pathology
Interesting X-rays

Abdominal Perforation

Respiratory Distress Syndrome

Pulmonary Interstitial Emphysema

PLL Infiltrate

Congenital Diaphragmatic Hernia
Summary

Remember in each case:

- Proper technique - ability to see important landmarks
- Orientation of the film, i.e. left or right marked
- Good inspiratory effort without motion
- Recognize film artifacts
- Systematic approach in looking at films
- Pertinent clinical history

Thanks!