APPH 226: Exposure Factor Selection and Technique Charts

Objectives: 11.1-11.4

MRT Program

Purpose

- Why do we need a technique chart?
  - To provide a level of consistency among images and radiographers
  - Standardizes selection of exposure factors to help the technologist produce quality radiographs and keep patient dose to a minimum

Technique Charts

- Designed for the average patient and do not account for unusual circumstances
- Technologist still needs to assess the patient
  - require patient assessment and appropriate adjustments – body habitus, pathology, condition
  - Certain conditions may require an increase/decrease in technique
- Helps ensure that there is consistent image quality throughout the entire dept, also decrease the number of repeats (reduce patient exposures)

Digital Systems

- Just as important for digital systems as well as conventional
- Wide dynamic range
- System compensates for poor exposure factor selection
  - Could be over exposing patient without knowing
  - Important to check EI numbers
  - Images may still appear diagnostic regardless of over/under exposure

Conditions

- Separate technique chart should be established for each x-ray tube
  - Even if they share the same generator
- Every portable must also have its own technique chart
- Standardization of positioning techniques throughout department
  - Positioning, accessory equipment, IR type, grid ratio
  - Decreases number of variables from case to case
    - Collimation, filtration, SID, IR speed/type
    - Positions, grid usage

Conditions

- For technique charts to be effective:
- Equipment must be calibrated
  - Accuracy of factors is important
  - Quality control program in place will ensure consistency of equipment performance
- Image processing must be consistent through the department

Main Types - Variable kVp/ fixed mAs

- Variable kVp/ fixed mAs
  - Based on the concept that kVp can be increased as anatomic part size increases
  - Basic characteristic of this chart is an inherently short scale of contrast
    - Typical exposures will be higher contrast due to the use of lower kVp
  - +2 kVp for every additional cm of part thickness
  - Accurate measurement of part is critical for this type of technique chart
    - calipers

Main Types - Variable kVp/ fixed mAs

- Variable kVp/ fixed mAs
  - Changing kVp values for variations in part thickness may be ineffective throughout the entire range of radiography exams
    - Only effective for pediatrics or small extremities – small changes in kVp more effective at low kVp levels than changing the mAs
    - Cons:
      - less latitude for error, adequate penetration of large parts is not always assured, increased patient dose

Main Types - Fixed kVp/variable mAs

- **Fixed kVp/variable mAs**
  - Uses concept of selecting optimal kVp for exam, and adjusting mAs for variations in part thickness
  - Most common type of chart
  - Optimal kVp: high enough to penetrate the body part
  - For each part, there is an optimum kVp and mAs is adjusted for part thickness

Theoretically

- X-rays are attenuated exponentially, meaning…
  - For every 4-5 cm change in part thickness, the mAs should be adjusted by a factor of 2
  - E.g. if a knee measures 10cm, and the technique is 70 kVp @ 6 mAs, and another knee measures 14 cm, the new technique will be 70 kVp @12 mAs
  - Thickness groups of 4-5 cm can be made, instead of thickness changes in increments of 1 cm
  - mAs can be adjusted by 30% or factors of 2 (1/2 or doubling) – depends on site criteria

Stages of Development

- Set appropriate kVp for the anatomical part
- Using a phantom, determine the mAs that produces desired radiographic density and exposure index
- Using a calculator, extrapolate the techniques for changes in part thickness (small, large)

Comparative Anatomy

- What if there is no technique for the part you are imaging? What if it isn't on the list?
  - Then you choose another anatomical part that has similar thickness/composition
  - E.g. knee and shoulder

High kVp technique chart

- This is another type of technique chart using kVp settings greater than 100
  - Ideal for barium exams to ensure adequate penetration of the barium
  - Also can be used for chest imaging
- Preparation of this type of chart is basically the same as preparing for the fixed kVp technique chart
- All exposures for a specific anatomical part will use the same kVp
- Using a phantom, determine the mAs that produces the desired radiographic density

Readings

- Radiologic Science for Technologists 11th Ed
  - Pg 252-256 (Radiographic Technique Charts, stop before Automatic Exposure Techniques)